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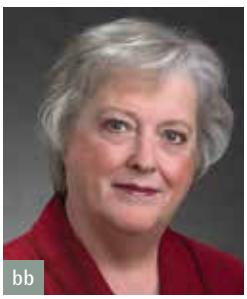
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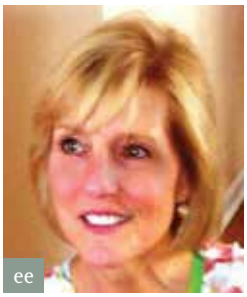
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Looking forward

by David B. Hoyt, MD, FACS

Over the course of the last year, the Executive Staff of the American College of Surgeons (ACS) has engaged in a Leadership Development Program, which has been a critical part of our effort to transform how we function and operate here at the College. This training program was developed in concert with our consultants from GE Healthcare to meet the following objectives:

- Provide Executive Staff with a platform to become champions of the ACS organizational values and serve as role models for the type of behaviors we should come to expect from one another
- Allow Executive Staff to achieve a deeper understanding of how to serve as leaders at the ACS, while remaining both team- and values-focused
- Offer the leaders of the College the tools they need to exceed rising expectations of individual, team, and organizational performance

This Leadership Development Program was an intense learning experience and required a significant time commitment on the part of each executive team member, but I believe that what we have taken away from this experience individually and collectively was well worth the effort.

This Leadership Development Program was an intense learning experience and required a significant time commitment on the part of each executive team member, but I believe that what we have taken away from this experience individually and collectively was well worth the effort.

Six components of the program

The six key pieces of the Leadership Development Program were as follows: leadership personality assessment, emotional intelligence (EI), coaching, conflict resolution, innovation, and continued engagement.

Leadership style

We began the training by looking inward to learn about our individual leadership styles and those of our colleagues and to see whether our behaviors are consistent with the values that we have developed for the organization: Professionalism, Excellence, Innovation, Introspection, and Inclusion. We assessed our work styles and personalities using a DiSC assessment tool, which measures an individual's tendency toward:

- Dominance: Dominant types take charge of situations, are decisive, and move forward quickly

All of the Executive Staff believe that this training program has made them better leaders of their teams and have committed to applying their newly acquired skills and knowledge to keep the College moving forward in a positive direction.

- Influence: People high on the Influence scale are persuasive and extroverted
- Steadiness: Steady relators seek consensus before acting, are loyal, and value collaboration
- Compliance/conscientiousness: People who fall into this category are cautious and detail-minded

This session provided us with insights into our personality type and interaction style to help us understand how we communicate with others, how we process information and our emotions, and the kind of activities we prefer and how we best complete them.

EI

We then turned our focus to EI, which comprises five components:

- Self-perception, including self-regard, self-actualization, and self-awareness
- Self-expression, including emotional expression, assertiveness, and independence
- Interpersonal skills, such as the ability to form relationships, to feel empathy, and to demonstrate social responsibility
- Decision making, such as problem solving, reality testing, and impulse control
- Stress management, including flexibility, stress tolerance, and optimism

Emphasis was placed on determining where our strengths and weaknesses lie and on implementing an individual development plan (IDP) to improve our awareness of how we can better inspire our teams to deliver their best work every day.

Coaching

Next, we learned about applying a coaching model to leading teams. Coaching is a style of leadership that focuses on team member development. Under this model, the coach builds a partnership with team members to enhance their effectiveness so that they feel more aligned, resourceful, and optimistic. Effective coaches are good listeners. They are self-aware and able to manage their impulses. They are curious and actively foster their employees' professional growth.

Conflict resolution

We then analyzed how we handle and resolve conflict. We used the Thomas-Kilmann Instrument (TKI) to explore the range of styles used in managing conflict based on our natural preferences and the demands of the situation. The TKI identifies five modes of dealing with conflict:

- Avoidance
- Accommodation
- Compromise
- Competition
- Collaboration

We learned to take constructive steps toward resolving conflict, including establishing a suitable time and place to discuss the issue, actively listening to the other party's perspective, reaching agreement on the root cause of the problem, looking for common ground, brainstorming for alternatives, and committing to action.

Fostering innovation

Our next session focused on fostering innovation. We learned that four fundamental forces work in different ways to produce innovative solutions:

- Collaboration, which uses human relations to make innovation happen

ACS Executive Staff members celebrate the successful completion of their leadership training.

- Competition, which focuses on the rational pursuit of success, often at the expense of weaker competitors

- Creation, which uses open systems and experimentation to produce new knowledge about products and services

- Control, which uses careful planning, systems, and processes to generate incremental changes

Successful leaders effectively integrate these four approaches to grow the organization in the face of complex demands, aspirations, and practices.

Engagement

Finally, we tied what we learned at each of these training sessions together. Each participant created a Reflection and Action Poster to promote informal, one-on-one conversations and small-group interactions. After the poster presentations, participants were recognized with a glass plaque for their year-long commitment to the program (see photo, this page), reported on one or two actions they will take to continue on our leadership development journey, and explained what they intend to do to improve as ACS leaders and why.

Expansion to other staff and ACS leaders

All of the Executive Staff believe that this training program has made them better leaders of their teams and have committed to applying their newly acquired skills and knowledge to keep the College moving forward in a positive direction. For this training to truly have a lasting impact, we realize that all staff and ACS volunteers must be inculcated in these techniques. That way, we can harness our collective intelligence, skills, talents, and capabilities to make the College an even more effective organization than it is. Consequently, all staff are now participating in the DiSC and EI training programs, and ACS Regents and Officers participated in a half-day session centered on key aspects of this training in July. I would encourage all of you to learn more about these leadership techniques as well to help grow your institutions and improve patient care. ◆

If you have comments or suggestions about this or other issues, please send them to Dr. Hoyt at lookingforward@facs.org.

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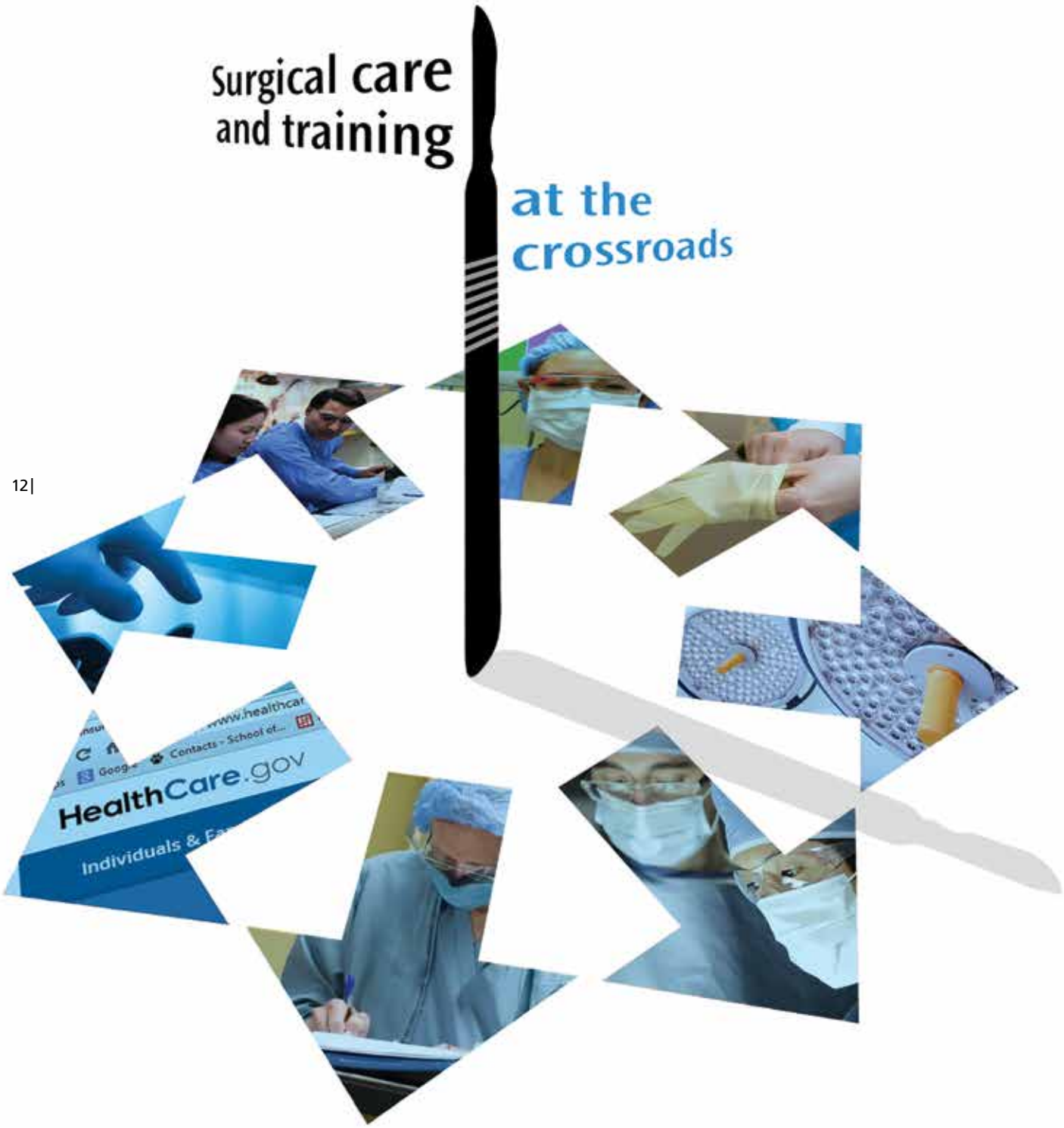

Making the transition from mentee to mentor

by Robert D. Winfield, MD

HIGHLIGHTS

- Discusses the importance of mentoring for residents
- Describes the qualities of effective mentors
- Considers the obstacles to effective mentoring
- Advises young surgeons on how to make the transition from mentee to mentor

I have been fortunate to have had a number of outstanding mentors in my surgical career. I can still hear the voices of the people who guided me through medical school, general surgery residency, a research fellowship, and a clinical fellowship. I am acutely aware that the advice they dispensed and the opportunities of which they either made me aware, or outright provided, were critical in my development as an academic general and trauma surgeon. They continue to influence how I conduct my surgical career each and every day.

As I have transitioned from trainee to faculty surgeon, new mentors are helping me to face the challenges that independent surgical practice and a research career entail. With their assistance, I feel well-prepared to take on these positions because they are natural extensions of the ones I filled during my training.

A different role has emerged in my first two years of practice, though; I am now responsible for mentoring residents and medical students as they navigate their initial development as surgeons, a process that I have only recently completed. This sudden transition, to me, is the epitome of the theme of this Resident and Associate Society of the American College of Surgeons issue of the *Bulletin*—Surgical Care and Training at the Crossroads—and leads me to ask, "How do I make the transition from being mentored to becoming a mentor, and, perhaps more importantly, how do I pay forward the many gifts—medical knowledge, career advice, opportunities to serve and lead in various surgical organizations—that my mentors provided to me?" Because many young surgeons entering practice must confront this challenge, a review of mentorship with a specific focus on making the transition from mentee to mentor is the thrust of this commentary.

Importance of mentorship

The topic of mentorship in academic medicine has been examined extensively in the literature, with identification of a variety of short- and long-term benefits to the mentees, depending on level of experience. Mentoring medical students has been shown to influence their career choice, and approximately half of general surgery residents indicate that a surgical mentor influenced their decision to pursue surgical training.[1-3] Once in training, graduating

Because many young surgeons entering practice must confront this challenge, a review of mentorship with a specific focus on making the transition from mentee to mentor is the thrust of this commentary.

general surgery residents indicate that their mentors influence their decisions to pursue surgical careers (65 percent), a specialty (45 percent), and a subspecialty (44 percent).[4] Finally, both medical students and surgical residents have indicated a greater degree of success in performing research when mentored.[4,5] Over a longer period of time, mentorship is associated with improved career satisfaction among mentees.[6]

Significant qualities of mentors

A positive mentor-mentee relationship depends on characteristics of both individuals, of course, but the supervisory role of the mentor is enhanced by certain behaviors and features. Entezami and colleagues reviewed the existing literature on mentoring in surgery and found a focus on the qualities of mentors to be present in 82 percent of such articles. In this review, they found that professional role modeling, devoting time and effort to the mentor-mentee relationship, providing feedback, exhibiting leadership in the field, and challenging surgical students were deemed essential.[7] Sanfey and colleagues add that mentors should ensure mentees reach appropriate academic milestones, promote their integration into the academic environment and help them to establish professional relationships, demonstrate confidence in the mentee, provide an environment of support, and give advice on opportunities that may be of benefit or detriment to the mentee.[6]

Real and perceived obstacles

Doing the right thing when mentoring is important, but a number of potential stumbling blocks confront surgical mentors. Devoting time to the relationship with the mentee is key, and failing to set up regular times to meet with the mentee poses a significant problem. In Entezami's review, 68 percent of articles on surgical mentoring mentioned time restrictions as a barrier to effectiveness, and with the time demands of surgical practice, these constraints are perhaps the most challenging aspect of being a good mentor.[7] Other challenges may arise from seemingly innocuous pairings of individuals of dissimilar cultural backgrounds, opposite genders, or different generations.[6,7] Failing to set appropriate expectations and provide meaningful feedback regarding mentee performance sets the stage for a poor experience for both individuals. This can be particularly problematic if the mentor and mentee are working together to generate an academic product, such as an abstract or presentation, where issues of first authorship, relative contribution, and ownership of intellectual property are important to both individuals. Finally, a mentor needs to understand the limits of the relationship, both in terms of what the mentor can offer and the appropriate personal boundaries needed for a professional relationship.

Making the transition

In the early years of practice, living up to the ideals of quality mentoring (and avoiding the pitfalls of subpar mentoring) requires additional work and preparation for most surgeons. Before the first meeting with a prospective mentee, the mentor should review any information they may have regarding this individual, such as curriculum vitae, transcripts, personal statements, or other documents pertinent to the mentee's professional role. This documentation may provide insights into the mentee's career plans, strengths, and weaknesses, and suggest areas where more activity, effort, or guidance might be beneficial. At the initial meeting, spending time learning about the mentee's educational, cultural, and social background will pay dividends by helping to create a holistic relationship. As mentioned previously, cultural and gender differences between mentor and mentee may be potential barriers, but with a sensitive approach on the part of the mentor, the experience can be enriching for both parties.[8]

With respect to mentoring someone of the opposite gender, data from the surgical literature suggests that the majority of trainees do not have a preference for a mentor of the same sex.[9] However, women surgeons are more likely to identify a lack of mentoring

as an impediment to career success than are men, and among residents, women are more likely to feel that a same-sex mentor would be more understanding of their needs.[10] That said, opposite-gender mentoring does not diminish the academic productivity of the partnership, and a thoughtful and considerate mentor can provide the environment necessary to promote success and understanding, regardless of gender.[11]

This awareness of the need for sensitivity regarding gender differences dovetails with awareness of generational variances; priorities with regard to family, outside interests, and work-life balance may vary between mentor and mentee. Although the junior faculty mentor may look like a generational counterpart to the mentee, a five- to 10-year gap in age and experience may separate the new practicing surgeon from an intern, and it should not be assumed that their priorities run parallel.

Once the pairing of mentor and mentee has been established and understanding of expectations have been communicated to the mentee, the mentor needs to apply a consistent approach. Although the mentee needs to share in the responsibilities required of the partnership, determining the frequency of meetings should not be among these. The effective mentor will ensure that time is set aside on a regular basis to discuss goals and reassess their current relevance, revisit ongoing projects, and inquire about social changes that may be affecting the mentee's life. An open-door policy can be reassuring to the mentee and should be the standard, but schedule demands may come into play and make this difficult. The busy surgeon-mentor can use alternate methods (e-mail, text, telephone) to maintain contact when needed, and some mentors in academic health care have found this strategy to be effective.[12]

In terms of providing meaningful feedback, the mentor should avoid the trap of being a cheerleader because a lack of critical evaluation will not lead to professional growth for the mentee; conversely, being a harsh critic is perhaps even more detrimental, as it erodes confidence and may generate resentment. Ultimately, providing thoughtful feedback based on previously established expectations will lead to the best outcomes, as it allows for both compliment, critique, and building confidence by highlighting achievements reached while simultaneously identifying areas for continued improvement.

The junior faculty member who is rising to the challenge of mentoring can clearly prepare and succeed in this new role. There may be areas, though, where the young mentor may feel unable to help or needs to recognize that additional assistance is necessary. As mentioned earlier, being a leader in one's field is viewed by mentees as a key quality of a strong mentor, while new faculty are unlikely to be viewed in this light by their own institution, much less by one's specialty peers. This image does not render the mentor incapable of assistance.

In the course of training, while presenting in academic forums and interviewing for fellowship and job positions, surgeons are fortunate enough to come into contact with a number of leaders in their field, most of whom will respond favorably to a request for assistance from a junior colleague. By using these contacts, the young mentor can provide experience by proxy. Likewise, the new mentor is someone who is also learning to navigate the academic environment and may not be best suited for making introductions or determining the relative benefits of one career pathway over another. When the mentee requires guidance that the mentor cannot deliver, a referral to a senior surgeon is not a failure, but evidence of sound judgment that is focused on providing the best experience for the mentee.

Issues may arise in the life of the mentee that require the assistance of a nonsurgeon. Substance abuse, disruptive behavior, and psychiatric illness may all manifest in the course of a relationship between mentor and mentee. For the health and well-being of the mentee, support should be offered, but attempts by the mentor to correct the problem on behalf of the mentee are generally misguided and may be damaging to both individuals. These are situations in which a referral for counseling or treatment is the most appropriate action.

Surgeon mentors learn about differences in cultural, generational, and gender concerns when we listen carefully to our mentees, and this knowledge strengthens our ability to understand these issues when we care for patients and work with our colleagues.

Rewards of mentoring

Becoming a mentor to a junior surgeon is challenging. To borrow a phrase from Gen. George Patton, accepting challenges, such as becoming a mentor, allows us to feel the exhilaration of victory. Victory shows itself in many ways when surgeons take on the role of mentor. We take pride as our mentees learn new skills, when they succeed in achieving their personal and professional goals, and when they develop the independence that allows them to go on to mentor others.

Surgeon mentors learn about differences in cultural, generational, and gender concerns when we listen carefully to our mentees, and this knowledge strengthens our ability to understand these issues when we care for patients and work with our colleagues. Finally, when we mentor, we amplify the ability to provide quality care to patients. By serving as appropriate role models, we show our mentees how to be surgeons, knowing that they will go on to provide that same great care to others.

In the past year, bridging my first and second years in practice, I have been fortunate to have had the opportunity to formally mentor one medical student and two general surgery trainees. For each mentee, I have tried to practice what I have preached in this article—actively listening, providing good feedback, and encouraging them to take advantage of good opportunities and avoid bad ones. I have watched my student matriculate into her top choice for general surgery residency training, one of my residents compete in and win a trauma papers competition, and the other find an activity outside of work to decompress from the stressful days of residency training and achieve better work-life balance. I am equally thrilled by the achievements of each of these three outstanding young women and have enjoyed providing guidance to them as they navigate the various stages of their surgical careers. I look forward to working with each of them in the future, monitoring their progress, and seeing their successes.

I can only hope to become the kind of mentor that my mentors were for me, and I can certainly see why they did what they did on my behalf. Of the many joys that my surgical career brings to me, helping my mentees grow and develop into accomplished young surgeons infuses my career with energy and life and inspires me to be a better surgeon and person. ◆

REFERENCES

1. Osborn EH. Factors influencing students' choices of primary care or other specialties. *Acad Med*. 1993;68(7):572-574.
2. Rubeck RF, Donnelly MB, Jarecky RM, Murphy-Spencer AE, Harrell PL, Schwartz RW. Demographic, educational, and psychosocial factors influencing the choices of primary care and academic medical careers. *Acad Med*. 1995;70(4):318-320.
3. Lukish J, Cruess D. Executive Committee of the Resident and Associate Society of the American College of Surgeons. Personal satisfaction and mentorship are critical factors for today's resident surgeons to seek surgical training. *Am Surg*. 2005;71(11):971-974.
4. Thakur A, Fedorka P, Ko C, Buchmiller-Crair TL, Atkinson JB, Fonkalsrud EW. Impact of mentor guidance in surgical career selection. *J Pediatr Surg*. 2001;36(12):1802-1804.
5. Aagaard EM, Hauer KE. A cross-sectional descriptive study of mentoring relationships formed by medical students. *J Gen Intern Med*. 2003;18(4):298-302.
6. Sanfey H, Hollands C, Gantt NL. Strategies for building an effective mentoring relationship. *Am J Surg*. 2013;206(5):714-718.
7. Entezami P, Franzblau LE, Chung KC. Mentorship in surgical training: A systematic review. *Hand (N Y)*. 2012;7(1):30-36.
8. Moller MG, Karamichalis J, Chokshi N, Kaafarani H, Santry HP. Mentoring the modern surgeon. *Bull Am Coll Surg*. 2008;93(70):19-25.
9. Gurgel RK, Schiff BA, Flint JH, et al. Mentoring in otolaryngology training programs. *Otolaryngol Head Neck Surg*. 2010;142(4):487-492.
10. Sambunjak D, Straus SE, Marusic A. Mentoring in academic medicine: A systematic review. *JAMA*. 2006;296(9):1103-1115.
11. Levinson W, Kaufman K, Clark B, Tolle SW. Mentors and role models for women in academic medicine. *West J Med*. 1991;154(4):423-426.
12. Straus SE, Johnson MO, Marquez C, Feldman MD. Characteristics of successful and failed mentoring relationships: A qualitative study across two academic health centers. *Acad Med*. 2013;88(1):82-89.

What does the ACA mean for residents and their future practice?

by Stefan W. Leichtle, MD; Naveen Sangji, MD, MPH; William H. Ward, MD; and Priya Iyer, MD

HIGHLIGHTS

- Describes the major provisions in the ACA, including insurance exchanges, employer-based coverage mandates, Medicaid expansion, quality improvement efforts, and highlights sections of the act affecting GME
- Summarizes the ongoing debate over some of the law's major mandates
- Provides details on how the ACA may affect the future of surgical practice in terms of physician reimbursement, administrative burdens, physician shortages, and practice models

On March 23, 2010, President Barack Obama signed the Patient Protection and Affordable Care Act, better known as the Affordable Care Act (ACA) or "Obamacare," into law.[1] The ACA is the most significant piece of health care legislation signed into law since the enactment of Medicare and Medicaid in 1965. There have been numerous failed legislative attempts over the last several decades to rein in the rising costs of health care and the increasing number of uninsured Americans, including promising initiatives from Sen. Ted Kennedy (D-MA), President Richard Nixon (R), and President Bill Clinton (D), all of which failed to gain sufficient support.[2,3]

The practice environment for current residents and young surgeons has changed tremendously over the last years, and legislation such as the ACA will continue to dramatically alter the landscape of medical practice. Physicians today practice in a much more regulated environment and are challenged with budget cuts, strict administrative oversight, and public reporting, which influence patient care on a daily basis. As a result, physicians need to possess more than medical knowledge—they need to be well-versed in the basics of the health care delivery system, particularly the effects of legislation such as the ACA.

Health care costs have grown steadily from 7.1 percent of the gross domestic product (GDP) in 1970 to 17 percent of the GDP in 2009, and are expected to reach 20 percent by 2017. In 2009, 17 percent of the U.S. population (45 million Americans) was uninsured. Additionally, Medicare and Medicaid spending has become an ever-increasing portion of the GDP, and is expected to reach 6 percent by 2019.[3-5] Given the potentially disastrous consequences of these trends for the American health care system and the U.S. economy in general, it is unsurprising that President Obama made health care reform a key election issue in 2008.

ACA

Soon after his election, President Obama requested that key House and Senate committees develop legislation to increase access to health care, control costs, and improve the quality of care. The ACA builds on existing programs, such as

Many sections that affect GME were likely motivated by critical reports, such as the Medicare Payment Advisory Commission's June 2010 *Report to the Congress: Aligning Incentives in Medicare,* which highlighted key concerns regarding GME, including a perceived lack of diversity among physicians, excessive focus on specialty care at the expense of preventative medicine and chronic disease management, and a lack of emphasis on value.

Medicare, Medicaid, and the employer-based insurance system, to expand coverage to uninsured and underinsured Americans.

Funding for the ACA comes from many of the stakeholders involved, including employers, consumers, providers, insurance companies, and state and federal governments. The Congressional Budget Office (CBO) and Joint Committee on Taxation (JCT) estimate that the law will reduce the number of non-elderly uninsured individuals by 12 million in 2014, 19 million in 2015, and 26 million in 2017.[6] Moreover, whereas federal outlays for health care are initially expected to increase, the ACA is projected to increase federal tax receipts and eventually reduce the federal budget deficit by $152 billion by 2024.[6]

The ACA may profoundly change the environment in which physicians practice in the future. Of particular importance for residents, fellows, and young surgeons are several ACA provisions that have direct implications for graduate medical education (GME).

Many sections that affect GME were likely motivated by critical reports, such as the Medicare Payment Advisory Commission's June 2010 *Report to the Congress: Aligning Incentives in Medicare,* which highlighted key concerns regarding GME, including a perceived lack of diversity among physicians, excessive focus on specialty care at the expense of preventative medicine and chronic disease management, and a lack of emphasis on value.[7] Additionally, the report described the $6.5 billion for indirect medical education, an amount found to be inappropriately high, and several budget cuts were suggested.

The entire 907 pages of the ACA are available online.[8] A summary of the law's key components follows, with a particular focus on the implications for early-career physicians.[9]

Individual mandate and insurance exchanges

As of March 31, 2014, all Americans are required to have health insurance coverage meeting certain minimum standards or be subject to a tax penalty, referred to as the individual shared responsibility mandate. This penalty will rise from 1 percent of the yearly household income or $95 per person (whichever is greater) in the first year, to 2 percent of the household income or $325 per person in 2015, and to 2.5 percent of household income or $695 per person in 2016, with subsequent adjustments for inflation.[10] Certain individuals are exempt from the penalty, including people who would have to pay more than 8 percent of their income for coverage, those exempted from filing a tax return based on income or religious objections, and those who are in the country illegally. Additional exemptions are described in the ACA.

Americans with an annual income between 100 percent and 400 percent of the federal poverty level are eligible for subsidies in the statewide health insurance exchanges established by the Secretary of the U.S. Department of Health and Human Services (HHS).

Insurance exchanges are organized on a state level and allow U.S. citizens, legal immigrants, and small businesses to buy approved health coverage. The exchanges can be run by either a governmental agency or a not-for-profit organization, and multiple insurance exchanges may be available in a single state. Insurance exchanges also can be run as Consumer Operated and Oriented Plans, which are managed by its members (insurance holders, for example) and may encourage personal responsibility and cost savings.

Although the federally run exchange used in more than half the states and several state-run exchanges were initially plagued by technical difficulties that led to lagging enrollment numbers, more than 7.1 million Americans had signed up by the April 1 dead-

line, meeting and exceeding the government's goal of 7 million enrollments.

Employer coverage

The ACA offers incentives to small employers to provide insurance for employees and penalizes larger employers that refuse to provide insurance. Businesses with more than 200 employees must enroll these individuals in a health plan or pay a $2,000 penalty per full-time employee, excluding the first 30 employees. Employers with fewer than 50 employees receive tax credits for offering health insurance. The employer mandate has been delayed until 2015.

Extended coverage and improved benefits

The ACA extends parental coverage to children up to age 26 and, since enactment, has mandated that children under 19 years old with pre-existing conditions have access to coverage. Beginning in 2014, no one may be denied coverage due to pre-existing conditions. Additionally, plans must cover preventative services with proven benefits without charging a deductible or copayment, and there lifetime limits on coverage are prohibited. To direct money toward actual patient care rather than administration, the ratio of health insurance company spending on administrative costs versus actual medical care is limited. This provision mandates that all health plans must offer certain benefits within their tiers of coverage (bronze, silver, gold, platinum), and thus offer an adequate, baseline level of protection.

Medicaid expansion

The ACA allows states to expand Medicaid to low-income U.S. citizens younger than age 65. Originally formulated as a mandate to extend Medicaid to all Americans with annual incomes of less than 138 percent of the federal poverty level ($16,000 for an individual or $32,500 for a family of four) who are ineligible for Medicare, the Supreme Court in 2012 ruled that states could choose whether to comply with the mandate.[11] As of April, 27 states and the District of Columbia had planned to expand Medicaid, five were debating the expansion, and 19 states were maintaining the status quo.[12]

At present, 42 states and the District of Columbia use the Medicaid program to supplement GME. Medicaid's $2 billion to $3.8 billion contributions to GME, either directly or through Medicaid managed care programs, make Medicaid the second-biggest GME payment source behind Medicare's $9.5 billion contribution to indirect and direct GME funding.[10,13] Most of this money is allocated to teaching institutions, and states that proceed with Medicaid expansion may have more resources for resident training. Several states with a large number of residency programs, such as California, have not supported GME via Medicaid for years, regardless of the ACA's Medicaid expansion provision. For the future practice of current residents, the access of uninsured Americans to insurance could decrease the amount of uncompensated care provided and foster the overall health of a state's population.[14]

Physician Payments Sunshine Act

To increase transparency in physician-industry relationships, the ACA included the Physician Payments Sunshine Act, which requires companies to report their dealings with physicians to the Centers for Medicare & Medicaid Services.[15] Currently, no penalties are imposed on physicians with financial relationships with industry, and although these reporting requirements do not affect residents, they do apply to surgeons in fellowship training.

Patient-Centered Outcomes Research Institute (PCORI)

One of the ACA's major goals is to increase the value and decrease the cost of medical care. Measures include the support of preventative and outpatient

With the overall number of residency slots in this country still capped, up to 80 percent of graduating residents pursuing subspecialty training, and a large number of experienced surgeons expected to retire in the near future, there is an anticipated shortage of up to 91,000 physicians (among them 46,000 surgeons) by 2020.

care, the introduction of integrated care models such as accountable care organizations, and a focus on evidence-based medicine through institutions such as the PCORI.[16]

National Health Service Corps

To improve health care in rural and underserved areas, the ACA provided increased funding to the National Health Service Corps, which offers loan repayment and other incentives for those health care professionals who work in underserved locations and specialties. Physician supply to rural areas is one part of the discussion concerning the future of the physician workforce, which will heavily influence the practice environment for future generations of physicians.

Additionally, the ACA allows for the redistribution of currently unused residency slots that can thus be assigned to training programs in primary care and general surgery in states with low physician-to-patient ratios, large health care professional shortage areas, and a large number of rural hospitals. Since its inception, five rounds of redistribution have occurred, with 63 hospitals from Arizona to Pennsylvania receiving additional slots in the first round alone.[17]

The physician workforce

A dramatic physician shortage has become increasingly apparent over the last decade, particularly in primary (surgical and nonsurgical) care and in rural regions, and is anticipated to intensify with the implementation of the ACA. Millions of previously uninsured or underinsured Americans will enter mainstream health care. Physicians and surgeons are expected to see many more referrals and will face more advanced conditions in patients who have not had access to health care in many years, if ever.

With the overall number of residency slots in this country still capped, up to 80 percent of graduating residents pursuing subspecialty training, and a large number of experienced surgeons expected to retire in the near future, there is an anticipated shortage of up to 91,000 physicians (among them 46,000 surgeons) by 2020.[18,19] This imminent workforce crisis has attracted considerable attention, and steps to mitigate its effects include the establishment of multiple medical schools and the previously described redistribution of unused residency slots. In addition, several medical schools and training programs encourage students and residents to rotate in rural, underserved areas and have successfully increased the interest of graduates in practicing in these locations.[20,21]

Unfortunately, an overall increase in residency slots, likely the only durable solution to physician shortages, has yet to be achieved. In an attempt to accomplish this goal, Reps. Joseph Crowley (D-NY) and Michael Grimm (D-NY) introduced the Resident Physician Shortage Reduction Act of 2013, which was aimed at increasing the number of residency slots by 15,000 in 2019. A major obstacle to this expansion is the extremely high cost involved, and decisions on this bill have been at a standstill since its assignment to the Senate Finance committee. Movement on this topic may emerge from a highly anticipated Institute of Medicine report on the governance and financing of GME. The report—which initially was to be released in April but at press time had not been published—is expected to provide "recommendations for policies to improve graduate medical education, with an emphasis on the training of physicians."[22]

Opinions on the ACA

Despite—or perhaps because of—the significant media coverage and often politically motivated discussions that the ACA has inspired, correct public knowledge about the ACA is surprisingly limited. In the fall of 2013, fewer than 40 percent of the public knew about its key components, such as insurance exchanges.[23] Additionally, approximately 30 percent to 40 percent of the general population had a favorable opinion of the ACA, and roughly the same percentage had an unfavorable one, with a clear division along self-identified party affiliations.[24] In the first months of 2014, disapproval

of the ACA seemed to be on the rise, particularly among less-educated and older Americans, in contrast to the rising numbers of individuals enrolling in the statewide insurance exchanges.

Patients will expect their physicians to help them navigate the ACA and address their concerns and knowledge gaps. Physicians themselves, however, seem to disagree on key elements and implications of the ACA. Some surveys demonstrate a fairly even split between physicians considering the ACA to be "a good start" versus a "step in the wrong direction"[25]; others draw a more negative picture, particularly among surgical specialists, more than 60 percent of whom are concerned that the ACA may have negative implications for patient care.[26]

Physician reimbursement

The future of physician payment has garnered much attention over the last several years for obvious reasons and has been accompanied by an environmental shift focusing on the development of quality metrics instead of simple quantitative measurements to calculate physician reimbursement.[27]

One payment model outlined in the ACA calls for establishing bundled payments. Introduced in August 2011, the Bundled Payments for Care Improvement initiative and its ultimate effects will directly affect practicing surgeons. Under this paradigm, the traditional fee-for-service payment system would be replaced with a single payment made to a third-party administrator for all services rendered to a patient during the length of a treatment "episode"; that is, the preadmission, inpatient, and postdischarge care delivered in association with a surgical procedure.[28] According to this model, a bundled payment would then be distributed among those physicians and institutions responsible for a

REFERENCES

1. H.R. 3590: Patient Protection and Affordable Care Act. (111th). Available at: https://www.govtrack.us/congress/bills/111/hr3590. Accessed March 15, 2014.
2. Evans J, Schiff J. A timeline of Kennedy's health care achievements and disappointments. *Kaiser Health News*. September 17, 2010. Available at: http://www.kaiserhealthnews.org/stories/2009/august/26/kennedy-health-care-timeline.aspx. Accessed March 15, 2014.
3. Pfiffner J. President Clinton's health care reform proposals of 1994. Available at: http://www.thepresidency.org/storage/documents/President_Clintons_Health_Care_Reform_Proposals.pdf. Accessed June 10, 2014.
4. Kaiser Family Foundation. Snapshots: Health care spending in the United States and selected OECD countries. April 12, 2011. Available at: http://kff.org/health-costs/issue-brief/snapshots-health-care-spending-in-the-united-states-selected-oecd-countries/. Accessed March 15, 2014.
5. Congressional Budget Office. Key issues in analyzing major health care proposals. December 2008. Available at: http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/99xx/doc9924/12-18-keyissues.pdf. Accessed March 15, 2014.
6. Congressional Budget Office. Updated estimates of the effects of the insurance coverage provisions of the Affordable Care Act. April 2014. Available at: http://www.cbo.gov/sites/default/files/cbofiles/attachments/45231-ACA_Estimates.pdf. Accessed April 27, 2014.
7. Medicare Payment Advisory Commission. Report to the Congress: Aligning incentives in Medicare. June 2010. Available at: http://www.medpac.gov/documents/jun10_entirereport.pdf. Accessed March 12, 2014.
8. U.S. Department of Health and Human Services: Patient Protection and Affordable Care Act. December 24, 2009. Available at: http://www.hhs.gov/healthcare/rights/law/patient-protection.pdf. Accessed June 10, 2014.
9. Chaikind H, Copeland CW, Redhead CS, Staman J. PPACA: A brief overview of the law, implementation and legal challenges. Congressional Research Service. March 2, 2011. Available at: http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R41664.pdf. Accessed March 15, 2014.

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A particular concern among surgical residents and junior attending surgeons appears to be the decline of the traditional "private practice" business model for which surgeons have long been known.

REFERENCES (CONTINUED)

10. HealthCare.gov. What if someone doesn't have health coverage in 2014? Available at: https://www.healthcare.gov/what-if-someone-doesnt-have-health-coverage-in-2014/. Accessed March 15, 2014.
11. Kaiser Family Foundation. A guide to the Supreme Court's Affordable Care Act decision. June 29, 2012. Available at: http://www.kff.org/healthreform/8332.cfm. Accessed March 15, 2014.
12. Kaiser Family Foundation. Status of state action on the Medicaid expansion decision. June 10, 2014. Available at: http://kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/. Accessed March 15, 2014.
13. Henderson TM. AAMC: Medicaid graduate medical education payments: A 50-state survey. March 2013. Available at: https://members.aamc.org/eweb/upload/Medicaid%20Graduate%20Medical%20Education%20Payments%20A%2050-State%20Survey.pdf. Accessed March 13, 2014.
14. Raykar N, Mandigo M, Nagengast E, et al. Medicaid expansion likely to affect the delivery of surgical care. *Bull Am Coll Surg.* 2014;99(3):10-21.
15. Ollapally VM. Preparing for implementation of the Physician Payments Sunshine Act. *Bull Am Coll Surg.* 2014;99(3):28-30.
16. Selby JV, Lipstein SH. PCORI at 3 Years—progress, lessons, and plans. *N Engl J Med.* 2014;370(7):592-595.
17. Association of American Medical Colleges. Washington highlights. CMS announces fifth round of closed hospital residency slots redistribution. Available at: https://www.aamc.org/advocacy/washhigh/highlights2013/344668/cmsannouncesfifthroundofclosedhospitalresidencyslotsredistribut.html. Accessed June 10, 2014.
18. Sheldon GF. Access to care and the surgeon shortage: American Surgical Association Forum. *Ann Surg.* 2010;252(4):582-590.
19. Association of American Medical Colleges. Physician shortages to worsen without increases in residency training. June 3, 2013. Available at: https://www.aamc.org/download/153160/data/physician_shortages_to_worsen_without_increases_in_residency_tr.pdf. Accessed April 26, 2014.
20. Deveney K, Deatherage M, Oehling D, Hunter J. Association between dedicated rural training year and the likelihood of becoming a general surgeon in a small town. *JAMA Surg.* 2013;148(9):817-821.

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patient's care and would be constructed to reward the meeting of preset quality metrics. The implementation of the bundled payment approach will directly affect the practicing surgeon, especially with regard to how such payments are distributed among providers and a hospital. Although multiple models exist, the overall result of this new compensation methodology remains unclear.[29]

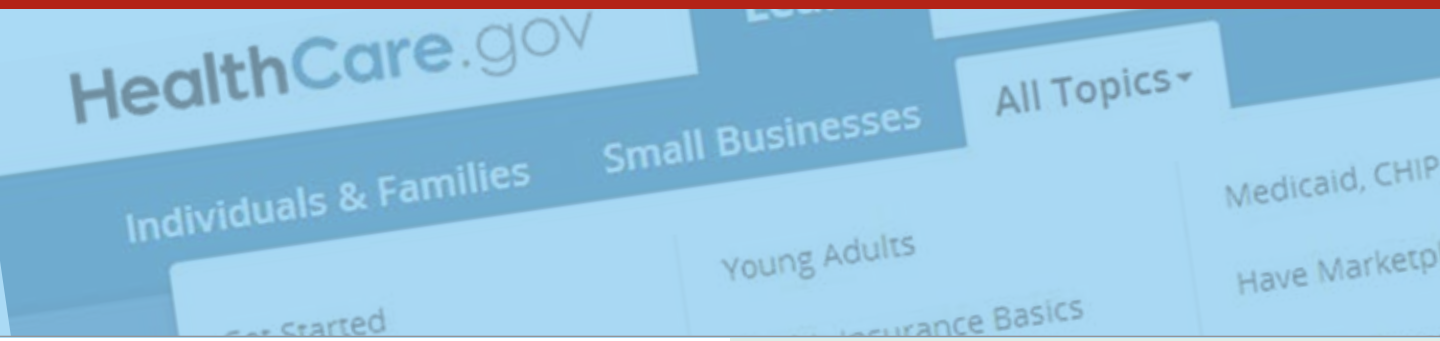
Administrative burdens

Most surgeons and residents have felt the pressures of meeting increased administrative requirements and regulations in medicine, such as greater demands from insurers for documentation and justification items. This climate of increasing paperwork and less time to devote to direct patient care has contributed substantially to overall physician dissatisfaction. With the implementation of the ACA, many fear that these requirements will become more cumbersome. Of all medical specialties, the surgical community probably has the most significant reason for alarm because more administrative duties correspond to less operative availability, which is the primary interest, as well as source of income and billing, of general surgeons.

Change in practice models

A particular concern among surgical residents and junior attending surgeons appears to be the decline of the traditional "private practice" business model for which surgeons have long been known. Increasingly, physicians join large health care networks as employees, a trend fostered by the developments in health policy, medical innovation, and changing attitudes toward resident training and physician lifestyle.[30] Current surgical graduates are enthusiastically joining hospital-based practices, which may provide larger compensation packages to junior surgeons but lack the degree of autonomy available in the traditional small business model.

The ACA and its associated requirements may accelerate this shift from private practice to employment.



The effects of this change on the future of surgical practice are an important consideration that both residents and attending surgeons should monitor.

Conclusion

Health care in the U.S. faces a challenging future. Whether the ACA is an important first step in the right direction or a wrong turn on the way to reform of the U.S. health care system, it represents one of the most profound changes to our health care environment in recent times and remains a highly debated topic among the public and physicians alike. Regardless of personal opinion or preference, physicians have an obligation to be informed about the key components of the ACA both to help their patients navigate the new health care landscape and to look out for their own professional interests.

Only by demonstrating strong interest, personal engagement, and active participation in shaping our new health care environment can we, as surgeons, guarantee what the American College of Surgeons has successfully represented for more than 100 years—highest standards and better outcomes. ◆

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Disclaimer

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REFERENCES (CONTINUED)

21. Jarman BT, Cogbill TH, Mathiason MA, et al. Factors correlated with surgery resident choice to practice general surgery in a rural area. *J Surg Educ*. 2009; 66(6):319-324.
22. Institute of Medicine of the National Academies. Consensus study on the governance and financing of graduate medical education. Available at: http://www.iom.edu/Activities/Workforce/GMEGovFinance.aspx. Accessed June 10, 2014.
23. Levey NN. The media and health care reform. *JAMA*. 2013;310(18):1941-1942.
24. Kaiser Family Foundation. Health tracking poll: Exploring the public's views on the Affordable Care Act. February 2014. Available at: http://kff.org/interactive/health-tracking-poll-exploring-the-publics-views-on-the-affordable-care-act-aca/. Accessed March 29, 2014.
25. Deloitte Center for Health Solutions. Deloitte 2013 survey of U.S. physicians: Physician perspectives about health care reform and the future of the medical profession. Available at: http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/us_chs_2013SurveyofUSPhysicians_031813.pdf. Accessed March 29, 2014.
26. The Doctor's Company. The future of health care. A national survey of physicians. February 2012. Available at: www.thedoctors.com/KnowledgeCenter/Publications/CON_ID_004672?refId=FUTURE. Accessed March 15, 2014.
27. White JV, Young D, Mahal-van Brenk C, Peters JA. Surgical leadership in the era of quality-based payment. *Bull Am Coll Surg*. 2013;98(5):22-28.
28. Herman B. 7 points to know about the bundled payment initiative. *Becker's Hospital Review*. September 27, 2011. Available at: http://www.beckershospitalreview.com/hospital-physician-relationships/7-points-to-know-about-the-bundled-payment-initiative.html. Accessed March 15, 2014.
29. American College of Surgeons. General Surgery Coding and Reimbursement Committee. Surgeons and bundled payment models: A primer for understanding alternative physician payment approaches. April 2013. Available at: http://efacs.org/portal/page/portal/ACS_Content/Advocacy/ACSADVOCACY/ACSADVOCACY/SurgeonsandBundledPaymentModels.pdf. Accessed April 27, 2014.
30. Leichtle SW, Hartin CW Jr. Physician leadership and the future of surgical practice. *Bull Am Coll Surg*. 2012;97(5):15-19.

Surgical education and training at the crossroads between medical school and residency

by Afif N. Kulaylat, MD; Sophia K. McKinley, MD, EdM; Erin M. Kenning, MD; and Feibi Zheng, MD, MBA

HIGHLIGHTS

- Outlines the challenges that have arisen in surgical training due to variations in technical, cognitive, and other competencies among graduating medical school students
- Describes the simulation-based and intensive training curricula various institutions have implemented to help medical students transition into training
- Summarizes national efforts that the AAMC, ACS, ASE, and APDS have led to assist in transition from medical school to surgical residency
- Provides details on the effects of these educational opportunities
- Identifies the constraints that some programs face in attempting to provide the level of training described in the article

The landscape of surgical training is changing. Faced with numerous challenges, including duty-hour restrictions, patient safety issues, cost-containment in the operating room (OR), and the medicolegal climate, operative exposure and autonomy during surgical residency have decreased.[1-11] Accordingly, numerous strategies, such as simulation and early specialization, have emerged to combat the potential deficiencies in training that may arise from these limitations.[12-19] Increased attention also has been directed toward the transition between medical school and surgical residency. Given that an ever-expanding complement of new surgical technologies increases the number of skills trainees are expected to acquire during residency, the interface between undergraduate and graduate medical education provides an opportunity for early skill development with the goal of achieving the proficiency levels necessary to optimize patient care, operative experience, and skill refinement. Innovative curricular approaches have been introduced to prepare incoming surgical trainees to deliver the highest quality of care to patients by leveraging the flexibility of the final year of medical school, the pre-internship period, and the first several months of the surgical internship year.

Many of the same challenges seen in surgical residency, including limited operative exposure and a lack of autonomy, also are present in medical school. These issues may limit medical students' opportunities to learn or apply technical skills intraoperatively or in the course of their surgical rotations.[10,11,20] Contributing to the challenge of ensuring that medical students have achieved adequate technical proficiency are the heterogeneous experiences that different institutions, services, or even surgeons offer.[21,22] Hence, even students graduating from the same medical school may enter residency with differing levels of proficiency in knot tying, suturing, and handling of laparoscopic instruments.[4,5] Simulation and structured preparatory skills sessions have emerged as interventions to standardize developing proficiency in basic surgical

TABLE 1. RECOMMENDED UNDERGRADUATE MEDICAL SKILLS

Body handling and positioning in OR	Aseptic/sterile technique
Venipuncture/venous cannulation (needle, catheter)	Pleural aspiration
Arterial puncture	Nasogastric intubation
Pulse Doppler examination	Anoscopy
Basic cardiopulmonary resuscitation	PEG tube replacement
Cardiac defibrillation	Paracentesis technique
Advanced cardiac life support	Skin biopsy and closure technique
Needle decompression of tension pneumothorax	Applying/changing dressings
Subclavian/femoral puncture	Joint fluid aspiration
Central venous catheter placement	Suturing technique
Chest tube insertion	Surgical knot tying

Note: Adapted from Appendix B of *AAMC Recommended Skills for Clinical Skills Curricula for Undergraduate Medical Education,* AAMC 2005.

skills and serve as an adjunct to potentially limited intraoperative application.[1,4,5,17,23-27]

Programs for graduating students

Medical schools have begun to provide structured experiences to fourth-year medical students to build technical proficiency in basic surgical skills; several studies have demonstrated the effectiveness of surgical skills curricula.[1,4,5,23,25,26] At Washington University in St. Louis (WUSTL), MO, for example, fourth-year medical students applying to a surgical specialty program attend a two- to three-hour session for seven weeks, with most of the session dedicated to instruction in technical skills such as suturing, knot tying, chest tube and line placement, intubation, and basic laparoscopic skills.[23] Pre- and posttesting of the students in this cohort demonstrated a significant improvement in all five tested suturing and knot-tying skills.[21,23] These improvements also extended to basic laparoscopic skills. By the end of the course, students' tested proficiency scores were not found to differ significantly from those of second-year surgical residents in three of the five suturing and knot-tying tasks.[23]

Educators at The University of Texas Southwestern (UT-Southwestern), Dallas, also have created a curriculum to develop surgical skills proficiency among graduating medical students entering a surgical field.[2,17,19] This curriculum emphasizes attaining proficiency on 12 open tasks for suturing and knot tying.[2,17] It also includes the Fundamentals of Laparoscopic Surgery (FLS™) curriculum.[19] These students demonstrated significant improvement in both open and laparoscopic skills, with all students meeting the criteria for FLS certification criteria by the end of the course.[4] In addition to improving technical skills, curricula such as those implemented at WUSTL, UT-Southwestern, and other institutions have also been shown to increase students' confidence as they enter their surgical intern year.[4,21,25,26]

In addition, educational researchers have sought to evaluate factors that optimize the effectiveness of skills training sessions for medical students. Gershuni and colleagues demonstrated that medical students retained technical proficiency longer on basic suturing and knot-tying skills if the surgical skills training occurred at the beginning of the fourth year of medical school as opposed to the spring—possibly due to the application of learned skills in the OR during subsequent surgical sub-internships.[1] Regarding methods to provide the best practice for different surgical skills, one group has shown that certain practice patterns are superior to others. When learning laparoscopic percutaneous endoscopic gastrostomy (PEG) transfer, medical students who underwent the proactive interference protocol (for example, practicing a dissimilar task, such as open suturing, between blocks of PEG transfer practice) performed better than students who underwent mass practice (for example, completing all PEG transfer practice blocks in a row).[28]

It has been shown that when medical students learn laparoscopic skills, expert coaching can positively influence certain performance outcome measures, such as

TABLE 2. ACS/ASE PROGRESSIVE SIMULATION-BASED SKILL ACQUISITION

Year 1 modules	Year 2 modules	Year 3 modules
Abdominal exam	Basic airway management	Arterial puncture and blood gas
Basic vascular exam	Communication—H&P, case presentation	Basic knot tying and basic suturing
Breast exam	Foley bladder catheterization	Central venous line insertion
Digital rectal exam	Intermediate vascular exam	Communication—during codes, and safe and effective handoffs
Female and pelvic exam	Nasogastric tubes	Airway management
Male groin and genital exam	Sterile technique—gloving and gowning	Interosseus access
Universal precautions	Surgical drains—care and removal	Local anesthetics
Venipuncture and peripheral IV		Paracentesis and thoracentesis

clinical knowledge and error frequency.[29] Given that faculty time is a valuable commodity in the structuring of curricula, targeting the tasks that provide the most benefit from faculty instruction will help to optimize efficiency in surgical skills training. Future research may further illuminate which factors enhance medical students' acquisition of technical skills and which maximize retention of skills.

National efforts

Beyond single institution initiatives, there have been national efforts to address standardization of skills development in medical school graduates.[30-32] Since the 1950s, undergraduate medical education has largely consisted of a year of core clinical rotations, followed by a year of elective experiences. Consequently, graduating medical students often have variable clinical experiences and disparate clinical skill proficiency. Since the late 1980s, several landmark reports from blue-ribbon committees decried the lack of a standardized skills curriculum for medical student training.[30-32] The Association of American Medical Colleges (AAMC) has spearheaded ongoing efforts aimed at standardizing the fourth-year experience with the goal of producing cohorts of medical students with comparable basic clinical and procedural skills. To this end, the AAMC published a list of skills to which medical students must be exposed and have performed prior to graduation (see Table 1, page 25). The AAMC also sought to benchmark curricula and rotations across medical schools to promote a more uniform experience for students from school to school and between rotation sites through curriculum inventory and reports (CIR), part of the AAMC's Medical Academic Performance Services (MedAPS) initiative.

In a joint effort, the American College of Surgeons (ACS) and Association for Surgical Education (ASE) produced an online curriculum—the ACS/ASE Simulation-Based Surgical Skills Curriculum for Medical Students—which addresses common clinical and procedural skills relevant to surgical practice, stratified by level of training (see Table 2, this page). This online curriculum includes a step-by-step description of the skills, a discussion of common errors, instructional videos, and various assessment tools for scoring student performance and providing feedback. Most recently, a surgical internship preparatory curriculum was developed in a collaborative effort between the ACS, the ASE, and the Association of Program Directors in Surgery (APDS). This program, the Surgery Resident Prep Curriculum, is currently being pilot-tested across the country. Unlike the curricula described earlier in this article, which emphasizes technical skill development, this initiative also provides hands-on training in domains where experience may be limited in other medical school rotations, such as answering mock pages/

TABLE 3. INTERN ACS/APDS-BASED SURGICAL SKILLS CURRICULUM MODULES

ACS/APDS phase	Clinical year	Module
1	1	Knot tying/suturing
1	1	Urethral and suprapubic catheterization
1	1	Airway management
1	1	Chest tube and thoracentesis
1	1	Central line insertion/monitoring and arterial lines
1	1	Basic laparoscopy skills
2	1	Open appendectomy
3	1	Patient handoff/preoperative briefing and checklists
1	1	Surgical biopsy
1, 2	1	Hernia anatomy/open inguinal/femoral hernia

common calls, order entry/prescribing, interpreting radiographs, and serving as a first responder to acute/emergent presentations.

Surgical interns enter their residencies with broad variations in exposure, experience, and skill. Accordingly, structured curricula are necessary to bolster and standardize incoming intern skills and knowledge and to prepare them for the demands of training. The ACS and APDS have developed one such curriculum for implementation at the beginning of internship, which allows first-year residents to demonstrate proficiency in several skills before applying them on the wards and in the OR.[18] The Surgery Resident Skills Curriculum includes three progressive phases over the course of residency: (1) attainment of basic skills, such as suturing and knot tying; (2) instruction in advanced procedures, such as laparoscopic/open colon resection and laparoscopic/open bile duct exploration; and (3) refinement of team-based skills, such as patient handoff and trauma team training (See Table 3, this page).[17] The use of lifelike simulation is fundamental to the curriculum, with the goal of having residents demonstrate proficiency in each skill set before operating on patients. Additionally, the ACS has introduced the *Fundamentals of Surgery* curriculum—an interactive, case-based, online curriculum that addresses the essential content areas that all surgical residents should master in the early years of training.

Other boot camp-style curricula in surgical training—which are administered before the formal start of internship—have been implemented across the country.[5,24,27] Most are tailored to fit the needs or priorities

REFERENCES

1. Gershuni V, Woodhouse J, Brunt LM. Retention of suturing and knot-tying skills in senior medical students after proficiency-based training: Results of a prospective, randomized trial. *Surgery.* 2013;154(4):823-829; discussion 829-830.
2. Goova MT, Hollett LA, Tesfay ST, et al. Implementation, construct validity, and benefit of a proficiency-based knot-tying and suturing curriculum. *J Surg Educ.* 2008;65(4):309-315.
3. Hu Y, Tiemann D, Michael Brunt L. Video self-assessment of basic suturing and knot tying skills by novice trainees. *J Surg Educ.* 2013;70(2):279-283.
4. Naylor RA, Hollett LA, Castellvi A, Valentine RJ, Scott DJ. Preparing medical students to enter surgery residencies. *Am J Surg.* 2010;199(1):105-109.
5. Parent RJ, Plerhoples TA, Long EE, et al. Early, intermediate, and late effects of a surgical skills "boot camp" on an objective structured assessment of technical skills: A randomized controlled study. *J Am Coll Surg.* 2010;210(6):984-989.
6. Sanfey H, Dunnington G. Verification of proficiency: A prerequisite for clinical experience. *Surg Clin North Am.* 2010;90(3):559-567.
7. Sanfey H, Ketchum J, Bartlett J, et al. Verification of proficiency in basic skills for postgraduate year 1 residents. *Surgery.* 2010;148(4):759-766.
8. Schill M, Tiemann D, Klingensmith ME, Brunt LM. Year one outcomes assessment of a masters suturing and knot-tying program for surgical interns. *J Surg Educ.* 2011;68(6):526-533.
9. Schwartz SI, Galante J, Kaji A, et al. Effect of the 16-hour work limit on general surgery intern operative case volume: A multi-institutional study. *JAMA Surg.* 2013;148(9):829-833.

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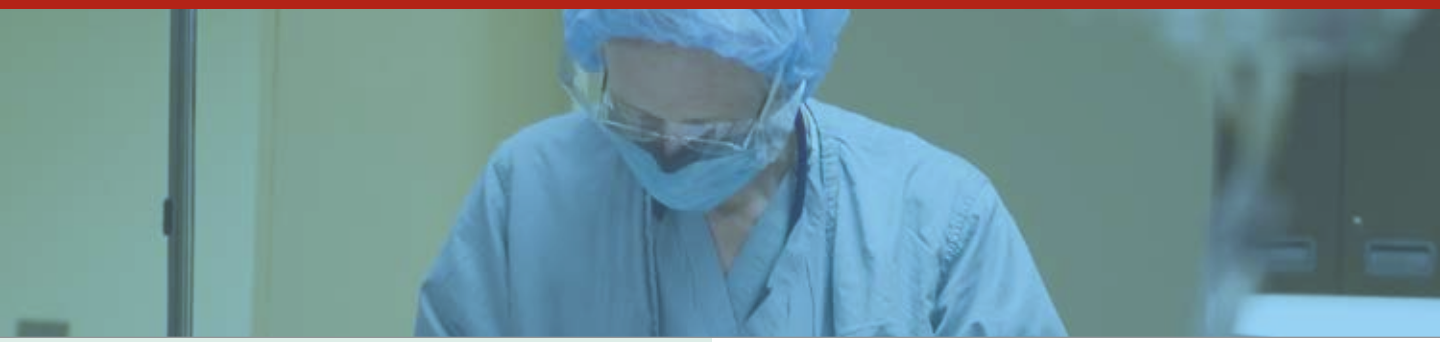

REFERENCES (CONTINUED)

10. Bridges M, Diamond DL. The financial impact of teaching surgical residents in the operating room. *Am J Surg.* 1999;177(1):28-32.
11. Kanashiro J, McAleer S, Roff S. Assessing the educational environment in the operating room—a measure of resident perception at one Canadian institution. *Surgery.* 2006;139(2):150-158.
12. Bass BL. Early specialization in surgical training: An old concept whose time has come? *Semin Vasc Surg.* 2006;19(4):214-217.
13. Sturm LP, Windsor JA, Cosman PH, Cregan P, Hewett PJ, Maddern GJ. A systematic review of skills transfer after surgical simulation training. *Ann Surg.* 2008;248(2):166-179.
14. McCluney AL, Vassiliou MC, Kaneva PA, et al. FLS simulator performance predicts intraoperative laparoscopic skill. *Surg Endosc.* 2007;21(11):1991-1995.
15. Klingensmith ME, Valentine RJ. Early experience with alternative training pathways: A view from the trenches. *J Surg Educ.* 2009;66(2):80-84.
16. Stain SC, Biester TW, Hanks JB, et al. Early tracking would improve the operative experience of general surgery residents. *Ann Surg.* 2010;252(3):445-449; discussion 449-451.
17. Scott DJ, Dunnington GL. The new ACS/APDS Skills Curriculum: Moving the learning curve out of the operating room. *J Gastrointest Surg.* 2008;12(2):213-221.
18. Tavakol M, Mohagheghi MA, Dennick R. Assessing the skills of surgical residents using simulation. *J Surg Educ.* 2008;65(2):77-83.
19. Ritter EM, Scott DJ. Design of a proficiency-based skills training curriculum for the fundamentals of laparoscopic surgery. *Surg Innov.* 2007;14(2):107-112.
20. Scallon SE, Fairholm DJ, Cochrane DD, Taylor DC. Evaluation of the operating room as a surgical teaching venue. *Can J Surg.* 1992;35(2):173-176.
21. Zeng W, Woodhouse J, Brunt LM. Do preclinical background and clerkship experiences impact skills performance in an accelerated internship preparation course for senior medical students? *Surgery.* 2010;148(4):768-776; discussion 776-777.
22. Lind DS, Deladisma AM, Cue JI, Thomas AM, MacFadyen BV, Nesbit RR. Survey of student education in surgery. *J Am Coll Surg.* 2007;204(5):969-974; discussion 975-976.
23. Brunt LM, Halpin VJ, Klingensmith ME, et al. Accelerated skills preparation and assessment for senior medical students entering surgical internship. *J Am Coll Surg.* 2008;206(5):897-904.

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of a given institution, but boot camps may incorporate combinations of didactic sessions, actor-based clinical skills assessment, technical skill and clinical scenario-based simulation, and self-directed Web-based learning modules.[18,24] In one study, Parent and colleagues found that a three-day intensive simulation-based boot camp improved interns' competence and comfort level in central line and chest tube placement when compared with interns who did not participate in the program.[5] Although a difference in ability was indiscernible between the groups by mid-year, the boot camp group attained proficiency earlier in their training.[5] Furthermore, interns who participated in one boot camp described the intensive curriculum as both useful and relevant. In addition, nursing staff indicated that they believed that the boot camp made interns more respectful, better communicators, and more adept in patient assessment.[5] Investigators also observed that more interns scored better on the American Board of Surgeons In-Training Examination (ABSITE); this correlation between boot camp training and improvement on ABSITE scores has been demonstrated in other studies as well.[5,27]

Constraints

Despite the established benefits of simulation-centered, proficiency-based training for matriculating residents, there are certain barriers to adoption of such curricula.[5,7,24] Reportedly, up to one-third of general surgery residencies lack an intensive boot camp program.[33] Factors such as physical space, staff limitations, and resident time restrictions are commonly cited as impediments to adoption.[5,17,34,35] Financial constraints are consistently cited as a barrier to implementation of a surgical skills teaching curriculum among various general surgery training programs.[33] The ACS/APDS Surgery Resident Skills Curriculum, which provides free registration through the ACS website and emphasizes low-cost simulators, is estimated to have indirect costs of more than $30,000 per resident.[17] Contributing to these expenses are the costs of OR instruments,

In a joint effort, the ACS and ASE produced an online curriculum—the ACS/ASE Simulation-Based Surgical Skills Curriculum for Medical Students—which addresses common clinical and procedural skills relevant to surgical practice, stratified by level of training.

porcine models, simulation space, simulation center staffing, and administrative costs.[33]

Limitations on physical space add to cost concerns as well as logistic challenges, particularly when an institution lacks a dedicated simulation center. Furthermore, proficiency or competency testing necessitates engaging faculty surgeons, who are increasingly pressured in the current health care environment to increase clinical productivity and are not necessarily compensated or recognized for educational efforts.[33] Duty-hour restrictions, particularly those affecting interns, have likewise limited the time available for structured or mentored simulation-based technical training.[35]

Challenges notwithstanding, there is value in bridging the gap in knowledge, skills, and competencies among medical school graduates to better meet the overarching demands and expectations of a surgical internship. Efforts such as surgical boot camps and the ACS/APDS Resident Skills Curriculum have proven useful in optimizing this transition.

Pathway to the future of patient care

The crossroads of medical school and surgical internship provides a unique opportunity to meet the challenges of a shifting landscape in surgical education and training. With numerous factors limiting operative exposure and involvement, competency-based curricula allow for earlier proficiency in technical skills and clinical knowledge and provide worthwhile preparatory experiences. Collectively, these efforts serve to expedite the learning curve of early internship to optimize the delivery of patient care, refinement of pre-existing skills, and acquisition of advanced skills. As newer technologies and techniques, such as single-site laparoscopy, robot-assisted operations, and endoscopic procedures, become further incorporated into the training curricula, it will become exceedingly important for surgical trainees to arrive with a baseline level of proficiency in basic or fundamental surgical skills and knowledge. These abilities, after all, will serve as the foundation of their entire surgical career. ◆

REFERENCES (CONTINUED)

24. Krajewski A, Filippa D, Staff I, Singh R, Kirton OC. Implementation of an intern boot camp curriculum to address clinical competencies under the new Accreditation Council for Graduate Medical Education supervision requirements and duty hour restrictions. *JAMA Surg.* 2013;148(8):727-732.
25. Peyre SE, Peyre CG, Sullivan ME, Towfigh S. A surgical skills elective can improve student confidence prior to internship. *J Surg Res.* 2006;133(1):11-15.
26. Stewart RA, Hauge LS, Stewart RD, et al. A CRASH course in procedural skills improves medical students' self-assessment of proficiency, confidence, and anxiety. *Am J Surg.* 2007;193(6):771-773.
27. Fernandez GL, Page DW, Coe NP, et al. Boot cAMP: Educational outcomes after 4 successive years of preparatory simulation-based training at onset of internship. *J Surg Educ.* 2012;69(2):242-248.
28. Willis RE, Curry E, Gomez PP. Practice schedules for surgical skills: The role of task characteristics and proactive interference on psychomotor skills acquisition. *J Surg Educ.* 2013;70(6):789-795.
29. Cole SJ, Mackenzie H, Ha J, Hanna GB, Miskovic D. Randomized controlled trial on the effect of coaching in simulated laparoscopic training. *Surg Endosc.* 2014;28(3):979-986.
30. Cooke M, Irby DM, Sullivan W, Ludmerer KM. American medical education 100 years after the Flexner report. *N Engl J Med.* 2006;355(13):1339-1344.
31. Papa FJ, Harasym PH. Medical curriculum reform in North America, 1765 to the present: A cognitive science perspective. *Acad Med.* 1999;74(2):154-164.
32. Debas HT, Bass BL, Brennan MF, et al. American Surgical Association Blue Ribbon Committee Report on Surgical Education: 2004. *Ann Surg.* 2005;241(1):1-8.
33. Pentiak PA, Schuch-Miller D, Streetman RT, et al. Barriers to adoption of the surgical resident skills curriculum of the American College of Surgeons/Association of Program Directors in Surgery. *Surgery.* 2013;154(1):23-28.
34. Scott DJ, Goova MT, Tesfay ST. A cost-effective proficiency-based knot-tying and suturing curriculum for residency programs. *J Surg Res.* 2007;141(1):7-15.
35. Antiel RM, Reed DA, Van Arendonk KJ, et al. Effects of duty hour restrictions on core competencies, education, quality of life, and burnout among general surgery interns. *JAMA Surg.* 2013;148(5):448-455.

Coaching and mentoring modern surgeons

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HIGHLIGHTS

- Discusses the evolving nature of the mentor/mentee relationship, comparing and contrasting traditional mentoring under the Halstedian model with that of the current era
- Describes various mentoring styles with an emphasis on the mosaic model
- Offers recommendations on how to serve as a successful mentor and apply the ACS values
- Outlines the qualities that mentees should display to forge a mutually beneficial relationship with their mentors

Mentorship is a tool used to help surgical trainees develop the skills they need to succeed in various aspects of life—both personal and professional.[1] According to Healy and colleagues, mentorship is defined as "a process whereby an experienced, highly regarded, empathetic person (the mentor) guides another (usually younger) individual (the mentee) in the development and re-examination of their own ideas, learning, and personal and professional development."[2] In his presidential address at the 2011 annual meeting of the American Association for Thoracic Surgery, Irving Kron, MD, FACS, said that in surgery, "mentorship is more than just about technical surgery, but also about life."[3]

The concept of mentorship first emerged in the Greek myths. In Homer's Odyssey, the character of Mentor guided the development of Odysseus' son, Telemachus, from adolescence to adulthood while Odysseus was away.[4] The character name Mentor has been adopted in English to refer to an individual who imparts wisdom to and shares knowledge with a less experienced associate. Today, a mentor is defined as a "developer of talent, a teacher of skills and knowledge of the discipline, an assistant in defining goals, and one who shares social and professional values."[5]

Surgical training has been a topic of discussion since medieval times. In England, surgeons-in-training were taught under the apprenticeship model, which continued to be the standard of training for 400 years. Using this paradigm, a master of the arts and sciences or the hospital surgeon taught "the whole of education of the pupil" until the student was deemed ready to write certification exams.[6]

The apprenticeship model of one-on-one training changed in 1890, when William Halsted, MD, introduced the concept of surgical residency.[6] In this system, trainees spent five or more years in a teaching hospital training in human anatomy, clinical skills, surgical skills, and research, under the guidance of a tutor and other teachers.[6] This process quickly became the standard of surgical training in the U.S.[7]

Recently, changes in surgical residencies have created challenges for the traditional mentoring relationship between

Surgical mentors teach technical and clinical skills to guide the resident to transition to independent practice. However, the traditional style of coaching/mentoring may not prove optimal for all surgical trainees and its effectiveness may depend on the personality of the mentor and resident.

surgeon and resident.[1] These changes include shortened periods of inhospital time for residents due to duty-hour restrictions, subspecialty and diversified training programs, and technological and surgical innovations.[1] There is an increased focus on patient safety, a switch to a competency-based training model, and constraints on teaching time, both in and out of the operating room (OR).

This article examines the issue of mentoring in the face of these changes and challenges, describing various mentoring styles, elements of successful mentoring, and the development of a successful mentor. The authors also provide practical guidelines to ensure quality training for the next generation of surgeons.

Mentoring styles

Mentorship in surgical training can take many forms. The Socratic dialectical method—a form of inquiry and discussion between individuals centered on asking and answering questions to stimulate critical thinking and to illuminate ideas—was a strong influence on Dr. Halsted. As a result, this style of learning and teaching developed into what is now known as the Halstedian apprenticeship model of training.[8,9] The popular phrase, "See one, do one, teach one," is central to this model, and many training institutions used this style. To this day, in some programs, a resident is assigned to an attending surgeon for the entire rotation, gaining increased responsibility as he or she progresses. This method allows for maximum exposure in a short period of time. The surgical resident is exposed to and develops clinical knowledge and a range of technical skills, patient-physician interaction competencies, and disease management techniques.

Ensuring that residents have adequate exposure in an era of work-hour restrictions, many institutions have established formal mentorship programs.[10] Through these mentorship programs, each resident is assigned to a faculty member, who serves as a mentor with the expectation that the surgeon and the trainee will meet regularly.

A mentor is more or less analogous to an athletics coach. Athletes require strong and healthy relationships with their coaches to succeed in their sport. Coaches push athletes to the limit, forcing them to perform under pressure and stress. Sometimes, coaches can be tough, even harsh on their players, which may strain relationships, but the end goal for the coach is to help the athlete succeed, grow as an individual, and build character.[11] Similarly, surgical training is intense, and residents are often asked to perform in high-pressure situations. Surgical mentors teach technical and clinical skills to guide the resident to transition to independent practice. However, the traditional style of coaching/mentoring may not prove optimal for all surgical trainees and its effectiveness may depend on the personality of the mentor and resident. Singletary has suggested that the traditional mentor/mentee relationship may have become a style of the past.[12] Due to current changes in surgical training and culture, different models of mentoring are developing.

At the 2014 American College of Surgeons (ACS) Leadership & Advocacy Summit in Washington, DC, John Rombeau, MD, FACS, staff surgeon, U.S. Department of Veterans Affairs, Palo Alto Health Care System, CA, and emeritus professor of surgery, Perelman School of Medicine, University of Pennsylvania, Philadelphia, discussed four new directions in surgical mentoring for the millennial generation. First, he addressed the reverse academic mentoring pyramid. With this approach, the most experienced surgeons are mentors to those individuals who are just beginning their surgical career. Dr. Rombeau explained that this method takes advantage of the fact that emeritus professors or professors who are near retirement have an enormous amount of experience and may have fewer clinical responsibilities than younger surgeons, which

allows them extra time for mentoring junior faculty and residents. Simultaneously, junior faculty and assistant professors are free to focus on operating and establishing their own career paths.

Another new direction discussed by Dr. Rombeau was mosaic mentoring. Under this model, mentors fill different roles, such as resident mentors, administrative/business mentors, clinical specialist mentors, research mentors, and so on, based on their specific interests and abilities. This model is based on the theory that each aspect of a surgical career should have a specific mentor.

A third approach takes advantage of innovations in technology and uses the simulation lab as a place where the mentor and mentee can develop a relationship.[13] Simulation labs comprise a vast amount of resources and modalities, allowing surgical residents to learn a range of surgical skills and to benefit from detailed explanations and demonstrations. The Accreditation Council for Graduate Medical Education (ACGME) mandates that residents undergo dedicated surgical skills lab training. David Leach, MD, a past-director of the ACGME, made the following observation in an article published in the *Bulletin,* "Every resident deserves competent teachers and an excellent learning environment. Simulation serves both of these core principles."[14] These teaching sessions are not limited to building surgical skills; they may be used to instruct students on other topics, as well. Unlike the OR, simulation labs are free of time constraints and alleviate fear of complications or operative mistakes. A stress-free environment is created, which fosters teaching and mentoring opportunities.

The final mentoring model highlighted by Dr. Rombeau is the return of the scrub sink and OR mentoring styles. The scrub sink—a more traditional surgical mentorship technique—is a place where surgeons pose such questions as, "What is the operation? Why are we performing it? How is it done? What is the evidence to support this operative decision?" in an effort to teach and motivate trainees.

Mentorship does not always have to be structured, and may occur outside the clinical environment at journal clubs, while working on research projects, in lectures, in discussions, and at other events.[15] Peer-group mentoring supports collaboration in a non-hierarchical environment as mentees receive guidance from their peers who share similar challenges.[13] Peer mentorship may even take on a larger role as the trainee progresses, with the possibility of mutual mentoring by peers after training is complete.[16] Tele-mentoring or mentored skills courses, in which experienced surgeons evaluate recordings of participants' skills, may assist trainees and even fully trained surgeons to quickly master new skills and technologies.[17] Each method has its own benefits and may be used at different stages in a surgeon's training and career.

Mentorship for different facets of surgical life

Each of the different roles that surgeons play requires a mentor.[18] Hence, a mentor can satisfy a mentee's need for guidance in one or many aspect(s) of professional and individual development, including clinical/patient care, academic surgery, research, practice management, and personal growth.[18] The mosaic mentorship model identified by Dr. Rombeau allows residents to find mentors who best fit specific aspects of training so as to place fewer scheduled demands on each mentor.[1] At the outset, mentor and mentee should clearly define their roles, and set clear goals with time-lines and end-points.[1,18]

Traditionally, clinical mentorship has been heavily weighted in surgical training due to its focus on surgical technique, intraoperative decision making, pre- and postoperative care, and communication among the team members.[1,19] The importance of academic mentorship to an individual should be explored by a mentor early in the relationship so that the mentee can form a solid plan for achieving his or her career goals. An academic mentor provides guidance to navi-

A successful mentor/mentee relationship requires dedication and commitment from both parties, and it is essential to recognize that the needs of each individual change and evolve over time.

gate sometimes turbulent institutional politics, and eases the mentee's integration into the social environment of a health system, academic institution, or regional/national/international organization.[18]

Research mentorship is an area that has received little attention. In one study, Monn and colleagues found that trainees perceive research as one area in which they received consistent but insufficient mentoring.[19] Mentoring in this area is time-intensive, and PhDs are perhaps best-suited to playing the mentor role. Mentees benefit from this relationship by receiving assistance in setting realistic goals and deadlines to achieve academic milestones and building professional relationships with individuals who the mentor knows—giving rise to opportunities for collaboration.[18]

Mentorship in the financial and business aspects of clinical practice is often viewed as lacking in residency training.[19] This shortcoming may be best addressed if the trainee is able to interact with a diverse assortment of surgeons from a range of practice settings, including academia, private practice, and rural surgery. Additionally, a financial counselor may help in the transition to clinical practice.

The personal side of surgical life is perhaps the most idiosyncratic of all mentoring areas. Work-life balance may be insufficiently addressed in training, and it is up to the mentee to find a suitable mentor, as goals and circumstances differ widely among individuals.[19] The gender of a mentee may be an important factor when choosing a mentor for work-life balance.[18] Some mentees may seek the guidance of a life coach or spiritual mentor, which may be of benefit as they seek personal enrichment while establishing a practice.

Elements of successful mentoring

A successful mentor/mentee relationship requires dedication and commitment from both parties, and it is essential to recognize that the needs of each individual change and evolve over time.[20] Time constraints are a major concern in a surgeon's life, so ensuring that both mentee and mentor are committed to finding the necessary time to interact is crucial, especially at the beginning of the relationship. Clarifying the needs and expectations of both parties at the start of the mentoring relationship to avoid role confusion, confidentiality breeches, and pre-existing biases will help both individuals save time. Changing needs, for both the mentor and the mentee, are in fact a defining characteristic of successful mentoring, as it indicates that both parties are evolving, developing new aspirations, and finding fulfillment. Mentoring requires dedication to the process, which includes substantial investment not only of time, but also of energy and resources. The quality with which the parties listen to each other is also very is important; mentors and mentees must be active listeners to build productive and fruitful relationships.

A good mentor should be flexible and willing to serve in different capacities as needed.[1] A mentor makes adjustments to suit the environment and may serve several functions, including role model, teacher, manager, friend, administrator, and even a coach in an effort to accommodate the mentee's changing needs. Perhaps most importantly, the mentor should introduce the mentee to new professional networks and partners for collaborative projects. These individuals, groups, and institutions will provide a lifelong foundation of support for the mentee's personal and professional development. Creating a new research or clinical team with carefully selected associates can be challenging, especially in the initial stages of a surgeon's career, and the importance of mentor-driven guidance to choose these team members cannot be stressed enough.

The two most important measures of productive mentoring are the mentee's success and the mentor's and mentee's perception of the relationship.[20] It may be difficult to evaluate a mentoring relationship, but it is important to regularly review progress. If both parties agree the relationship is succeeding and if the mentee is achieving his or her goals, then the relationship is, by definition, successful.

Values of a successful mentor

In 2012, the ACS identified a set of values to guide its work. In his Presidential Address at the 2013 Clinical Congress, Carlos A. Pellegrini, MD, FACS, FRCSI(Hon), urged Initiates to adopt the same set of standards and apply them in their practices: Profes-

MOST FREQUENTLY MENTIONED QUALITIES OF A MENTOR

1	Serves as a professional role model
2	Stays involved in terms of time and effort
3	Is compassionate, kind, and supportive
4	Acts as a critic, evaluator, and assessor
5	Is a leader in the field and challenges the mentee

sionalism, Excellence, Innovation, Introspection, and Inclusion. Successful surgical mentors also embody the following values:

- Professionalism focuses on accountability and honesty, and a good mentor is open with his or her mentees and accepts responsibility for his or her charges' professional growth and success.
- Excellence is necessary for the mentor to act as a "role model" for his or her mentees and to promote the highest quality of patient care.
- Innovation and creative thinking are requisite skills for the mentor who wants to fully lead his or her mentees in new directions and forge a better future.
- Introspection consists of self-improvement and self-assessment, qualities that an active listener and mentor must possess to lead by example.
- Inclusion is centered on the active engagement of both the mentor and the mentee and encompasses productive collaboration aimed at harnessing collective intelligence and creativity.

A 2011 systematic review of mentorship in surgical training described the five most frequently cited qualities of a mentor. These characteristics are outlined in the table on this page.[15]

The following are general recommendations for good mentoring:

- *Be present and prepared.* In preparation for the first meeting, review the mentee's grades, curriculum vitae, research interests, job description, and so on. Talk to other colleagues who have worked with the individual. Help the mentee develop and structure a specific goal.
- *Make time in your schedule.* Your time is valuable, but strive to have meaningful contact with your mentee every one to two months.
- *Market your mentee.* Introduce your mentee to colleagues; encourage and facilitate their participation in local or national research committees and organizations.
- *Check in.* Between meetings, send an e-mail to make sure your mentee is on track with tasks, and assist with any challenges that have developed.
- *Evaluate.* With each meeting, assess how the mentee is progressing toward his or her goal and help to keep him or her on the appropriate time-line.

Finding the right mentor and being a good mentee

Finding the right mentor or mentors can be one of the more challenging tasks for the mentee. Mentees may benefit from seeking a specific mentor to focus on one area of their development. For example, the mentee may select a research mentor who has engaged in a body of work that they respect and choose a different work-life balance mentor whose family life they would like to emulate.

Securing a mentor at one's institution affords the benefits of being able to conduct regular in-person meetings and having a mentor who is familiar with the mentee's educational requirements and demands. Conversely, national mentorship programs, such as the ACS Junior Faculty Empowerment Program and the Association of Women Surgeons mentoring program for Early Career Women Faculty, have opened the door to long-distance mentoring.[18] Many institutions have implemented formal, assigned mentorship programs, but if mentees are tasked with finding their own mentors, some have recommended testing out the relationship by first asking for advice from a potential mentor to see if personalities and communication styles are a good match.[18]

The role of the mentee is not typically well-defined in literature. The following are commonly suggested guidelines for mentees:

The two most important measures of productive mentoring are the mentee's success and the mentor's and mentee's perception of the relationship.

- *Have a clearly defined goal.* At the first meeting, clearly define your goal and outline your ideas and plans to achieve your goal. Include details on how you think your mentor can help.
- *Be respectful of your mentor's time.* Be punctual, be prepared, and allow your meeting to end on time.
- *Follow through on tasks.* Finish tasks on time and to the best of your ability.
- *Self assess.* Spend time preparing before your next meeting. Reflect on your progress, the tasks you have completed successfully, and the steps that remain to achieve your goal.
- *Refine your goals.* Throughout your training or professional advancement, re-evaluate your goals and, with the help of your mentor, refine them and develop new ones.

Conclusion

Mentorship styles and structures are multifaceted, and will likely continue to develop in the future. Increased specialization means that mentors will likely play a specific role for one mentee and play a different role for the next. As surgery changes at an ever-increasing pace, the practice of mentoring the next generation must evolve to produce new surgeons of the highest quality. ◆

REFERENCES

1. Patel VM, Warren O, Ahmed K, et al. How can we build mentorship in surgeons of the future? *ANZ J Surg.* 2011;81(6):418-424.
2. Healy NA, Cantillon P, Malone C, Kerin MJ. Role models and mentors in surgery. *Am J Surg.* 2012;204(2):256-261.
3. Kron IL. Surgical mentorship. *J Thorac Cardiovasc Surg.* 2011;142(3):489-492.
4. Gough I. Mentoring: Historical origins and contemporary value. *ANZ J Surg.* 2008;78(10):831.
5. Zusan E, Vaughan A, Welling RE. Mentorship in a community-based residency program. *Am Surg.* 2006;72(7):563-564.
6. The training of the surgeon. *Br Med J.* 1936;1(3918):268. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2122353/. Accessed July 15, 2014.
7. Kotsis SV, Chung KC. Application of the "see one, do one, teach one" concept in surgical training. *Plast Reconstr Surg.* 2013;131(5):1194-1201.
8. Engels PT, de Gara C. Learning styles of medical students, general surgery residents, and general surgeons: Implications for surgical education. *BMC Med Educ.* 2010;10:51.
9. Pugh CM, Watson A, Bell RH Jr., et al. Surgical education in the internet era. *J Surg Res.* 2009;156(2):177-182.
10. Moller MG, Karamichalis J, Chokshi N, Kaafarani H, Santry HP. Mentoring the modern surgeon. *Bull Am Coll Surg.* 2008;93(7):19-25.
11. Omar-Fauzee MS, Nazaruddin MN, Saputra YM, et al. The strategies for character building through sports participation. *Int J Acad Res in Bus and Soc Sci.* 2012;2:48-58.
12. Singletary SE. Mentoring surgeons for the 21st century. *Ann Surg Oncol.* 2005;12(11):848-860.
13. Rombeau JL, Goldberg A, Loveland-Jones C. *Surgical Mentoring: Building Tomorrow's Leaders.* New York: Springer; 2010.
14. Accreditation Council for Graduate Medical Education. Editor's introduction: Simulation and rehearsal: Practice makes perfect. *ACGME Bulletin.* 2005. Available at: http://www.asahq.org/SIM/~/media/For%20Healthcare%20Professionals/Education%20and%20Events/Simulation%20Education%20Network/ACGME%20Sim%20December%20bulletin12_05.ashx. Accessed June 24, 2014.
15. Entezami P, Franzblau LE, Chung KC. Mentorship in surgical training: A systematic review. *Hand (N Y).* 2012;7(1):30-36.
16. Jones A, Eden C, Sullivan ME. Mutual mentoring in laparoscopic urology—a natural progression from laparoscopic fellowship. *Ann R Coll Surg Engl.* 2007;89(4):422-425.
17. Hay D, Khan MS, Van Poppel H, et al. Current status and effectiveness of mentorship programmes in urology—a systematic review. *BJU Int.* February 27, 2014. [Epub ahead of print].
18. Sanfey H, Hollands C, Gantt NL. Strategies for building an effective mentoring relationship. *Am J Surg.* 2013;206(5):714-718.
19. Francesca Monn M, Wang MH, Gilson MM, Chen B, Kern D, Gearhart SL. ACGME core competency training, mentorship, and research in surgical subspecialty fellowship programs. *J Surg Educ.* 2013;70(2):180-188.
20. Holmes DR, Jr, Hodgson PK, Simari RD, Nishimura RA. Mentoring: Making the transition from mentee to mentor. *Circulation.* 2010;121(2):336-340.

Heather Evans, MD, MS, FACS, wearing Google Glass.

The "bionic" era: Exploring the use of advanced technology in surgery

by Hyuma A. Leland, MD; Rebecca L. Hoffman, MD; Ray S. King, MD; and Ahmad W. Ahad, MD

HIGHLIGHTS

- Describes how emerging advanced technologies are being used to revolutionize surgical patient care
- Demonstrates how infrared and fluorophore technology are allowing surgeons to "see" what is typically outside the normal human field of vision
- Looks at applications for wearable technology, such as Google Glass
- Discusses the increasing use of augmented reality models and applications of 3-D printing technology

"We can rebuild him. We have the technology. We can make him better than he was. Better...stronger...faster." So goes the voice-over from the opening sequence of the 1970s television series *The Six Million Dollar Man,* referring to lead character Steve Austin, who had received bionic limbs and a zoom-lens, infrared-capable eye after a nearly fatal accident. One could argue that the enduring popularity of the show demonstrates a public belief that technological advances in surgery can be used to improve human ability and well-being.

Today, as we stand at a metaphorical crossroads in surgical care, dedication to improving patient outcomes through advanced technology is stronger than ever. Improved collaboration between scientists in both medicine and engineering has resulted in advances that surpass the capabilities of their individual efforts.

The idea that surgeons can use advanced technology to augment the patient experience is not novel. Surgeons have long possessed the unique opportunity to harness society's technological advances to better serve our patients. Notably, the once futuristic bionic body parts of the "Six Million Dollar Man" are closer to becoming a reality today. In leui of bionic legs and arms, patients receive three-dimensional (3-D) printed titanium pelvises, and the bionic eye is instead a pair of computerized glasses. Advances such as wearable technology, tumor cell detection with fluorophores and nanomaterials, and 3-D organ modeling and printing represent the next era in surgical care. Surgeons have established themselves as leaders throughout medical history, and we once again are poised to lead the charge into an exciting new age of technical innovation.

Optical illusion

Advances in infrared and fluorophore technology are allowing surgeons to have the ability to "see" what is typically outside the spectrum of normal human sight. The first example of this was the development of cutting-edge instruments designed to detect patterns of photon scatter and absorption.[1,2] This technology uses the near-infrared spectrum to distinguish healthy, well-perfused

Advances such as wearable technology, tumor cell detection with fluorophores and nanomaterials, and 3-D organ modeling and printing represent the next era in surgical care.

tissue from poorly perfused tissue, for instance, at sites of bowel or vascular anastomoses. Although the technology has been in use for some time now, it continues to evolve in exciting ways via the development of enhanced optics and patient-centered applications.

Epitomizing this evolution was the development of the fluorescence-assisted resection and exploration (FLARE) system in 2001 at the John Frangioni laboratory, Beth Israel Deaconess Medical Center, Boston, MA. Using near-infrared light in combination with a specially designed fluorescing dye designed to target specific tissues, researchers have discovered a way to advance the properties of a prototypical, non-specific fluorescent dye, such as indocyanine green. The dye, which is injected into the body, has an affinity for certain tissue components, and has been used to successfully identify sentinel lymph nodes in breast cancer and colon cancer, and vessels in free flap reconstruction.[3]

The next step in the development and utility of this technology was to engineer tissue-specific and cancer cell-specific fluorophores for real-time identification of structures and margins during surgery. Both bio- and nanomaterial development have allowed for the creation of targeted fluorophores that have this capability, and a number of talented surgeon-scientists in the field of fluorescence-guided surgery are paving the way for further advances in surgical oncology. For instance, Bouvet and colleagues have been able to demonstrate the effectiveness of fluorophore-tagged antibodies directed at common tumor antigens in combination with light-emitting diode (LED) cameras in a mouse model of pancreatic and colon cancer.[4] Other applications of fluorescence-guided surgery have occurred in ovarian tumor debulking, glioblastoma multiforme resection, and urologic procedures. This promising field represents the marriage of innovation in engineering with modern surgical technique. The optical illusion of tumor and tissue planes can be exposed with the creative manipulation of proteins and light.

Wearable technology

The development of an "eye" that can zoom, take pictures, import data instantaneously, and telecommunicate is now a reality. Advances in computer technology have transcended the limitations of location and have moved from the desktop to the laptop to the mobile device, and now to head-mounted eyewear.

Surgeon researchers—particularly those familiar with the connection between improved dexterity and computer game usage—are currently exploring the next generation of crossover devices, with a particular emphasis on wearable technology. Hand gestures, voice activation, and gyroscopic control now replace manual data input for Google Glass, a device introduced by Google, Inc., Mountain View, CA, in early 2013. Google Glass, or simply Glass, is worn like a pair of regular reading glasses but allows the user to access a central processing unit and a holographic projector. The ultra-light frame houses a high-definition camera, microphone, and wireless connectivity, as well as a bone-conduction sound transducer and a remote touch pad.

Glass can take pictures, record videos, text, e-mail, teleconference, access medical records, and download images, all using voice or gesture command. Images are projected to the right upper corner of the wearer's visual field, which makes using the device analogous to looking in your car's rearview mirror. The beta testing program, called the Google Explorer Program, included many surgeons who volunteered to become early adopters of this technology and have used it to document preoperative time-outs, record key portions of an operation, look at image specimens, request intraoperative consultations via teleconferencing, run medical record or preoperative imaging queries, and even teach remotely.[5] In terms of student instruction, the resident or medical student no longer has to look over the surgeon's shoulders to view an operation; with Glass, he or she can observe the procedure directly from the surgeon's point of view from a remote location.

Telementoring is also possible by remotely evaluating a trainee during simulations or while performing actual procedures. Investigators from Massachusetts General Hospital, Boston, recently evaluated the Glass as an augmented reality telementoring tool between chief surgical residents and interns.[6] Despite continuing concerns over patient privacy and data security and the technology lacking the image resolution required for large-scale use in teaching, the authors were optimistic about the potential of this device in their review. They

note that "the wearable technology revolution provides a unique opportunity for surgical educators to connect with trainees....this type of technology will undoubtedly continue to improve, and surgeons should provide feedback to shape the development of these devices for clinical applications."[6]

Google Glass is just one type of wearable technology available today. The use of infrared or fluorescence-detecting goggles for augmented-reality surgery is another example of the "bionic eye" making its appearance in the surgical theater, the concept of which originated more than a decade ago in animal models.[7] Using green fluorescence protein linked to paramagnetic nanoparticles, brain tumors were localized in rats with magnetic resonance imaging (MRI) and fluorescence-detecting cameras.[7] More recently, in February 2014, researchers at Washington University-Barnes Jewish Hospital, St. Louis, MO, have developed and implemented the use of fluorescence-detecting goggles to visualize fluorescent breast cancer cells.[8]

The applications of computer-aided "bionic vision" extend beyond eyewear and fluorescent cells; the ability to translate the best features of this vision into technical skill remains the sine qua non of surgical care. The introduction of minimally invasive surgery signified a paradigm shift that illustrates the foundation of this concept, specifically advances in high-definition, live-image transmission, which led to less invasive surgery and improved patient outcomes. The traditional concept that optimal exposure necessitated large incisions transitioned to the adoption of smaller incisions using laparoscopic guidance for many procedures. Like any other change in health care, improved patient outcomes are the drivers behind medical innovation. Yet while the adoption of laparoscopic technology was a significant advancement in surgical history, it, too, came with its own challenges, thus perpetuating the cycle of innovation.

Augmented reality

In an effort to overcome the loss of depth perception that occurs with traditional two-dimensional laparoscopy and to render procedures safer for patients, stereoscopic adaptations to minimally invasive surgery are available. Stereoscopy refers to a technique that creates the illusion of a 3-D image via the combination of multiple two-dimensional images taken from different perspectives, such as the image projected in the working console of the da Vinci Robotic Surgical System. But augmented reality (AR), or the merging of real images with computer graphics to enhance the user's perception, is taking stereoscopic surgery to the next level. First used in neurosurgery, orthopaedics, and otolaryngology, the applications of this technology are expanding to include urologic procedures and liver resections.[9] By superimposing preoperative computed tomography (CT) or MRI images onto patient anatomy during a complex surgical procedure, multiple inputs converge to take the guesswork out of lesion detection or complex anatomy. Within the last five years, intraoperative robotic C-arm CT scanning has been used in laparoscopic nephrectomy and liver resections to enhance surgeon perception and improve technical precision.[10]

Perhaps more impressive is the implementation of an AR iPad application during a hepatic tumor resection in Germany in August 2013.[11] Using this app, the computer's camera function can superimpose a patient's preoperative CT images onto an organ in real time. In the app's first trial, the iPad camera was held over the liver and the CT images were superimposed in the exact orientation of the organ, allowing the surgeon to "see" vessels, tumors, and other important anatomy. Touchscreen technology also allowed the surgeon to subtract anatomical structures from the image that had been resected in the procedure, modifying the image in real time. Thus, the surgeon was able to see different layers, modify tumor boundaries, and calculate residual liver volume using the imaging and computing power of AR.

Despite the amazing potential of technologies that provide surgeons with a "superhuman" eye, the incorporation of wearable technology and AR into the operating room has occurred on a limited basis. Regulatory and financial barriers, limited physician skill sets, and skepticism have contributed to a reluctance to incorporate these technologies. The biggest challenge in adopting new technology, however, is ongoing uncertainty regarding whether these advances actually enhance

Advances in computer technology have transcended the limitations of location and have moved from the desktop to the laptop to the mobile device, and now to head-mounted eyewear.

patient care. Fortunately, the number of reports and studies investigating the impact of these devices continues to grow.

3-D printing

Although surgeons have yet to implant legs capable of running at tremendous speeds and jumping to amazing heights, the profession is embracing 3-D-printing technology to achieve remarkable real-world feats. As health care becomes increasingly individualized, 3-D printing, also known as additive manufacturing, has become a tool for creating patient-specific models, implants, and assistance devices.

First developed in 1983, 3-D-printing technology has rapidly advanced over the last three decades toward smaller, cheaper, and higher-resolution printers. Home desktop models can be purchased for less than $500, while higher-end models range up to $750,000. The highest resolution printers can print detail to the 100 nm scale. The prevalence and quality of 3-D printers has fueled new bioengineering research focused on delivering individualized patient care.

Surgical modeling

The use of 3-D printers in health care initially gained traction in the mid-1990s when it was used to create models for complex craniofacial defect reconstruction and for the treatment of neurovascular disease.[12,13] CT or MRI images were converted into printer-ready files and produced using stereolithography, a technique involving laser polymerization of a photosensitive liquid resin.[14] Models were found to be accurate to within 0.85 mm on average—an impressive result, especially considering how new the technology was at that time. As the technology became more widely available, it was applied to congenital heart defects, the premature infant upper airway, and craniopagus twins. Despite their accuracy for operative planning, the use of 3-D printed models was limited due to inadequate computer processor speed, expensive printers and printing materials, and the time required to print a model. Today, the speed and accuracy of 3-D-printed models has improved dramatically. A life-size aortic root model can be printed in slightly more than three hours using publicly available software on an open-source 3-D-printing system.[15] Dimensional error is dependent on the printing method, but stereolithography has been reported as accurate to within 0.56 percent.[16]

Surgical implants

In the last three years, several well-publicized case reports using 3-D printed, patient-specific implants have emerged. Permanent implants fashioned by 3-D printers using osteoconductive titanium have been shown to be long-lasting and durable, even demonstrating osseointegrative properties.

In June 2011, an 83-year-old female with mandibular osteomyelitis underwent resection and reconstruction using a 3-D-printed titanium implant. Dutch and Belgian researchers and surgeons created the implant based on an MRI reconstruction of the patient's mandible and printed the implant using a 3-D titanium powder laser sintering machine. Similarly, in the U.K. in 2013, a motorcycle accident survivor underwent a complex facial reconstruction using a custom-designed, 3-D-printed titanium implant to restore the facial skeleton. In 2011, MRI and CT scans were used to model and produce a 3-D-printed titanium pelvis, which was successfully implanted into a patient after he underwent surgery for a chondrosarcoma. After three years, the patient is reportedly doing well and ambulating with a cane. An equally sensational case occurred in February 2012 with the implantation of the first biodegradable surgical implant in the U.S. Under an emergency-use exemption, a bioresorbable tracheal splint was deployed at the University of Michigan, Ann Arbor, in a 20-month-old male with tracheobronchomalacia. The story made national headlines, and subsequently a second case was reported.[17] These bioresorbable implants provide temporary support and scaffolding, which is then replaced by native tissue. These cases illustrate the applicability of 3-D printing to individualized patient care, enabling surgeons to create patient-specific implants that are precise in their form and function while achieving results superior to alternatively manufactured implants.

REFERENCES

1. Sevick-Muraca EM, Houston JP, Gurfinkel M. Fluorescence-enhanced, near infrared diagnostic imaging with contrast agents. *Curr Opin Chem Biol*. 2002;6(5):642-650.
2. Frangioni JV. In vivo near-infrared fluorescence imaging. *Curr Opin Chem Biol*. 2003;7(5):626-634.
3. Schaafsma BE, Mieog JS, Hutteman M, et al. The clinical use of indocyanine green as a near-infrared fluorescent contrast agent for image-guided oncologic surgery. *J Surg Onc*. 2011;104(3):323-332.
4. Kaushal S, McElroy MK, Luiken GA, et al. Fluorophore-conjugated anti-CEA antibody for the intraoperative imaging of pancreatic and colorectal cancer. *J Gastrointest Surg*. 2008;12(11):1938-1950.
5. Muensterer OJ, Lacher M, Zoeller C, Bronstein M, Kubler J. Google Glass in pediatric surgery: An exploratory study. *Int J Surg*. 2014;12(4):281-289.
6. Hashimoto D, Phitayakorn R, Fernandez-del Castillo C, Meireles O. Augmented reality telementoring tool to assess and guide chief to intern intraoperative education: The Google Glass experience. SAGES Annual Meeting; 2014; Salt Lake City, UT.
7. Kircher MF, Mahmood U, King RS, Weissleder R, Josephson L. A multimodal nanoparticle for preoperative magnetic resonance imaging and intraoperative optical brain tumor delineation. *Cancer Res*. 2003;63(23):8122-8125.
8. Winter C. These high-tech surgery goggles can spot glowing cancer cells. *Bloomberg Business Week*. February 26, 2014. Available at: http://www.businessweek.com/articles/2014-02-26/these-high-tech-surgery-goggles-can-spot-glowing-cancer-cells. Accessed May 1, 2014.
9. Nicolau S, Soler L, Mutter D, Marescaux J. Augmented reality in laparoscopic surgical oncology. *Surg Oncol*. 2011;20(3):189-201.
10. Teber D, Guven S, Simpfendorfer T, et al. Augmented reality: A new tool to improve surgical accuracy during laparoscopic partial nephrectomy? Preliminary in vitro and in vivo results. *Eur Urol*. 2009;56(2):332-338.
11. Fraunhofer Institute for Medical Image Computing MEVIS. Tablet PC supports Liver Surgeons—New app from Fraunhofer MEVIS tested for the first time during an operation in Germany. Press release. August 2013. Available at: http://www.mevis.fraunhofer.de/en/news/press-release/article/tablet-pc-supports-liver-surgeons-new-app-from-fraunhofer-mevis-tested-for-the-first-time-during-a.html. Accessed June 23, 2014.

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Prosthetic devices

3-D printing has enabled the layperson to construct functional prostheses for patients. In 2011, South African carpenter Richard Van As traumatically lost four fingers from his right hand. He collaborated with Ivan Owen, a special effects designer from the state of Washington, to create the first functional 3-D-printed hand. The prosthetic hand can be opened and closed by wrist extension and flexion, allowing the user to grip objects as narrow as a pencil or coin. News of their innovation spread quickly, and their next design was a prosthetic hand for a five-year-old boy in South Africa who was born without digits.[18] Van As and Owen made their designs publicly available, and the open-source technology has allowed parents like Paul McCarthy to print a prosthetic hand for his 12-year-old son and young printing enthusiasts like 16-year-old Mason Wilde to create a prosthesis for a family friend's nine-year-old son.[18] As 3-D printers have become increasingly available to the public, developers have optimized designs and technology, allowing users with no formal training to create wearable, mechanical hands capable of purposeful grip for as little as $60.[19] The low cost and accessibility of 3-D-printing technology has enabled tech-savvy patients the opportunity to take a therapeutic role in health care.

Despite successes in bone and prosthetic printing, the Holy Grail of 3-D printing is the development of printable, patient-specific organs and soft tissues. To achieve this goal, vascular networks will need to be incorporated into grafts that allow circulation at the cellular level. Creating diffuse and permeable vascular networks in 3-D grafts is a complex engineering problem that has seen some success through the use of sugar scaffolds. The sugar, when dissolved, leaves behind patent channels lined with living cells through which blood can be supplied. Although this technique shows promise, the clinical applications of 3-D printing will be limited to alloplastic implants and prostheses until the more intricate challenges of incorporating vessels can be overcome.[20]

As 3-D printing has evolved to become cheaper, faster, and more precise, the technology has enabled physicians, researchers, and families to individualize care for patients. As vascularity and bioprinting of scaffolds

Within the last five years, intraoperative robotic C-arm CT scanning has been used in laparoscopic nephrectomy and liver resections to enhance surgeon perception and improve technical precision.

and cells further evolves, the ultimate goal of manufacturing patient-specific, functional, live-tissue organ grafts may one day become a reality.

Conclusion

The futuristic science that was once the basis of a 1970s television show is now, in 2014, similar in complexity to the technology that is making its way into the surgical theater. The drive for improved patient outcomes has characterized surgeon mentality since the days of Ernest Codman, MD, FACS, a key figure in the founding of the American College of Surgeons (ACS), and remains evident in the innovations that are continuing to take place.

The changing national health care scene, the critical reappraisal of surgical education, and the technologic boom have put surgery at a pivotal crossroads in health care. The idea that "we have the technology… we can make him better…" is the idea that fuels the collaboration between industry and surgery, and it will steer the discipline into a new era of patient care. The bionic eye of science fiction, reinvented in the form of fluorophores, wearable technology, and augmented reality apps and super-powerful extremities reinvented in the form of printable prostheses represent areas of innovation decades in the making. Improvements in these technologies must be made before the barriers to their widespread adoption are overcome, but the advancements occurring in surgery make this era an exciting precursor to the coming advanced technology-driven age. As new generations of surgeons begin to use Google Glass and iPad apps, it is inevitable that advanced technology will continue to have a presence into the operating room. ◆

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REFERENCES (CONTINUED)

12. Barker TM, Earwaker WJ, Lisle DA. Accuracy of stereolithographic models of human anatomy. *Australas Radiol*. 1994;38(2):106-111.
13. Klein HM, Schneider W, Alzen G, Voy ED, Gunther RW. Pediatric craniofacial surgery: Comparison of milling and stereolithography for 3D model manufacturing. *Pediatr Radiol*. 1992;22(6):458-460.
14. D'Urso PS, Thompson RG, Atkinson RL, et al. Cerebrovascular biomodelling: A technical note. *Surg Neurol*. 1999;52(5):490-500.
15. Kalejs M, von Segesser LK. Rapid prototyping of compliant human aortic roots for assessment of valved stents. *Interact Caridiovasc Thorac Surg*. 2009;8(2):182-186.
16. Choi JY, Choi JH, Kim NK, et al. Analysis of errors in medical rapid prototyping models. *Int J Oral Maxillofac Surg*. 2002;31(1):23-32.
17. Zopf DA, Hollister SJ, Nelson ME, Ohye RG, Green GE. Bioresorbable airway splint created with a three-dimensional printer. *N Engl J Med*. 2013;368(21):2043-2045.
18. Henn S, Carpien C. National Public Radio. 3-D printer brings dexterity to children with no fingers. June 18, 2013. Available at: http://www.npr.org/blogs/health/2013/06/18/191279201/3-d-printer-brings-dexterity-to-children-with-no-fingers. Accessed May 5, 2014.
19. Truesdell J, Grout P. Mason Wilde gives family friend a helping hand—literally. *People.com*. March 20, 2014. Available at: http://www.people.com/people/article/0,,20795392,00.html. Accessed May 5, 2014.
20. Bae H, Puranik AS, Gauvin R, et al. Building vascular networks. *Sci Transl Med*. 2012;4(160):160ps123.

The *e*-volution of the 21st century surgeon

by Priya H. Iyer, MD; Scott B. Grant, MD, MBE; Megan E. McNally, MD; Nicolas J. Mouawad, MD, MPH, MBA; and Konstantinos Spaniolas, MD

HIGHLIGHTS

- Explores the effects of advanced surgical technology on the delivery of care and the expansive growth in the number of minimally invasive procedures across the surgical specialties
- Explains that procedures that were once the sole province of surgeons are now being performed by radiological and medical interventionists
- Looks at the impact of robot-assisted operations
- Discusses the need for proper training in the use of surgical procedures that rely on advanced technology
- Describes how technology is contributing to changing patient expectations

Surgery was born in the Neolithic age as interventional medicine. Trepanation, or creation of a burr hole, was performed to release "evil spirits" and is a procedure that has been documented up to the 20th century. The Egyptians, the Sushrutas, and the Greeks developed scientific principles on surgical technique, trauma care, and anatomy.[1-3] After the fall of the Roman Empire, barber-surgeons worked as general interventionalists.[4] With the advents of human anatomic dissection, bleeding control, anesthesia, and antisepsis, the last 150 years have seen a transformation in the field of surgery, paving the way for surgeons to successfully perform major operations.[5] At the peak of this era, Francis D. Moore, MD, FACS, was featured on the cover of *Time* magazine in 1963 with the caption, "If they can operate, you're lucky."[6]

The general approach to interventional medicine has been the basis of surgery since its inception, and a similar concept informs the practice of general surgery today. In fact, clinicians often perform a broad spectrum of procedures, including gastrointestinal, endocrine, breast, vascular, and thoracic, in a variety of patients, from the fetal to the frail. Interestingly, general surgeons performed cardiac procedures until the 1970s. Clinical expertise, experience, and technical skills had previously allowed general surgeons to maintain a broad scope of practice.

Technological advances in medicine during the 20th century led to exponential growth in new surgical procedures. By the end of the century, laparoscopic surgery was being widely performed, and a wealth of newfound information and knowledge led to subspecialization. Concurrently, the electronic revolution and socioeconomic factors have added to the complexity of health care practice and delivery. How do these challenges affect the profession, art, and practice of surgery?

"First, do no harm"

With the advent of laparoscopic surgery in the 1980s, the application of minimally invasive techniques rapidly expanded to all disciplines, particularly general surgery. When new techniques are introduced, though, new complications or indications for procedures also arise. Laparoscopic cholecystectomy

Although most general surgery residents now graduate with proficiency in basic laparoscopic procedures, more advanced procedures require additional training, obtained either through fellowships or postgraduate courses.

is reported to be the most commonly performed procedure on the digestive tract.[7] The surge in performance of this procedure, which is primarily done on an outpatient basis, is due in part to the ease of the minimally invasive technique, and because patients experience a less painful recovery than an open operation would allow. However, the most worrisome complication, bile duct injury, increased to a 0.4 percent to 0.6 percent occurrence rate from a 0.1 percent to 0.3 percent occurrence rate.[8-11] The increase in biliary tree injury is thought to be a result of the learning curve associated with the new technique; most injuries were reported in the first 100 cases of those surgeons who had been in practice for a while and had learned cholecystectomy at postgraduate courses. At this time, proctoring was encouraged but not mandatory.

The American College of Surgeons (ACS) encourages physicians to evaluate new procedures to gain proficiency. More specifically, surgeons are encouraged to become knowledgeable about the disease and the indications of the new procedure, as well as to develop the necessary technical skills; however, no federal mandates apply to the acquisition of new skills outside a surgeon's training program. Although most general surgery residents now graduate with proficiency in basic laparoscopic procedures, more advanced procedures require additional training, obtained either through fellowships or postgraduate courses.

Many industry- and association-sponsored programs provide postgraduate training to surgeons in practice, including lecture-based and hands-on formats. After a course is complete, the surgeon's practice credentialing committee is responsible for determining whether the surgeon is qualified to perform that procedure. Most of these committees have proctoring requirements for surgeons prior to providing full credentials for a procedure, but this standard varies by institution. Although there is no direct federal mandate, hospital credentialing committees must have established protocols to at least reactively assess a surgeon's quality performance if the institution is to maintain Joint Commission accreditation.

As surgeons continue to push the boundaries of which operations can be performed with minimally invasive techniques, complications will continue to arise. With the addition of single-incision laparoscopic procedures, morbidity due to bile duct injury and hernia rates may, in fact, rise.[12,13] So, as responsible physicians abiding by the Hippocratic Oath, surgeons should educate themselves on new procedures, evaluate their applications and merit, and ensure that they have learned the procedure adequately before applying it to patients.

Gizmos, gadgets, and toys

Given the rapid growth of surgical technology, many clinical practices are in the market for young surgeons trained in minimally invasive surgery. Surgeons trained in the early 1980s learned laparoscopy as the technology evolved to remain compliant with the modern standard of surgical care. Advancements in medical technology have brought many new and exciting techniques and options, but with them, some standard and cherished procedures are slowly being relegated to the senior surgeons who have amassed expertise in these operations.

The trend away from open procedures has forced more senior staff to learn how to perform new operations. Each of us can relate to becoming comfortable with a procedure, as well as the anxiety that accompanies doing something new. Even in residency, when trainees are exposed to new procedures on an almost daily or weekly basis, one anticipates that the learning curve will plateau after graduation.

The following scenarios highlight how senior surgeons may rely on junior surgeons for their expertise and vice-versa. In this example, the senior pediatric surgeon in a busy group practice sought assistance from the junior faculty, and together they completed a laparoscopic Nissen fundoplication. The junior surgeon led the senior surgeon through the procedure, encouraging him to continue at points when it became frustrating. The senior surgeon graciously accepted the junior colleague's assistance and followed the suggestions provided. A week later, a 1 kg, 24-week infant with both a tracheo-esophageal fistula (TEF) and tetralogy of Fallot required TEF ligation. The infant was unable to tolerate thoracoscopy, so the procedure required an open technique. The junior faculty had less experience with this procedure in such a small infant, so he collaborated with the senior surgeon to successfully treat the patient.

Other senior surgeons have built their careers on the practice of specific procedures that most trainees and young surgeons have rarely seen or even read about in surgical textbooks. These situations are not specific to one discipline in surgery, but rather, are seen in a variety of contexts.

Peptic ulcer was traditionally treated as a surgical disease. The management of gastric and duodenal ulcers via a variety of gastrointestinal resections occupied much of the general surgeon's operative time. The long list of post-gastrectomy syndromes and complications also required an equal expertise in identification and management. In 1982, Barry Marshall, AC, DSc, and Robin Warren, AC, discovered Helicobacter pylori, which now is recognized as the cause of 90 percent of duodenal ulcers and 80 percent of gastric ulcers; they received the Nobel Prize in Physiology or Medicine in 2005 for this discovery.[14] In essence, Marshall and Warren converted peptic ulcer disease from a surgical condition to an infection that is treated with medication, with only resistant or complicated cases requiring surgery.

Medical advancements are particularly evident in the field of vascular and endovascular surgery. New devices and technologies have changed the way many vascular conditions are surgically treated, allowing for a more minimally invasive and intraluminal approach. In North America, most infrarenal abdominal aortic aneurysms, ruptured or elective, are repaired with endovascular aneurysm repair (EVAR).[15] EVAR is associated with a significant reduction in early perioperative mortality, specifically because aortic crossclamping and adequate operative exposure are unnecessary. Since the approval of endograft devices, the number of EVARs performed annually has increased by approximately 600 percent.[16] Now, conventional open repair is most often reserved for cases that are not amenable to endovascular approaches, and it remains uncertain how future generations of vascular surgeons will be trained to perform open repairs.

Most surgical procedures are unlikely to become truly obsolete, but already younger trainees are becoming less familiar with certain open procedures due to significant advances in pharmacology and technology, yielding stronger medications, advanced devices for minimally invasive surgery such as laparoscopy, and endoluminal and endovascular methods for the treatment of common vascular diseases.

Procedural specialists

Since 1933, the American Board of Medical Specialties (ABMS) has overseen the board-certification process for physicians by assisting the now 24 medical specialty boards with developing and implementing educational and professional standards to evaluate physicians. There are now several surgical member boards of the ABMS, including the American Boards of Colon and Rectal Surgery, Neurological Surgery, Obstetrics and Gynecology, Ophthalmology, Orthopaedic Surgery, Otolaryngology, Plastic Surgery, Surgery, Thoracic Surgery, and Urology. However, other member boards of the ABMS certify physicians primarily to perform interventional procedures, including but not limited to gastroenterology and interventional cardiology, and interventional and diagnostic radiology.[17]

Historically, the first upper endoscopy, colonoscopy, and endoscopic retrograde cholangiopancreatography were performed by surgeons, but now these procedures and further interventions using these technologies are often performed by gastroenterologists. Indeed, the gold standard treatment for achalasia has shifted over time from pneumatic dilatation to laparoscopic Heller myotomy and now, possibly, to other modes. In fact, this issue has become so contested that physicians Marco Allaix, MD, and Marco Patti, MD, FACS, published an article, "What is the best primary therapy for achalasia: Medical or surgical treatment? Who owns achalasia?"[18] The available treatments for achalasia now include calcium channel blockers and nitrates, endoscopic botulinum toxin injection, pneumatic dilatation, per-oral endoscopic esophageal myotomy, and laparoscopic or open Heller myotomy. Although temporary relief can be achieved with traditional endoscopic methods, and myotomy remains the gold standard in medically fit patients, the clinical practice varies with demographics and geography.[19,20] Additionally, new endoscopic therapies for achalasia require advanced technical skills, raising the question of who should be performing these procedures. Unless a practitioner has all the treatment

It is important to remember, however, that robotic surgery is still in its infancy.

modalities in his or her armamentarium, bias in practice pattern is introduced.

Gastroenterologists are rapidly expanding the scope of pathology that they can treat endoscopically. Pancreatitis with concomitant pancreatic pseudocysts and necrosis have long been exclusively managed with surgery. Now, however, pancreatic sphincterotomy, stenting, dilatation, and stone extraction of the pancreatic duct, sometimes with extra-corporeal shock wave lithotripsy, are being performed.[21] Endoscopic cyst-gastrostomy, cyst-duodenostomy, or even transpapillary drainage are also possible approaches to drain pancreatic pseudocysts, in addition to image-guided percutaneous approaches by interventional radiologists. In other words, viable alternatives to open or laparoscopic surgical cyst-gastrostomy or cyst-duodenostomy or pancreatic necrosectomy are now being performed. The patients often prefer minimally invasive options despite unknown or possibly lower efficacy, similar to the trend with laparoscopic cholecystectomy in the early adoption phase.

Another discipline that is being heavily affected by new technology is cardiac surgery, where percutaneous coronary interventions with or without the use of stents have challenged the use of coronary-artery bypass graft (CABG). One-third fewer CABGs were performed in 2008 than one decade earlier. In fact, three out of four revascularization patients had angioplasties instead of CABG in 2008, compared with two out of three 10 years ago. The annual rate of CABG surgeries is decreasing steadily due to the introduction of more advanced percutaneous devices, as well as a drop in patient demand and satisfaction.[22] Now there is even transcatheter aortic valve replacement, potentially further limiting the common operations performed by cardiac surgeons.

To successfully eliminate the silos and departmental borders that have developed between interventional cardiologists, gastroenterologists, and radiologists, as well as between cardiac surgeons, general or minimally invasive surgeons, and others, these specialists will need to function as interdisciplinary teams. It has become common practice for surgeons to refer patients with choledocholithiasis to their colleagues in gastroenterology to "clear the duct" via endoscopic retrograde cholangiopancreatogram with sphincterotomy and balloon sweeping of stones before cholecystectomy. Similarly, endoscopic ultrasound by gastroenterologists for staging of pancreatic tumors that will be resected by surgical oncologists, or cardiac catheterizations performed by interventional cardiologists that refer triple vessel or left main disease to cardiac surgeons, are examples where the team approach yields better outcomes for the patients.

Can't forget the robot

Neurosurgical biopsies and orthopaedic joint replacement were the first procedures to use robotic assistance. The first robotic cholecystectomy was performed nearly 20 years ago, and since then, robotic surgery has been increasingly widespread. Published data from the Nationwide Inpatient Sample show an increase from 2008 to 2009 in the proportion of prostatectomies, nephrectomies, hysterectomies, coronary artery bypasses, and gastrectomies performed robotically.[23] Most prostatectomies and one-third of partial nephrectomies were performed robotically in 2009. Hysterectomy was the second most common (18 percent of total) robotic procedure performed in U.S. hospitals during the period of time examined. A more recent study estimates that 90 percent of prostatectomies and 20 percent of hysterectomies in the U.S. are conducted robotically.[24] The diffusion of robotic prostatectomy occurred in the early 2000s, despite the lack of large comparative effectiveness studies (which first appeared in 2009), and without a systematic approach to method adoption.[25] Robotic assistance for hysterectomy also has increased in the last five years to almost 10 percent of all procedures performed for benign disorders in the U.S.[26] The adoption of robotic surgery for diseases of the colon and rectum has been limited but progressively increasing. Data from the Nationwide Inpatient Sample in 2009 and 2010 reveal that less than 3 percent of all colorectal procedures in the U.S. are done robotically.[27]

Health care today is focused on value—quality divided by cost. Robotic surgery has a significantly higher perioperative cost, but long-term costs are still being evaluated. Several recent, large population stud-

REFERENCES

1. Atta HM. Edwin Smith Surgical Papyrus: The oldest known surgical treatise. *Am Surg.* 1999;65(12):1190-1192.
2. von Staden J. The discovery of the body: Human dissection and its cultural context in ancient Greece. *Yale J Biol Med.* 1992;65(3):223-241.
3. Prakash UB. Shushruta of ancient India. *Surg Gynecol Obstet.* 1978;146(2):263-272
4. Ackerknecht EH. From barber-surgeon to modern doctor. *Bull Hist Med.* 1984;58(4):545-553.
5. Gawande A. Two hundred years of surgery. *New Eng J Med.* 2012;366(18):1716-1723.
6. Moore, Francis. "If they can operate, you're lucky." *Time.* 1963;81(18):cover.
7. Archer SB, Brown DW, Smith CD, Branum GD, Hunter JG. Bile duct injury during laparoscopic cholecystectomy: Results of a national survey. *Ann Surg.* 2001;234(4):549-558.
8. Wherry DC, Marohn MR, Malanoski MP, Hetz SP, Rich NM. An external audit of laparoscopic cholecystectomy in the steady state performed in medical treatment facilities of the Department of Defense. *Ann Surg.* 1996;224(2):145-154.
9. Windsor JA, Pong J. Laparoscopic biliary injury: More than a learning curve problem. *ANZ J Surg.* 1998;68(3):186-189.
10. Roslyn JJ, Binns GS, Hughes EF, Saunders-Kirkwood K, Zinner MJ, Cates JA. Open cholecystectomy. A contemporary analysis of 42,474 patients. *Ann Surg.* 1993;218(2):129-137.
11. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. *J Am Coll Surg.* 1995;180(1):101-125.
12. Joseph M, Phillips MR, Farrell TM, Rupp CC. Single incision laparoscopic cholecystectomy is associated with a higher bile duct injury rate: A review and a word of caution. *Ann Surg.* 2012;256(1):1-6.
13. Marks JM, Phillips MS, Tacchino R, et al. Single-incision laparoscopic cholecystectomy is associated with improved cosmesis scoring at the cost of significantly higher hernia rates: 1-year results of a prospective randomized, multicenter, single-blinded trial of traditional multiport laparoscopic cholecystectomy vs single-incision laparoscopic cholecystectomy. *J Am Coll Surg.* 2013;216(6):1037-1047.
14. Konturek JW. Discovery by Jaworski of Helicobacter pylori and its pathogenetic role in peptic ulcer, gastritis and gastric cancer. *J Physiol Pharmacol.* 2003;54 Suppl 3:23-41.
15. Nedeau AE, Pomposelli FB, Hamdan AD, et al. Endovascular vs open repair for ruptured abdominal aortic aneurysm. *J Vasc Surg.* 2012;56(1):15-20.
16. Giles KA, Pomposelli F, Hamdan A, Wyers M, Jhaveri A, Schermerhorn ML. Decrease in total aneurysm-related deaths in the era of endovascular aneurysm repair. *J Vasc Surg.* 2009;49(3):543-550.

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ies have not revealed improvements in complication rates following robotic hysterectomy, colectomy, or prostatectomy.[26,28-30] In fact, two large population studies have suggested worse genitourinary complications and impaired patient safety during the early adoption time for robotic prostatectomy.[31,32] With respect to colectomy, at least two separate database studies have revealed higher postoperative bleeding rate with robotic surgery versus conventional laparoscopy.[27,28]

It is important to remember, however, that robotic surgery is still in its infancy. With proper patient selection and cost containment, it may represent a valuable tool for treating different diseases and specific patient populations. A large database analysis of robotic hysterectomy for benign disease suggests shorter hospital length of stay than laparoscopy.[26] Shorter hospital stays, in theory, could lead to cost reduction and better use of resources, but, at present, the cost associated with the robotic procedures is higher than the potential savings. In addition, research has suggested that robotic colon surgery is associated with lower conversion to open surgery than is laparoscopy, as well as possibly decreased length of hospital stay and postoperative ileus after left-sided resections.[27,33,34] Furthermore, robotic surgery is associated with improved ergonomics over laparoscopy and may decrease surgeon fatigue.[35,36] The potential benefits and evolution of technology indicate that robotic surgery needs to be further evaluated.

Considering the challenges and issues raised in this article and elsewhere in the literature, the benefit of a formal robotic training curriculum is clear.[37] The current recommended training pathway is a result of limited research and opinion, suggesting that experience and medical training to overcome the learning curve are necessary to perform these operations. Interestingly, the learning curve for robotic surgery is not well-established. For example, the minimum number of cases required for competency in robotic prostatectomy—the most commonly performed robotic operation—has been increasing as experience with the procedure has changed over time.[25]

Moreover, the definition of competence in this area is inconsistent. Experience has been emphasized as a way to obtain technical abilities. However, experience comes from practice, which should occur only

Today, many patients first turn to the Google search engine before seeking medical attention. As a result, patients often obtain fragmented information about their condition, complications, concerns, and hospital stays—which, in turn, sometimes leads to unrealistic expectations.

after proper education. Beginning with "simple" cholecystectomy procedures has been suggested as a way to enter the clinical field and obtain technical confidence.[38] Although this approach certainly seems safer than beginning with more complex procedures, this practice can be disconcerting for patients undergoing practice cholecystectomies. Clearly, education is the key, and a previously published *Bulletin* article on the topic of the future of robotics underscores this point.[39] Urologic fellowships for robotic training have been available for some time now and have contributed to the wide adoption of robotic prostatectomy. To bring fellowship training to a broader range of procedures, various industry leaders are planning to fund the development of clinical robotic fellowships for general surgery starting with the academic year 2016.[40]

The Google effect

Historically, patients visited the physician's office for expert medical advice. Today, many patients first turn to the Google search engine before seeking medical attention. As a result, patients often obtain fragmented information about their condition, complications, concerns, and hospital stays—which, in turn, sometimes leads to unrealistic expectations.

Take, for example, an obese patient who presents to the surgery clinic with a diagnosis of hyperparathyroidism. Before her visit, she "Googled" hyperparathyroidism treatment options and ultimately landed on trans-axillary robotic parathyroidectomy. She finds that a physician at a nearby tertiary care center performs the operation and requests this treatment modality. However, the surgeon believes that this operation may not be the best option for her and that the traditional approach may allow for the fastest recovery, less operative time, and less discomfort. Dissatisfied with the conflicting recommendation, her experience is negative. Although she goes ahead with a traditional operation with excellent outcomes, the patient feels frustrated because she did not receive the newest, fanciest operation.

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scoring system allows patients to provide survey feedback regarding their experience. After their hospitalizations, patients

REFERENCES (CONTINUED)

17. American Board of Medical Specialties. Who we are & what we do. Available at: http://www.abms.org/About_ABMS/who_we_are.aspx. Accessed June 26, 2014.
18. Allaix ME, Patti MG. What is the best primary therapy for achalasia: Medical or surgical treatment? Who owns achalasia? *J Gastrointest Surg.* 2013;17(9):1547-1549.
19. Schoenberg MB, Marx S, Kersten JF, et al. Laparoscopic Heller myotomy versus endoscopic balloon dilatation for the treatment of achalasia: A network meta-analysis. *Ann Surg.* 2013;258(6):943-952.
20. Enestvedt BK, Williams JL, Sonnenberg A. Epidemiology and practice patterns of achalasia in a large multi-centre database. *Aliment Pharmacol Ther.* 2011;33(11):1209-1214.
21. Heyries L, Sahel J. Endoscopic treatment of chronic pancreatitis. *World J Gastroenterol.* 2007;13(46):6127-6133.
22. Sibbald B. Declining CABG rate means fewer jobs for surgeons. *CMAJ.* 2005;173(6):583-584.
23. Anderson JE, Chang DC, Parsons JK, Talamini MA. The first national examination of outcomes and trends in robotic surgery in the United States. *J Am Coll Surg.* 2012;215(1):107-114.
24. Tsui C, Klein R, Garabrant M. Minimally invasive surgery: National trends in adoption and future directions for hospital strategy. *Surg Endosc.* 2013;27(7):2253-2257.
25. Mirheydar HS, Parsons JK. Diffusion of robotics into clinical practice in the United States: Process, patient safety, learning curves, and the public health. *World J Urol.* 2013;31(3):455-461.
26. Wright JD, Ananth CV, Lewin SN, et al. Robotically assisted vs laparoscopic hysterectomy among women with benign gynecologic disease. *JAMA.* 2013;309(7):689-698.
27. Halabi WJ, Kang CY, Jafari MD, et al. Robotic-assisted colorectal surgery in the United States: A nationwide analysis of trends and outcomes. *World J Surg.* 2013;37(12):2782-2790.
28. Keller DS, Senagore AJ, Lawrence JK, Champagne BJ, Delaney CP. Comparative effectiveness of laparoscopic versus robot-assisted colorectal resection. *Surg Endosc.* 2014;28(1):212-221.
29. Juo YY, Hyder O, Haider AH, Camp M, Lidor A, Ahuja N. Is minimally invasive colon resection better than traditional approaches? First comprehensive national examination with propensity score matching. *JAMA Surg.* 2014;149(2):17-84.
30. Jacobs BL, Zhang Y, Schroeck FR, et al. Use of advanced treatment technologies among men at low risk of dying from prostate cancer. *JAMA.* 2013;309(24):2587-2595.
31. Hu JC, Gu X, Lipsitz SR, et al. Comparative effectiveness of minimally invasive vs open radical prostatectomy. *JAMA.* 2009;302(14):1557-1564.

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are given a 32-question survey that addresses the following topics: "your care from nurses," "your care from doctors," "your experience in this hospital," "hospital environment," "overall rating," "understanding your care when you left the hospital," and "about you."[41]

Despite serial introductions, names on white boards, and photographs, patients often cannot differentiate physicians from nurses or nurse practitioners. They may be unable to differentiate primary provider from consultant. In addition, patients in tertiary care centers, who typically are more ill, have multiple providers and consultants, and ultimately may be more frustrated with their condition, tend to provide more negative feedback. With only three questions on the survey addressing interactions with the patient ("How often did doctors treat you with courtesy and respect?" "How often did doctors listen carefully to you?" and "How often did doctors explain things in a way you could understand?") physicians may receive poor "grades" while providing excellent care. With HCAHP scores becoming more publicly available, patients may receive biased information.

A 2012 study from the University of San Diego, CA, evaluated the "cost of satisfaction." Fenton and colleagues conducted a prospective cohort study from 2000 to 2007 of more than 50,000 adults who took a medical expenditure panel survey that assessed patient satisfaction, inpatient admissions, emergency department visits, and mortality. Interestingly, the study showed that higher patient satisfaction was associated with less emergency department use, but greater inpatient use, higher overall health care and prescription drug expenditures, and higher mortality.[42] Without HCAHPS scores, during a pre-Google era, we may not have known how patients felt about 6:00 am rounds. Now, with the fear of retribution through lack of reimbursement, how will our system change?

Conclusion

Ultimately, it is a surgeon's duty to learn and safely apply new technology without losing information and skills gleaned from previous training, and to keep in mind the importance of stable, proven practices. As residents and fellows, it is important to advocate for training in both trusted techniques and future innovations because only training in both will ensure that we are able to provide quality, patient-centered care. And as practicing surgeons, we must continue to maintain safety and quality while learning new techniques in a technology-wealthy environment. ◆

REFERENCES (CONTINUED)

32. Agarwal PK, Sammon J, Bhandari A, et al. Safety profile of robot-assisted radical prostatectomy: A standardized report of complications in 3317 patients. *Eur Urol.* 2011;59(5):684-698.
33. Casillas MA Jr, Leichtle SW, Wahl WL, et al. Improved perioperative and short-term outcomes of robotic versus conventional laparoscopic colorectal operations. *Am J Surg.* 2013;208(1):33-40.
34. Kang J, Yoon KJ, Min BS, et al. The impact of robotic surgery for mid and low rectal cancer: A case-matched analysis of a 3-arm comparison—open, laparoscopic, and robotic surgery. *Ann Surg.* 2013;257(1):95-101.
35. Lee GI, Lee MR, Clanton T, Sutton E, Park AE, Marohn MR. Comparative assessment of physical and cognitive ergonomics associated with robotic and traditional laparoscopic surgeries. *Surg Endosc.* 2014;28(2):456-465.
36. Hubert N, Gilles M, Desbrosses K, Meyer JP, Felblinger J, Hubert J. Ergonomic assessment of the surgeon's physical workload during standard and robotic assisted laparoscopic procedures. *Int J Med Robot.* 2013;9(2):142-147.
37. Chitwood WR Jr, Nifong LW, Chapman WH, et al. Robotic surgical training in an academic institution. *Ann Surg.* 2001;234(4):475-484.
38. Jayaraman S, Davies W, Schlachta CM. Getting started with robotics in general surgery with cholecystectomy: The Canadian experience. *Can J Surg.* 2009;52(5):374-378.
39. Griffen FD, Sugar JG. The future of robotics: A dilemma for general surgeons. *Bull Am Coll Surg.* 2013;98(7):9-15.
40. Intuitive Surgical, Inc. Intuitive Surgical Clinical Robotics Fellowship. Available at: http://intuitivesurgical.com/company/educational-grants/fellowship_grants.html. Accessed June 26, 2014.
41. Hospital Consumer Assessment of Healthcare Providers and Systems. Home page. Available at: http://www.hcahpsonline.org/. Accessed June 26, 2014.
42. Fenton JJ, Jerant AF, Bertakis KD, Franks P. The cost of satisfaction: A national study of patient satisfaction, health care utilization, expenditures, and mortality. *Arch Intern Med.* 2012;172(5):405-411.

The five-year general surgery residency:

Reform or revolution?

by Stefan W. Leichtle, MD; Christodoulos Kaoutzanis, MD; and Nicolas J. Mouawad, MD, MPH, MBA

Editor's note: The subject of this article, the future of the general surgery residency, will be debated at this year's Resident and Associate Society of the American College of Surgeons (RAS-ACS) Symposium on Sunday, October 26, at the 2014 Clinical Congress in San Francisco, CA. The symposium and this article are sponsored by the Advocacy and Issues Committee of the RAS-ACS.

In 1904, William Halsted, MD, presented his revolutionary concepts on the "training of the surgeon."[1] By replacing an unstructured apprenticeship model with a rigorous, formal curriculum based on basic science and bedside training, he introduced the principles that continue to guide modern surgical residency training in the U.S.[2,3]

The field of medicine and the practice of surgery have seen tremendous advances in the last few decades, but surgical educators and other stakeholders have expressed concern that our current training system may be lagging behind modern demands, which raises the question, "Does the traditional five-year general surgery residency structure still prepare graduates optimally for their role as practicing surgeons?"

This apprehension has transcended our "inner circle" as medical professionals and moved into the public media. Last year, a column in the *New York Times* asked, "Are today's new surgeons unprepared?"[4] Furthermore, whereas the state of surgical training and its future challenges have always been topics of speeches at surgical conferences, in editorials, and of scientific inquiry, the last decade has seen an alarming increase in studies demonstrating a lack of confidence and skill of graduating surgical trainees.[5-8] In other words, today, surgical training is again at a crossroads.

A look back at surgical training in the U.S.

When Dr. Halsted announced his new tenets of surgery resident training at the turn of the 20th century, his ideas were mostly influenced by the authoritarian and hierarchical German system of surgical instruction. An intense and comprehensive training experi-

With the introduction of work-hour restrictions, substantial limitations in resident autonomy, and the decline in the number of traditional, open surgical procedures, the adequacy of the five-year residency model has come into question.

ence in a pyramidal system emphasized a close and dependent relationship between the surgical mentor and the trainee. Despite training that could last for many years, graduation was uncertain. Although this system did produce remarkable individual master surgeons, it did not ensure that all surgical trainees had a generalizable and standardized educational experience. It was Edward Churchill, MD, FACS, of Massachusetts General Hospital, Boston, who led the effort to replace the pyramidal structure with a "rectangular" training system to deliver comprehensive training for all residents in a program and provide a steady supply of well-trained surgeons.[2,3]

The inception of credentialing and accrediting organizations, such as the American Board of Surgery (ABS), the Residency Review Committee, and the Accreditation Council for Graduate Medical Education, provided supervision and structure to residency training and surgeon certification.

For decades, it was accepted that the rigorous five-year training program encompassing more than 100 hours per week of bedside and operative experience would adequately prepare surgical residents for independent practice and ensure a consistent stream of highly qualified surgeons. The exceptionally high standards and demanding training, however, took their toll on surgical residents, and many medical school graduates began to lose interest in surgery in the 1990s, culminating in unfilled surgery slots in the national resident matching program in the early 2000s.[2,3,9] While this trend has reversed, concerns about the attractiveness of a surgical career remain and a high attrition rate among general surgery residents continues to plague our training system.[10]

Are young surgeons unprepared?

With the introduction of work-hour restrictions, substantial limitations in resident autonomy, and the decline in the number of traditional, open surgical procedures, the adequacy of the five-year residency model has come into question.

When Mattar and colleagues surveyed fellowship program directors in 2012 about their experience with recent graduates from surgical residencies, a total of 91 responded and the results were dismal.[5] Many fellows could not operate for 30 unsupervised minutes in a major procedure, were unprepared for the operation, or demonstrated reluctance to take full responsibility for a case. Furthermore, the failure rate on the ABS certifying exam has increased by more than 50 percent over the last 10 years, and 80 percent of graduating residents now pursue fellowships after residency, presumably a result of trainees feeling inadequately prepared for independent practice after completion of residency.[7,11]

However, in other studies, most surgery residents appear to be satisfied with their training experience (n=3,686; 85.2%), and the majority of senior residents report choosing their fellowship based on real interest, not lack of skill.[12,13] In addition, 77 percent (n=229) of chief residents surveyed by Friedell and colleagues had performed more than 950 operations during their residency and felt comfortable with their operative skills and the prospect of taking call in a trauma center.[13]

Of course, the results of voluntary surveys must be taken with a grain of salt. Response rates are often low and may introduce bias—frequently toward residents in university programs and those individuals with either excellent or very poor experiences. Moreover, participating residents may be either overconfident or unwilling to admit to deficits in their training or to feelings of anxiety.

In a study conducted by the ACS Board of Governors and the Young Fellows Association, Lena M. Napolitano, MD, FACS, FCCP, FCCM, and colleagues posed the following question: "Are general surgery residents ready to practice?" After analyzing the results, a large gap was found between the impression of "young surgeons" (n=282) and "older surgeons" (n=978).[6] While most young surgeons felt that they had received adequate training and preparation for their transition into the attending role, only half of older surgeons agreed with that impression. The two groups also differed significantly in what they considered important aspects of the training for young surgeons.

More detailed information about trainees' operative experience was collected by Bell and colleagues, who surveyed 115 general surgery program directors to determine 121 "essential" procedures, such as laparoscopic cholecystectomies and colectomies. On aver-

age, general surgery residents reported completing only nine of these operations more than 20 times, and that they had performed 83 of these essential procedures fewer than five times.[8] Those are barely the numbers required to achieve competence and may be part of the reason up to one-quarter of senior surgery residents are worried their operative skills are inadequate.[11]

Revolution versus reform

Fortunately, the surgical community has been actively investigating these concerns and seeking strategies to tackle the challenges facing the surgical training system. Suggested solutions range from reform, or fixing the current system, to revolution, or replacing the five-year training structure as we know it.

The RAS-ACS will contribute to this important discussion during this year's debate at the resident symposium at the 2014 ACS Clinical Congress. We anticipate a lively discussion among residents and faculty in response to the question, The Five-Year General Surgery Residency: Reform or Revolution?

A Blue Ribbon Committee Report on Surgical Education issued in 2005 suggested changing the five-year surgical training paradigm to a "3+3" model, with two- or three-year core training in general surgery followed by early specialization.[14] This concept was never directly adopted, but it has been embraced in the form of the popular "integrated residencies" in plastic, cardiothoracic, and vascular surgery. Additionally, this model gave rise to initiatives, such as the ABS-approved "flexibility in surgical training" (FIST) model and projects such as "early tracking" available at selected institutions. These programs allow for a more customized residency experience.[15]

Early specialization seems to have support among a majority of surgery residents and to have multiple advantages.[7] Financially, integrated pathways allow for shorter overall training duration and earlier opportunities for higher income and higher reimbursement as a specialist. Better income opportunities are also driven by patient demand for a surgical specialist rather than a "generalist." Additionally, the increasing complexity of surgical care delivery— including the use of advanced technology in areas such as minimally invasive and endovascular surgery—often requires highly specialized training. Integrated training pathways allow for extra time and focus in these areas, while minimizing the exposure to skills and knowledge deemed unnecessary for certain subspecialties.

However, early specialization comes at the expense of a broader training and is fraught with potential problems. Integrated residencies and early specialization limit the exposure of medical students or junior residents to the full scope of surgery and require these individuals to decide early on in their education what direction their career will take. It is also unclear if the integrated residents' overall clinical and operative abilities are as good as the "battle-tested" management and operative skills of the general surgery residents entering a fellowship program. An analysis of practice patterns of general surgeons and their fellowship-trained colleagues demonstrated that many general surgery operations are performed by surgical specialists, making a strong argument for a basis in general surgery, even for trainees who intend to subspecialize.[16] Furthermore, splitting up general surgery may exacerbate the already critical shortage of general surgeons in rural areas and create organizational problems for residency programs, particularly those in community settings.[17]

The ACS recently introduced an alternative to a radical restructuring of surgical residency training through its Transition to Practice program (TTP). An increasing number of institutions across the nation are offering this opportunity to surgeons after completion of their five-year training. While surgeons in the TTP practice as board-eligible/certified attending surgeons, they enjoy close mentorship and individually tailored, graded responsibilities as well as additional training in the areas of leadership and practice management. Whether this "5+1" model represents a viable and successful strategy to encourage more graduates to enter general surgery practice and improve their confidence and skill set has yet to be determined. Conceivably, the TTP could be added onto a completed surgical residency shortened to four years, replacing the current chief year of residency, and thus emulating the chief year of previous decades.

The ACS recently introduced an alternative to a radical restructuring of surgical residency training through its Transition to Practice program.

Additionally, many other adjustments and improvements, such as a higher number of operative cases and endoscopy requirements for residents, as well as the introduction of milestone-based resident advancement, are promising steps toward reform of our current training system.

Conclusion

The debate continues over whether surgical training is in need of reform or revolution. Restoring the confidence of patients, surgeons, and trainees in the excellence of our education system is of utmost importance. The proactive role that surgeon leaders have assumed in this process is commendable and will prove invaluable to successfully addressing the challenges in surgical residency training. After all, despite the concerns addressed in this article, the quality of care provided by surgeons in this country remains exceptional, and the U.S. remains one of the most attractive and highly sought-after locations for residency and fellowship training among medical school graduates and physicians worldwide.[18] ◆

REFERENCES

1. Halsted WS. The training of the surgeon. *Bull of Johns Hopkins Hospital.* 1904;15:267-275.
2. Polavarapu HV, Kulaylat AN, Sun S. 100 years of surgical education: The past, present, and future. *Bull Am Coll Surg.* 2013;98(7):22-27.
3. Bell RH, Banker MB, Rhodes RS. Graduate medical education in surgery in the United States. *Surg Clin N Am.* 2007;87(4):811-823.
4. Chen PW. Are today's new surgeons unprepared?" *New York Times.* December 12, 2013. Available at: http://well.blogs.nytimes.com/2013/12/12/are-todays-new-surgeons-unprepared/. Accessed April 24, 2014.
5. Mattar SG, Alseidi AA, Jones DB, et al. General surgery residency inadequately prepares trainees for fellowship: Results of a survey of fellowship program directors. *Ann Surg.* 2013;258(3):440-449.
6. Napolitano LM, Savarise M, Paramo JC, et al. Are general surgery residents ready to practice? A survey of the American College of Surgeons Board of Governors and Young Fellows Association. *J Am Coll Surg.* 2014;218(5):1063-1072.
7. Coleman JJ, Esposito TJ, Rozycki GS, Feliciano DV. Early subspecialization and perceived competence in surgical training: Are residents ready? *J Am Coll Surg.* 2013;216(4):764-771.
8. Bell RH Jr, Biester TW, Tabuenca A, et al. Operative experience of residents in U.S. general surgery programs: A gap between expectation and experience. *Ann Surg.* 2009;249(5):719-724.
9. Pellegrini CA. Surgical education in the United States. Navigating the white waters. *Ann Surg.* 2006;244(3):335-342.
10. Yeo H, Bucholz E, Ann Sosa J, et al. A national study of attrition in general surgery training: Which residents leave and where do they go? *Ann Surg.* 2010;252(3):529-534; discussion 534-536.
11. Bucholz EM, Sue GR, Yeo H, Roman SA, Bell RH Jr, Sosa JA. Our trainees' confidence: Results from a national survey of 4136 U.S. general surgery residents. *Arch Surg.* 2011;146(8):907-914.
12. Yeo H, Viola K, Berg D, et al. Attitudes, training experiences, and professional expectations of U.S. general surgery residents: A national survey. *JAMA.* 2009; 302(12):1301-1308.
13. Friedell ML, Vandermeer TJ, Cheatham ML, et al. Perceptions of graduating general surgery chief residents: Are they confident in their training? *J Am Coll Surg.* 2014;218(4):695-703.
14. Debas HT, Bass BL, Brennan MF, et al. American Surgical Association Blue Ribbon Committee Report on Surgical Education: 2004. *Ann Surg.* 2005;241(1):1-8.
15. Eberlein TJ. A new paradigm in surgical training. *J Am Coll Surg.* 2014; 218(4):511-518.
16. Valentine RJ, Jones A, Biester TW, Cogbill TH, Borman KR, Rhodes RS. General surgery workloads and practice patterns in the United States, 2007 to 2009: A 10-year update from the American Board of Surgery. *Ann Surg.* 2011;254(3):520-525.
17. Valentine RJ. Presidential address: The neglected specialty. *J Surg Educ.* 2007;64(6):318-323.
18. Educational Commission for Foreign Medical Graduates. *2011 Annual Report.* Available at: http://www.ecfmg.org/resources/ECFMG-2011-annual-report.pdf. Accessed April 29, 2014.

Statement on peak performance and management of fatigue

The following statement was developed by the American College of Surgeons (ACS) Committee to Enhance Peak Performance in Surgery through Recognition and Mitigation of Fatigue through general consensus. The ACS Board of Regents approved the statement at its June 2014 meeting in Chicago, IL.

The ACS has had a long-standing commitment to defining and promoting excellence in patient care and surgical practice. With greater knowledge and understanding of the impact of fatigue on performance, it is crucial that potential detrimental effects of fatigue be considered and appropriate strategies developed to mitigate them, keeping in mind the distinctive nature of surgical practice and the importance of the continuum of care.

The fundamental characteristics of surgery differentiate it from other disciplines. Surgical proficiency necessitates intellectual, emotional, and physical preparation for all phases of patient care. Surgical practice requires decisive surgical judgment; operative intervention involving mental, physical, and tactile skills; and comprehensive, thoughtful postoperative care. Each part of this process involves sustained attentiveness, vigilance, and commitment to the patient's care and well-being. Teamwork is an integral component of surgical practice, and the surgeon, as the leader of the team, has the opportunity and privilege to directly affect the patient's disease process, along with ultimate responsibility for each patient. In 2012, the ACS appointed the Committee to Enhance Peak Performance in Surgery through Recognition and Mitigation of Fatigue, composed of surgeon leaders from various surgical specialties, internationally renowned sleep experts, as well as other national stakeholders, to address this important and complex national issue through far-reaching recommendations and innovative educational resources.

Research related to fatigue has demonstrated the following:

- Fatigue has significant detrimental effects, including prolonged reaction time, decreased vigilance, impaired decision making, and delayed recognition of critical situations.*
- Individuals vary in their response to fatigue; an individual's response may also differ in relation to pre-existing conditions, accompanying stressors, workload, cumulative sleep loss, and the nature of a specific situation.
- In objective testing, individuals often inaccurately assess their own level of sleepiness.
- Data concerning surgeons and fatigue are limited and primarily describe physicians in training.

*Shearburn WE III. Get some rest: Minimizing the effects of sleep deprivation on patient care. *Bull Am Coll Surg.* 2013;98(12):36-41.

In 2012, the ACS appointed the Committee to Enhance Peak Performance in Surgery through Recognition and Mitigation of Fatigue, composed of surgeon leaders from various surgical specialties, internationally renowned sleep experts, as well as other national stakeholders, to address this important and complex national issue through far-reaching recommendations and innovative educational resources.

- Restricted work hours for residents have not been linked to demonstrable improvements in patient safety and better outcomes or improved education of trainees.

While it is important to develop strategies to mitigate the ill effects of fatigue, the ACS believes that the imposition of prescriptive or strict regulation is impractical and potentially detrimental to patient well-being. Loss of continuity of care and the adverse effects of handoffs are two important issues to consider when mitigating fatigue. The ACS supports flexibility in developing these strategies with a strong focus on patient safety in each situation. Concepts that the ACS supports include the following:

- Commitment to surgical professionalism requires that the surgeon acknowledge the adverse effects of fatigue and be able to recognize and manage them. This may require additional education and support.

- The surgeon and the institution/organization have a shared responsibility for preventing and addressing fatigue. The individual surgeon is accountable for being physically and mentally prepared but cannot be solely responsible; the institution must establish and support systems to address fatigue issues.

- Recognizing that fatigue-related incidents represent the consequence of system failures, institutions and departments, with input from surgeons, are responsible for the development of systems to support alertness and peak performance. Each surgeon and each surgical department and organization should develop an educational plan for both the recognition and mitigation of fatigue, as well as practical measures applicable to each situation.* The ACS Division of Education could assume a leadership role in developing and disseminating educational programs on recognition and mitigation of fatigue.

- The essential principle of any institutional program is that it represents a balance between mitigating the effects of fatigue as much as possible while providing that the patient be cared for by the best surgeon to do so.

Institutional use of fatigue risk-management systems (FRMS) methodology or similar systems may provide guidance for program design.† FRMS emphasizes a tiered approach to fatigue, with controls incorporated at each level to prevent fatigue-related errors. Successful systems are characterized by being goal-driven and emphasizing flexibility within the system to optimize patient safety and excellence in care. Characteristics of an FRMS include being evidence-based, data-driven, and cooperative; that is, an FRMS is designed with input from all stakeholders and fully integrated and implemented throughout the system. Additional components include continuous improvement, financial viability, and ownership by corporate leadership.

The ACS has a demonstrated commitment to furthering patient safety, improving quality, and supporting excellence in surgical care. Professionalism in surgery, for both the individual surgeon and the profession as a whole, requires accountability and support systems for identifying, acknowledging, and preventing harmful fatigue. A comprehensive approach to various issues relating to recognition, management, and mitigation of fatigue will be necessary to address a variety of challenges in delivering surgical care of the highest quality. ◆

*Shearburn WE III. Get some rest: Minimizing the effects of sleep deprivation on patient care. *Bull Am Coll Surg.* 2013;98(12):36-41.

†Lerman SE, Eskin E, Flower DJ, et al. American College of Occupational and Environmental Medicine presidential task force on fatigue risk management: Fatigue risk management in the workplace. *J Occup Environ Med.* 2012;54(2):231-258.

Statement on the effects of tobacco use on surgical complications and the utility of smoking cessation counseling

This statement was developed by the Patient Education Committee of the American College of Surgeons (ACS) Division of Education. It was approved by the ACS Board of Regents at its June 2014 meeting in Chicago, IL.

Approximately one in five American adults, or about 45.3 million people living in the U.S., smoke cigarettes.[1] After 50 years of steady decline in smoking prevalence, progress has stalled. Half of all smokers will die from tobacco-related illness. For every smoking-related death, another 20 individuals will suffer from a smoking-related disease. Tobacco causes one in 10 deaths globally. Worldwide, lung cancer accounts for nearly one-fifth of all cancer deaths, with 1.8 million new cases developing annually.[2] Exposure to secondhand smoke also causes cancer.[3] Because of these adverse consequences, smoking costs the U.S. economy at least $133 billion each year for direct medical care for adults and more than $156 billion in lost productivity.[4]

The impact of smoking on surgical patients is considerable. Approximately 30 percent of all patients undergoing elective general surgery procedures smoke, which means that an estimated 10 million operations are performed on smokers annually.[5] Smoking within one year of surgery has been associated with increased postoperative complications, increased hospital costs, and higher resource use.[5] Deleterious effects on wound healing also occur and are thought to be related to the nicotine content of conventional tobacco products as well as tobacco substitutes containing nicotine.

Smoking cessation before surgery is associated with demonstrable benefits.[6] Short-term cessation results in a measurable reduction in vasoconstriction and irregular heart activity due to an immediate decrease in nicotine.[7] The lack of oxygen to surgical wound sites and increased risk of blood clots are also reversed with short-term smoking cessation.[8] Smoking-related impairment in wound healing and pulmonary function improve within four to eight weeks of smoking cessation.[9] In addition, there is no evidence that short-term cessation is harmful perioperatively.

Few surgeons in the U.S. provide smoking cessation counseling. While smoking cessation is a core quality measure and quitting before surgery improves patient outcomes, a survey revealed that only 13 percent of general surgeons provide smoking cessation counseling, and many surgeons are unaware of optimal methods of counseling and the reimbursement provided (or available) for such counseling.[10]

Surgeons should play an active role in smoking cessation counseling with their patients. Surgeons are in a unique position to leverage their influence at a critical time in their patient's life, affording an opportunity to change smoking behavior. Most smokers want to quit, and surgical patients are typically highly motivated.

The perioperative time is a critical window of opportunity to help patients realize the importance of their role in their own surgical outcomes and how smoking cessation can influence the success of their

Few surgeons in the U.S. provide smoking cessation counseling. While smoking cessation is a core quality measure and quitting before surgery improves patient outcomes, a survey revealed that only 13 percent of general surgeons provide smoking cessation counseling, and many surgeons are unaware of optimal methods of counseling and the reimbursement provided (or available) for such counseling.

operation. Only 5 percent of smokers can quit on their own, but guideline-driven interventions can boost cessation rates to 15 percent to 25 percent.[11] For example, smokers are more likely to quit when advised by a health professional, and cessation interventions as brief as three minutes can markedly increase quit rates.[12]

To reduce smoking-related surgical complications and smoking prevalence in general, the ACS supports the following:

- Smoking cessation counseling during all nonemergent patient consults
- Education programs on effective smoking cessation strategies and proper coding of interventions
- Development and dissemination of quality educational materials for surgeons to use in conjunction with their smoking cessation counseling
- Support for government regulation of tobacco products and incentives for individuals to avoid tobacco use
- Continued measurement and reporting of surgical outcomes of smokers versus nonsmokers ◆

REFERENCES

1. U.S. Centers for Disease Control and Prevention. Adult smoking in the US. *CDC Vital Signs*. Available at: http://www.cdc.gov/vitalsigns/pdf/2011-09-vitalsigns.pdf. Accessed May 12, 2014.
2. World Health Organization. International Agency for Research on Cancer. Latest world cancer statistics: Global cancer burden rises to 14.1 million new cases in 2012: Marked increase in breast cancers must be addressed. Press release. December 12, 2013. Available at: www.iarc.fr/en/media-centre/pr/2013/pdfs/pr223_E.pdf. Accessed June 18, 2014.
3. International Agency for Research on Cancer. Second-hand tobacco smoke. Available at: http://monographs.iarc.fr/ENG/Monographs/vol100E/mono100E-7.pdf. Accessed June 25, 2014.
4. U.S. Centers for Disease Control and Prevention. Economic facts about U.S. tobacco production and use. Available at: http://www.cdc.gov/tobacco/data_statistics/fact_sheets/economics/econ_facts/index.htm#costs. Accessed May 12, 2014.
5. Kamath AS, Vaughan Sarrazin M, Vander Weg MW, Cai X, Cullen J, Katz DA. Hospital costs associated with smoking in veterans undergoing general surgery. *J Am Coll Surg.* 2012;214(6):901-908.
6. Lindstrom D, Sadr Azodi O, Wladis A, et al. Effects of a perioperative smoking cessation intervention on postoperative complications: A randomized trial. *Ann Surg.* 2008;248(5):739-745.
7. Moller AM, Villebro N, Pedersen T, Tonnesen H. Effect of preoperative smoking intervention on postoperative complications: A randomised clinical trial. *Lancet*. 2002;359(9301):114-117.
8. Sorensen LT. Wound healing and infection in surgery. The clinical impact of smoking and smoking cessation: A systematic review and meta-analysis. *Arch Surg.* 2012;147(4):373-383.
9. Sorensen LT. Wound healing and infection in surgery: The pathophysiological impact of smoking, smoking cessation, and nicotine replacement therapy: A systematic review. *Ann Surg.* 2012;255(6):1069-1079.
10. Warner DO, Sarr MG, Offord KP, Dale LC. Anesthesiologists, general surgeons, and tobacco interventions in the perioperative period. *Anesth Analg.* 2004;99(6):1766-1773.
11. American Cancer Society. Guide to quitting smoking. A word about success rates for quitting smoking. Available at: http://www.cancer.org/healthy/stayawayfromtobacco/guidetoquittingsmoking/guide-to-quitting-smoking-success-rates. Accessed May 14, 2014.
12. The Tobacco Use and Dependence Clinical Practice Guideline Panel, Staff, and Consortium Representatives. A clinical practice guideline for treating tobacco use and dependence: A US Public Health Service report. *JAMA*. 2000;283(24):3244-3254.

NCDB and ACS-CRP:
Working together to develop risk-stratified strategies for surveillance

by George J. Chang, MD, MS, FACS; Caprice C. Greenberg, MD, MPH, FACS; Benjamin D. Kozower, MD, MPH, FACS; Judy C. Boughey, MB, BChir, FACS; Amanda Francescatti, MS; Daniel P. McKellar, MD, FACS; and David P. Winchester, MD, FACS

The PCORI has awarded three research funding contracts to the American College of Surgeons Cancer Research Program (ACS-CRP) of the Alliance for Clinical Trials in Oncology with the goal of developing a more patient-centered and individualized approach to post-treatment surveillance of colorectal, breast, and lung cancers.

A number of organizations—including the Institute of Medicine (IOM), the Patient-Centered Outcomes Research Institute (PCORI), and the Agency for Healthcare Research and Quality's Developing Evidence to Inform Decisions about Effectiveness Network Cancer Consortium—have identified improvements in surveillance after active treatment for cancer as a priority. Current guidelines do not account for individual risk and are based on limited and mostly outdated evidence.

Three funding contracts

The PCORI has awarded three research funding contracts to the American College of Surgeons Cancer Research Program (ACS-CRP) of the Alliance for Clinical Trials in Oncology with the goal of developing a more patient-centered and individualized approach to post-treatment surveillance of colorectal, breast, and lung cancers. Partnering with the Commission on Cancer (CoC) of the ACS, this program will study follow-up and recurrence after cancer treatment in an effort to identify strategies to tailor surveillance based on individual risk.

Later this year, a CoC special study will be launched through the National Cancer Data Base (NCDB) to determine current surveillance practice and recurrence outcomes for colorectal, breast, and lung cancers. The goal of this part of the project is to better understand how surveillance testing is being used to monitor patients and to determine the effect of surveillance on outcomes.

These studies have the potential to benefit CoC-accredited programs and the patients treated in those facilities. The ACS-CRP is working closely with the CoC to design the studies to evaluate the current approach to data collection, particularly as it relates to recurrence, and to determine the most effective methods for capturing this important outcome using this defined cohort of patients. A recent CoC study found that recurrence data for more than half of patients in the NCDB are incomplete, but the report failed to identify systemic factors that may have resulted in the missing data.*

*In H, Bilimoria KY, Stewart AK, et al. Cancer recurrence: An important but missing variable in national cancer registries. *Ann Surg Oncol*. 2014;21(5):1520-9. doi: 10.1245/s10434-014-3516-x. Epub 2014 Feb 7.

The CoC has identified this special study as a priority and an important initiative for improving patient-centered care. It will provide important data regarding recurrence, which has the potential to improve the value of the NCDB for cancer research and quality improvement.

In addition, these studies will look at the validity of some of the existing data in the NCDB and will be used to begin developing strategies and creating opportunities to improve the utility of the information in monitoring outcomes. The CoC and NCDB have made this area of investigation a priority over the last several years.

Front-line assistance

Many tumor registrars are directly engaged in the design of this project and have provided front-line input regarding the best ways to pursue our goals and help the accredited programs to maximize the value of their registry data. Select sites will be engaged in a pilot study over the summer to test and optimize the approaches to data collection. Significant effort is being made to ensure the objectives of the study can be met while minimizing the burden on cancer registrars at CoC sites.

The CoC has identified this special study as a priority and an important initiative for improving patient-centered care. It will provide important data regarding recurrence, which has the potential to improve the value of the NCDB for cancer research and quality improvement. Furthermore, the results of this study will provide much-needed data to inform our approach to surveillance after the active treatment of cancer and improve the quality of cancer care for survivors. Participation in this study will also apply toward Standard 5.7 for CoC accreditation.[†] During the study period, staff of the ACS-CRP/Alliance for Clinical Trials in Oncology will be available as a resource for registrars and cancer liaison physicians. An official announcement will be sent via e-mail later this year.

An additional goal of the research involves using surveillance data from past breast and colorectal trials of the Alliance for Clinical Trials in Oncology to evaluate risk and patterns of recurrence and treatment toxicities. We anticipate being able to provide a complete recording of relevant elements that can be used to construct a risk-stratified natural history model for recurrence and create shared resources from previously completed clinical trials that can be used for future research.

These projects also will engage stakeholders, such as cancer survivors, providers, and health outcomes researchers, in the development of patient-centered, risk-based, tailored approaches to post-treatment surveillance for breast, colon, and lung cancer. Decision support tools will be developed to inform stakeholders and tailor surveillance to the individual patient. Although each research contract (breast, colorectal, lung) has disease-specific objectives, the overall goal is to identify the key priorities most relevant to patients, caregivers, clinicians, and health care systems for consideration in post-treatment surveillance decisions. ◆

Acknowledgment

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[†]American College of Surgeons. Cancer Program Standards 2012, Version 1.2: Ensuring Patient-Centered Care. Available at: http://www.facs.org/cancer/coc/programstandards2012.html. Accessed June 23, 2014.

New draft guideline to prevent SSI

The draft guideline addresses new and updated strategies for the prevention of SSIs in health care settings by health care administrators and epidemiologists, as well as health care professionals including nurses, surgeons, and other staff responsible for the development, implementation, and evaluation of infection prevention and control programs.

Surgical site infections (SSIs) are the third most common health care-associated infection (HAI), according to the Centers for Disease Control and Prevention (CDC), occurring in more than 500,000 patients annually.[1,2] The Joint Commission has long been committed to developing the highest standards aimed at the prevention of HAIs and SSIs in an effort to improve patient safety and quality of care.

Earlier this year, The Joint Commission submitted public comments to the CDC regarding its "Draft Guideline for the Prevention of SSIs," which were published in the *Federal Register* in January.[3,4] The draft guideline addresses new and updated strategies for the prevention of SSIs in health care settings by health care administrators and epidemiologists, as well as health care professionals including nurses, surgeons, and other staff responsible for the development, implementation, and evaluation of infection prevention and control programs.

The recommendations in the draft guideline are based on a systematic review of the best available evidence on the prevention of SSIs. The document covers new topics related to antimicrobial prophylaxis parenteral, antimicrobial prophylaxis topical, and skin preparation, as well as updates on glycemic control, normothermia, and oxygenation. The guideline also comprises new pending recommendations on anthroplasty-related topics, such as transfusion, anticoagulation, and exhaust suits.

The CDC previously issued recommendations on the prevention of SSIs in 1999. Since then, SSIs have decreased significantly. According to the CDC, as of 2012, SSIs were down nationally by 20 percent since 2008.[5] The Joint Commission, health care providers, and practitioners have looked to the CDC's guideline over the last 15 years to attain a better understanding of the latest science and interpretation of empirical evidence related to SSIs to inform their patient care decisions.

Whereas the current CDC protocol for the prevention of SSIs has been extremely helpful to the health care community, The Joint Commission supports any updates with as many clear and concrete recommendations as the science will allow. The Joint Commission would further assert that, in some instances, practice recommendations that stem from the inclusion of controlled observation studies or other information from solid methodological evaluations and industry standards may provide an even greater benefit.

A section of NPSG 7 (NPSG.07.05.01) specifically focuses on the implementation of evidence-based practices for preventing SSIs and includes eight EPs.

Joint Commission use of current guideline

The Joint Commission and its affiliates use the current CDC guideline as an example of evidence-based guideline use in many of its accreditation, educational, and consulting activities. For example, The Joint Commission asks ambulatory care centers, critical access facilities, hospitals, and office-based surgery practices to comply with professional guidelines, such as those from the CDC, to demonstrate adherence to The Joint Commission's National Patient Safety Goal (NPSG) 7: Reduce the Risk of HAIs.

A section of NPSG 7 (NPSG.07.05.01) specifically focuses on the implementation of evidence-based practices for preventing SSIs and includes eight elements of performance (EPs). The EPs highlight the following:

- Educating of staff, patients, and families about the prevention of SSIs
- Implementing policies and practices aimed at reducing SSIs
- Measuring SSI rates for the first 30 or 90 days following surgical procedures
- Providing process and outcome measure results to key stakeholders

Additional SSI resources

In addition to use of the current CDC guideline, The Joint Commission has undertaken several other efforts to help reduce SSIs. In November 2012, the Joint Commission Center for Transforming Healthcare announced findings from its SSIs project on reducing the risk of colorectal SSIs.[6] Seven hospitals participated in the project and identified 34 unique correlating variables for the risk of colorectal SSIs that may be related to patient characteristics, including the surgical procedure; antibiotic administration; preoperative, intraoperative, and postoperative processes; and measurement challenges. The Joint Commission also has made several SSI resources available through its online HAIs portal at *http://www.jointcommission.org/hai.aspx*.

For more information on SSIs, go to *www.jointcommission.org.* ◆

REFERENCES

1. Centers for Disease Control and Prevention. Healthcare-associated infections. Available at: http://www.cdc.gov/hai/surveillance/index.html?mobile=nocontent. Accessed June 9, 2014.
2. Meeks DW, Lally KP, Carrick MM, et al. Compliance with guidelines to prevent surgical site infections: As simple as 1-2-3? *Amer J of Surg.* 2011;201(1):76-83.
3. The eRulemaking Program Management Office. Regulations.gov. Comment from The Joint Commission: TJC comments on CDC draft guidelines SSIs. Available at: http://www.regulations.gov/#!documentDetail;D=CDC-2014-0003-0062. Accessed June 19, 2014.
4. Office of the Federal Register. Draft guideline—Centers for Disease Control and Prevention draft guideline for the prevention of surgical site infections. January 29, 2014. Available at: https://www.federalregister.gov/articles/2014/01/29/2014-01674/draft-guideline-centers-for-disease-control-and-prevention-draft-guideline-for-the-prevention-of. Accessed June 19, 2014.
5. The Centers for Disease Control and Prevention. CDC's Healthcare-Associated Infection Progress Report: Questions and answers. Available at: http://www.cdc.gov/hai/surveillance/QA_stateSummary.html. Accessed June 10, 2014.
6. Joint Commission Center for Transforming Healthcare. Project detail: Surgical site infections. Available at: http://www.centerfortransforminghealthcare.org/projects/detail.aspx?Project=4. Accessed June 19, 2014.

BYOB helmet

by Richard J. Fantus, MD, FACS

Look around any major U.S. city these days and you are likely to see bicycle rental stations, where an individual can rent a bicycle for a fee that is tied to distance and time. This is a wonderful way to get around congested urban areas, and these bike-sharing services provide an inviting recreational activity option for tourists and city dwellers alike.

The world's first bicycle-sharing program hit the streets of Amsterdam in 1965, but the concept was slow to spread elsewhere until the 1990s. Growth has primarily occurred in Europe over the last two decades, but the U.S. is quickly catching up. At present, bicycle-sharing services offer more than 500,000 bicycles in more than 500 cities spread across 49 countries.*

Bring your own

Credit card readers are installed at rental station kiosks, which simplifies the process of renting a bicycle. Visitors to a city who are unfamiliar with its layout, local traffic patterns, or available bicycle paths can walk up to one of these stations, swipe a credit card, and start riding. When renting one of these bicycles in most U.S. cities, though, a bicycle helmet is conspicuously absent from the picture.

As a trauma surgeon in a city with extensive bicycle paths, I have had the misfortune of treating numerous injured bicyclists over the years. The most severely injured have been helmetless. There may be statistics and studies that weigh the benefits of riding a bicycle from a physical fitness perspective versus the risk of head injury without a bicycle helmet; however, it seems like common sense to do whatever it takes to protect oneself from potential head injuries by using a properly fitted bicycle helmet, especially in congested urban areas. Boston, MA, has taken the lead in pioneering the use of a bicycle helmet rental program with vending machines placed at locations adjacent to the bicycle rental kiosks. These helmets are used and then returned to a collection bin, inspected, sanitized, and placed back in the vending machines to be rented again.

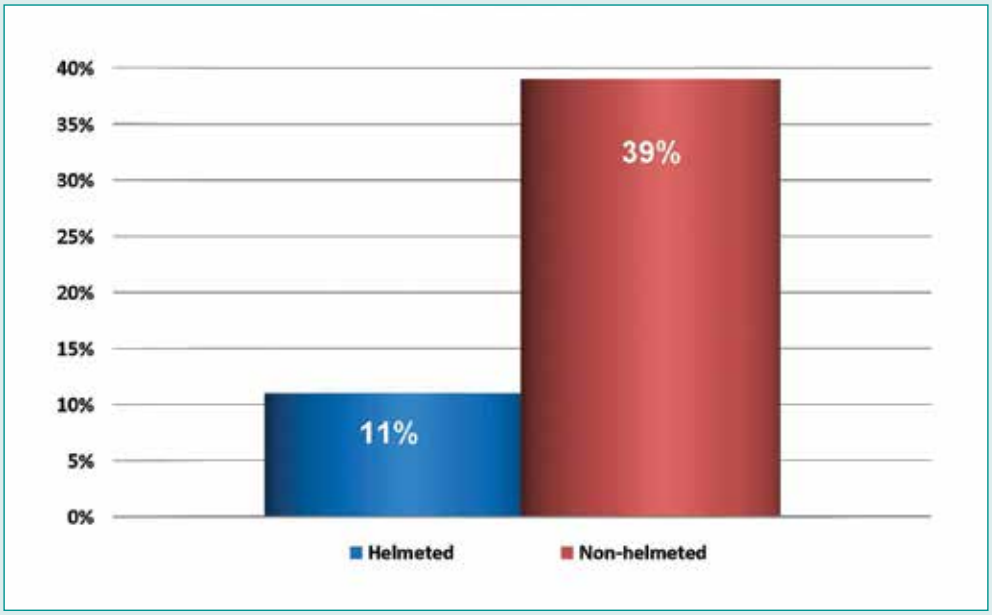
According to the U.S. Centers for Disease Control and Prevention, bicyclists have a higher risk of crash-related injury and death than occupants of motor vehicles. In 2010, an estimated 515,000 bicycle-related injuries requiring an emergency department visit

*Cyclehop, LLC. Bikeshare.com. Bike share hits significant global milestone. April 26, 2013. Available at: http://bikeshare.com/2013/04/bike-share-hits-significant-global-milestone/. Accessed June 6, 2014.

The NTDB *Annual Report* 2013 is available on the ACS website as a PDF file and as a PowerPoint presentation at *www.ntdb.org.*

In addition, information regarding how to obtain NTDB data for more detailed study is available on the website.

FIGURE 1. ALCOHOL USE



In 2010, an estimated 515,000 bicycle-related injuries requiring an emergency department visit occurred in the U.S. Nearly 800 cyclists died, and many more suffered non-fatal life-altering brain injuries.

occurred in the U.S. Nearly 800 cyclists died, and many more suffered non-fatal life-altering brain injuries. Adolescents and young adults ages 15 to 24 and adults ages 45 and older have the highest bicycle-related death rates. Children five to 14 years old and adolescents have the highest rate of non-fatal bicycle-related injuries, accounting for almost 60 percent of these injuries. Males are more likely to be injured or killed, and most deaths occur in urban areas and at non-intersection locations.[†]

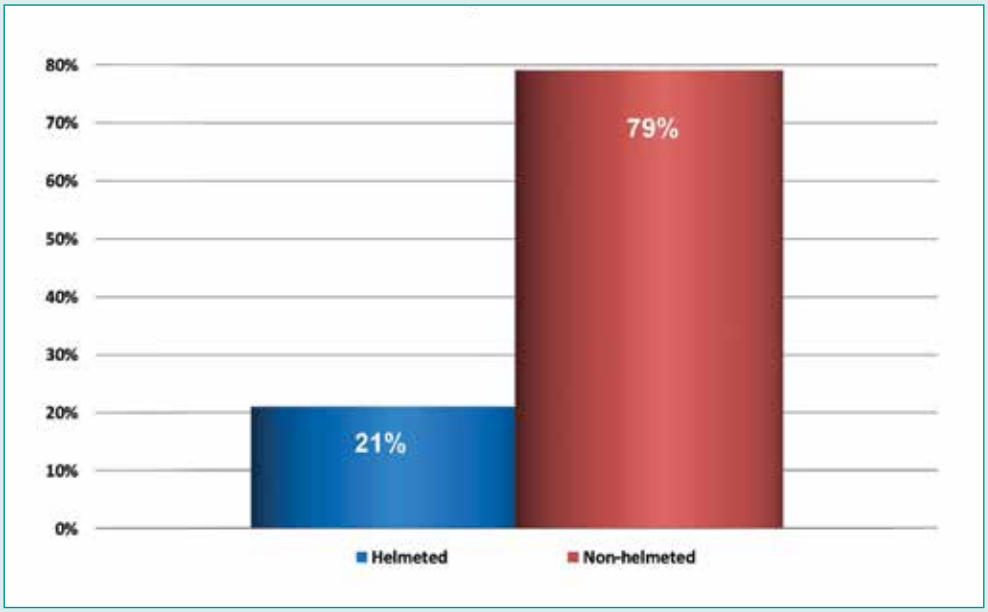
In the event of a crash, bicycle helmets reduce the risk of head and brain injuries. All cyclists, irrespective of age, can help protect themselves by wearing a properly fitted bicycle helmet every time they ride.

[†]Centers for Disease Control and Prevention. Home and recreational safety: Bicycle-related injuries. Available at: http://www.cdc.gov/HomeandRecreationalSafety/Bicycle/. Accessed June 6, 2014.

Biking under the influence

To examine the occurrence of bicyclist injuries where a protective device was involved, we searched the National Trauma Data Bank® (NTDB) research dataset for 2013 admissions medical records using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnoses codes. Specifically searched were records for pedal cyclist injuries identified with external cause of injury codes (E-code) E810–E819 (Motor vehicle traffic crashes) with a post decimal value of .6 for a pedal cyclist; E820–E825 (Motor vehicle non-traffic crashes) with a post decimal value of .6 for a pedal cyclist; and E826–E829 (Other road vehicle crashes) with a post decimal value of .1 for a pedal cyclist. These records were then searched for a valid protective device field value

FIGURE 2. PEDAL CYCLIST DEATHS



of either 1 (non-helmet) or 7 (helmet). A total of 24,760 records for pedal cyclist injuries were found; 18,682 records contained a valid protective field device value, including 11,954 with no helmet use and 6,729 with helmet use. The no-helmet group was younger (mean age 31 versus 42), had more than a two-fold increase in mortality (1.48 percent versus .71 percent), and for those tested for alcohol there was an almost four-fold increase in those individuals testing positive (39 percent versus 11 percent) when compared with the group that used helmets. Among those pedal cyclists who died, 79 percent were not wearing a helmet (see Figures 1 and 2, page 62 and this page).

Other protective measures

Helmets are not the only products that improve bicycle safety. Cyclists are encouraged to wear fluorescent clothing to increase visibility during daytime hours and retro-reflective clothing to make the rider more visible at night. Bikes should also be equipped with active lighting, including front white lights and rear red lights, to make the bicycle more visible at night or on overcast days.

Cities can contribute to bicyclist safety by implementing roadway engineering measures that go beyond simply painting a white line on a street next to a string of parked cars with an image of a bicycle. Several cities have sophisticated bicycle lanes with dividers and their own traffic lights.

While all of these safety precautions are important, at the head of the list is a properly fitted bicycle helmet. So, the next time you are looking to share a bicycle, make sure you BYOB (bring your own bike) helmet.

Throughout the year, we will be highlighting these data through brief reports in the *Bulletin*. The National Trauma Data Bank 2013 *Annual Report* is available on the ACS website as a PDF file at *www.ntdb.org*. In addition, information about how to obtain NTDB data for more detailed study is available on the website. To learn more about submitting your trauma center's data, contact Melanie L. Neal, Manager, NTDB, at mneal@facs.org. ◆

Acknowledgment

Statistical support for this article has been provided by Chrystal Caden-Price, Data Analyst, and Alice Rollins, NTDB Coordinator.

Robin T. Cotton, MD, FACS, FRCSC, receives 2014 ACS Jacobson Innovation Award

Dr. Cotton (left) with Dr. Pellegrini.

Robin T. Cotton, MD, FACS, FRCSC, a pediatric otolaryngologist from Cincinnati, OH, received the American College of Surgeons (ACS) 2014 Jacobson Innovation Award at a dinner held in his honor June 6 at the John B. Murphy Memorial Auditorium Building in Chicago, IL. Dr. Cotton is the director of the Aerodigestive Center at Cincinnati Children's Hospital Medical Center (CCHMC), OH, and professor, department of pediatrics, University of Cincinnati department of otolaryngology.

The prestigious Jacobson Innovation Award honors living surgeons who have developed a new technique in any field of surgery and is made possible through a gift from Julius H. Jacobson II, MD, FACS, and his wife, Joan. Dr. Jacobson is a general vascular surgeon known for his trailblazing work in the development of microsurgery.

Pioneer in pediatric otolaryngology

Dr. Cotton was honored with the 2014 Jacobson Innovation Award in recognition of his seminal work in the care and reconstruction of the stenotic pediatric airway. His efforts have led to reconstruction of the larynx and trachea in children with laryngotracheal stenosis, allowing them to live and breathe normally. Four of his patients were at the dinner and conveyed their own stories regarding how they have benefitted from his outstanding patient care.

"Dr. Cotton embodies the meaning and spirit of this award," ACS President Carlos Pellegrini, MD, FACS, FRCSI(Hon), said at the award presentation. Until Dr. Cotton developed his innovative approach to reconstruction of the stenotic pediatric airway, "children who were born with or who, as a result of prolonged intubation in the intensive care unit, had developed significant narrowing of their airway, were condemned to a lifetime of breathing through a tracheostomy," Dr. Pellegrini noted.

Dr. Cotton's accomplishments include participation in the initial research work that helped to establish the safety and utility of laryngotracheal reconstruction in children. In collaboration with John Evans, MD, in London, U.K., Dr. Cotton pioneered the techniques used worldwide in the reconstruction of the larynx and trachea in children with laryngotracheal stenosis. He and his mentor, Blair Fearon, MD, developed the anterior cricoid split procedure, a technique to avoid tracheotomy in neonates with acquired subglottic stenosis, and the supraglottoplasty, which he popularized in the U.S. Both techniques were initially met with skepticism but were later embraced around the globe.

Dr. Cotton (center) with several of his patients, who spoke in tribute at the dinner.

Throughout a career dedicated to pediatric otolaryngology, Dr. Cotton has continuously sought to raise the standard of care for children. In his acceptance speech, Dr. Cotton noted that his interest in pediatric tracheal stenosis was ignited when he was in training.

"I was a resident at the Sick Children's Hospital in Toronto [ON] in the late 1960s, when the practice of intubating neonates with immature lungs for ventilator support became accepted. In a small number of infants, this causes damage to the larynx, requiring a tracheotomy. This was a new surgical problem, which needed an innovative idea to correct, and I was fortunate to be mentored by Dr. Blair Fearon, a pediatric otolaryngologist at the Sick Children's Hospital," Dr. Cotton said. "Using a monkey model, we worked out surgical solutions to this problem, which have become the worldwide standard for airway reconstruction in children."

At the forefront in the management of tracheal stenosis, he has been largely responsible for the incorporation of cricotracheal resection into the management of airway stenosis in children. Because results could not be compared between institutions without an appropriate staging system, he developed the grading system for subglottic stenosis that bears his name and is used universally.

In addition to developing innovative approaches to pediatric otolaryngology procedures, Dr. Cotton built the world's leading center for the diagnosis and treatment of airway abnormalities. Originally developed as the airway management unit at CCHMC, it has evolved into the Aerodigestive and Esophageal Center, which he directs today. "Dr. Cotton's innovations have led to a complete paradigm shift in the treatment of tracheal stenosis and the old 'tracheotomy units' have been replaced by 'aerodigestive units' around the world," Dr. Pellegrini noted.

"Cincinnati Children's Hospital Medical Center has been a wonderful partner in this endeavor and allowed me to assemble a team of medical and surgical specialists to take care of these medically fragile children who often need a lot of technological support," Dr. Cotton noted. "Partnering with CCHMC has [allowed] me to be very progressive in the development of a variety of surgical solutions for congenital and acquired pediatric diseases of the larynx."

Worldwide recognition

Today, Dr. Cotton is regarded as one of the leading pediatric otolaryngologists of this era and has trained many of the leading pediatric otolaryngologists in the U.S. and abroad. Dr. Cotton "has shared his knowledge widely and without restrictions," teaching his reconstructive techniques to surgeons globally and welcoming visitors to the Cincinnati Children's hospital to observe and learn, Dr. Pellegrini said. "He has mentored a number of surgeons and has passed the legacy of his philosophy and

In addition to developing innovative approaches to pediatric otolaryngology procedures, Dr. Cotton built the world's leading center for the diagnosis and treatment of airway abnormalities.

JACOBSON INNOVATION AWARD RECIPIENTS

1994	**Professor Francois Dubois,** Paris, France: Laparoscopic cholecystectomy
1995	**Thomas Starzl, MD, FACS,** Pittsburgh, PA: Liver transplantation
1996	**Joel D. Cooper, MD, FACS,** St. Louis, MO: Lung transplantation and lung volume reduction surgery
1998	**Juan Carlos Parodi, MD,** Buenos Aires, Argentina: Treatment of arterial aneurysms, occlusive disease, and vascular injuries by using endovascular stent grafts
1999	**John F. Burke, MD, FACS,** Boston, MA: Development and implementation of a number of innovative techniques in burn care, including the codevelopment of an artificial skin (Integra™)
2000	**Paul L. Tessier, MD, FACS(Hon),** Boulogne, France: Development and establishment of the surgical specialty of craniofacial surgery
2001	**Thomas J. Fogarty, MD, FACS,** Portola Valley, CA: Design and development of industry standard minimally invasive surgical instrumentation, especially for cardiovascular surgery
2002	**Michael R. Harrison, MD, FACS,** San Francisco, CA: Creator of the specialty of fetal surgery and developing techniques of fetoscopy for minimally invasive fetal technology
2003	**Robert H. Bartlett, MD, FACS,** Ann Arbor, MI: Pioneer in the development and establishment of the first extracorporeal membrane oxygenation (ECMO) program
2004	**Harry J. Buncke, MD, FACS,** San Francisco, CA: Pioneer in the field of microsurgery and replantation
2005	**Stanley J. Dudrick, MD, FACS,** Waterbury, CT: Innovator of specialized nutrition support and a pioneer in the field of clinical nutrition
2006	**Judah Folkman, MD, FACS,** Boston, MA: Pioneer in the field of angiogenesis
2007	**William S. Pierce, MD, FACS,** Hershey, PA: Pioneer in the conception and development of mechanical circulatory support and the total artificial mechanical heart
2008	**Donald L. Morton, MD, FACS,** Santa Monica, CA: Pioneer in research efforts toward the development and clinical application of sentinel lymph node biopsy
2009	**Bernard Fisher, MD, FACS,** Pittsburgh, PA: Development and implementation of a new course for the treatment of breast cancer by proposing that it is a systemic disease that metastasizes unpredictably and would best be treated with lumpectomy combined with adjuvant chemotherapy
2010	**Lazar J. Greenfield, MD, FACS,** Ann Arbor, MI: Development of the Greenfield filter, a vena cava filter implanted under fluoroscopic guidance to prevent pulmonary embolism in susceptible surgical patients
2011	**George Berci, MD, FACS, FRCSEd(Hon),** Los Angeles, CA: Pioneering contributor to the art and science of endoscopy and laparoscopy, resulting in the high level of technology used to perform many endoscopic and laparoscopic surgical procedures
2012	**W. Hardy Hendren III, MD, FACS, FRCSIre, FRCSEng, FRCSGlas(Hon),** Boston, MA: Developed novel reconstruction procedures for children with severe urogenital abnormalities
2013	**Susan E. Mackinnon, MD, FACS, FRCSC,** St. Louis, MO: Leader in the innovative use of nerve transfer procedures for treatment of patients with devastating peripheral nerve injuries

his techniques to individuals that will carry on his work."

"Mission work has allowed me to take surgical and nursing teams from CCHMC to use their skills in other countries to surgically correct children with airway disease and to teach these skills to local surgeons," Dr. Cotton added.

A member of more than 20 national and international otolaryngology organizations, including the American Academy of Otolaryngology, Dr. Cotton has served as president of the American Society of Pediatric Otolaryngology and the Society for Ear, Nose, and Throat Advances in Children. He has received many honors and awards, including the coveted Mosher Award from the Triological Society, the Chevalier Jackson Award, the deRoaldes Award, the Ronald McDonald Lifetime Achievement Award, the James Yearsley Medal, and the William Cooper Proctor Award. Dr. Cotton was named one of America's Top Doctors seven times in 10 years as well as one of Cincinnati's Top Doctors from 2002 to 2012.

He has published extensively and lectures throughout the world. He is on the editorial board of several journals and is a prolific contributor to the literature, having written more than 250 articles and books.

View the ACS press release announcing the award at *http://www.facs.org/news/2014/cotton-jacobson0614.html.* ◆

Dr. Mueller

In memoriam:

C. Barber Mueller, MD, FACS, FRCSC, recognized for contributions to the ACS and academic surgery

by Patricia J. Numann, MD, FACS

C. Barber "Barb" Mueller, MD, FACS, FRCSC, former Second Vice-President of the American College of Surgeons (ACS) and the 1984 recipient of the College's Distinguished Service Award (DSA), died February 13 in Hamilton, ON, at the age of 97. Dr. Mueller was awarded the DSA—the College's highest honor—in recognition not only of his devoted service to the ACS, but also for his contributions to the Royal College of Physicians and Surgeons of Canada, his basic research on breast cancer and renal failure, and his numerous achievements as an academic administrator.

Education and military service

Barb often said that he was born in an Illinois cornfield. For two years, he attended Blackburn College, a work college, in his hometown of Carlinville, IL. He then completed his undergraduate studies at the University of Illinois-Champaign. With the support of a Jack Johnson scholarship, he attended the Washington University School of Medicine, St. Louis, MO, receiving his medical degree in 1942.

He interned in surgery at Barnes Hospital in St. Louis and then joined the U.S. Navy in 1943. His naval unit was attached to the Fourth Marine Division, U.S. Fleet Marine Forces, Pacific. Barb often would join the men in training and in the trenches and participated in four invasion landings, the last on Iwo Jima. He was wounded twice, resulting in his receipt of a Purple Heart and a Bronze Star.

When he returned from service in 1946, he entered a Rockefeller Fellowship in Biochemistry at Harvard University Medical School, Boston, MA, under the tutelage of A. Baird Hastings, PhD. There, Dr. Mueller began his pursuit of the cause and prevention of acute renal failure. His ultimate contributions, which demonstrated the benefit of pretransfusion hydration and the use of mannitol to prevent acute renal failure, are enduring tenets of renal care.

He completed his surgery residency at Barnes and joined the faculty. He was the last chief resident of former ACS President Evarts A. Graham, MD, FACS, a man whom Barb credited with giving him significant opportunities and great direction. (Dr. Mueller honored Dr. Graham, a thoracic surgeon, by writing the definitive biography, *Evarts A. Graham: The Life, Lives, and Times of the Surgical Spirit of St. Louis,* published in 2002.*) He was also in the initial group of Markle Scholars in Academic Medicine.

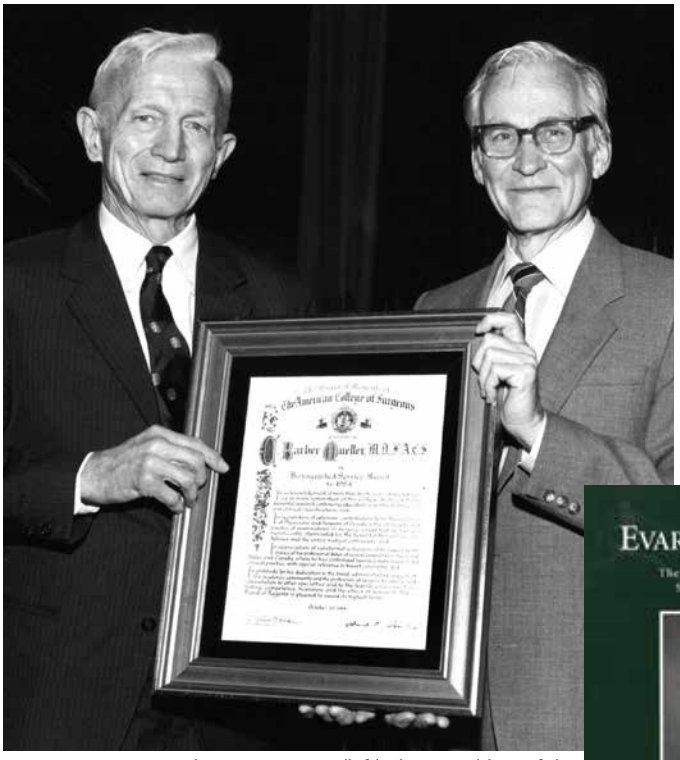
Contributions to SUNY

In 1956, at 39 years of age, Dr. Mueller became the first full-time academic chair at the State University of New York (SUNY) Upstate Medical Center, Syracuse, where he built a fine academic program, continued his research, and developed a course on the history of surgery. This class ignited his longtime interest in surgical history and culminated in his final book, *Excalibur: The Sword of Science that Reshaped the World,*† which was published when he was 95 years old.

While at SUNY Upstate, Dr. Mueller became interested in the natural history of breast cancer,

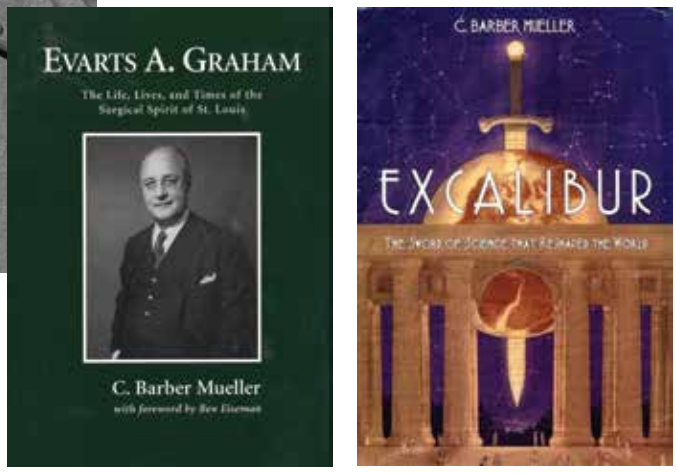
*Mueller CB, Eisman B. *Evarts A. Graham: The Life, Lives, and Times of the Surgical Spirit of St. Louis*. Hamilton, ON: BC Decker Inc.; 2002.

†Mueller CB. *Excalibur: The Sword of Science that Reshaped the World*. Toronto, ON. Baxter Publishing; 2012.



Henry T. Bahnson, MD, FACS (left), then-President of the ACS, presenting Dr. Mueller with his DSA plaque in 1984.

Dr. Mueller in 2006.



The two books written by Dr. Mueller.

which led to a publication that further defined breast cancer as a systemic disease early in its course. He was among the first health care leaders to question the cost-effectiveness of screening mammography.

In 1967, he was offered the opportunity to join the faculty of the new and innovative medical school at McMaster University in Hamilton, ON. He relished the opportunity to develop a new problem-based curriculum. He was involved in the building of the university hospital. Dr. Mueller remained at "Mac" after his retirement and continued his teaching and intellectual pursuits. He established the Friends of the Library program at McMaster University, where his noteworthy papers now reside.

Distinguished legacy

A Fellow of the ACS since 1953, Dr. Mueller served in a number of leadership positions in the organization. He served on the Board of Governors (1966–1969) and on the Communications Committee during his term as Second Vice-President (1987–1988).

Dr. Mueller received a number of other honors in addition to the ACS DSA. He received an Alumni Achievement Award from Washington University and honorary degrees from Blackburn College and SUNY. The Association for Academic Surgery honored him with its distinguished service award, and he was an honorary member of the Canadian Association of General Surgeons.

Dr. Mueller is survived by his four children, seven grandchildren, and five great-grandchildren. He was predeceased by his wife of 69 years, Jean. He leaves a legacy of students, residents, and peers who continue to make great contributions to surgery based on his teaching and example. ◆

ACS commemorates 50-year anniversary of Surgeon General's report on smoking and health

by Frederick Greene, MD, FACS; David Johnstone, MD, FACS; and Nancy Strand, MPH, RN

Surgeons see firsthand the detrimental effects of smoking. Smoking within one year of surgery has been linked to delayed wound healing and wound infections; increased risk of deep venous thrombosis, hypertension and myocardial infarction; shortness of breath and risk of respiratory infections; and implant and graft loss.

January 2014 marked the 50th anniversary of a milestone. On January 11, 1964, Luther L. Terry, MD, then Surgeon General of the U.S. Public Health Service, released the first report of the Surgeon General's Advisory Committee on Smoking and Health. Based on the analysis of more than 7,000 articles relating to smoking and disease, the committee concluded that cigarette smoking is: (1) a cause of lung cancer and laryngeal cancer in men, (2) a probable cause of lung cancer in women, and (3) the most common cause of chronic bronchitis.[1]

The release of the report was the first in a series of steps to diminish the impact of tobacco use on the health of the American people. In the 50 years that have elapsed since then, individual citizens, private organizations, public agencies, and elected officials have pursued the advisory committee's call for "appropriate remedial action." Following Dr. Terry's report, the U.S. Congress adopted the Federal Cigarette Labeling and Advertising Act of 1965 and the Public Health Cigarette Smoking Act of 1969.[2,3] These laws required that cigarette packages include a health warning, banned cigarette advertising in the broadcast media, and called for an annual report on the health consequences of smoking.

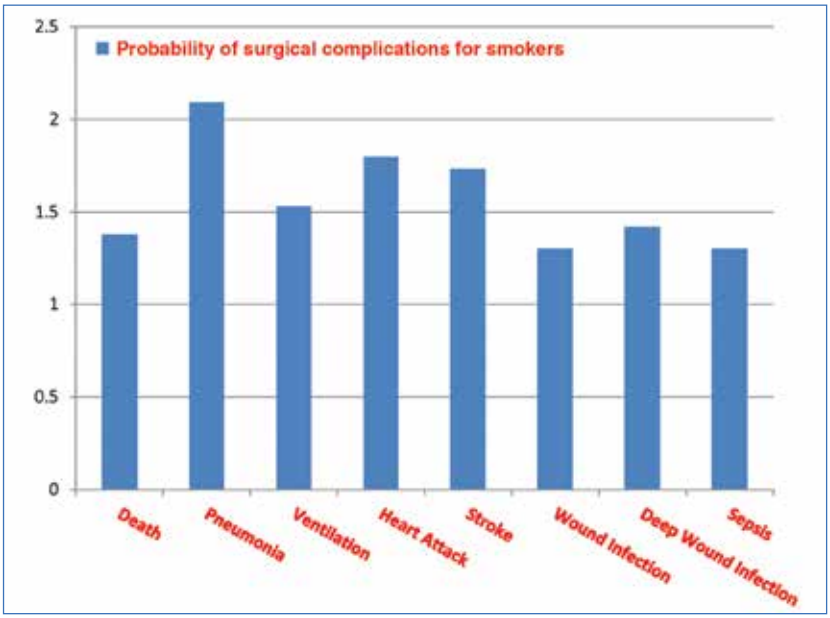
Negative effects on society

Tobacco use is the leading cause of preventable disease and death in the U.S., and roughly 20 percent of Americans smoke. The global use of tobacco products is increasing, killing 5.4 million people each year and accounting for one in 10 adult deaths worldwide.[4] Almost half of the world's children breathe air polluted with tobacco smoke.[4]

Smoking costs the U.S. $133 billion in direct medical costs and $156 billion in lost productivity annually.[5] An estimated 30 percent of elective surgery patients are smokers, meaning that approximately 10 million procedures are performed on smokers annually.[6]

Surgeons see firsthand the detrimental effects of smoking. Smoking within one year of surgery has been linked to

PROBABILITY OF SURGICAL COMPLICATIONS FOR SMOKERS



Turan A, Mascha EJ, Roberman D, Turner P. Smoking and perioperative outcomes. *Anesthesiology.* 2011;114(4):837-846.

TABLE 1. HEALTH CARE PROVIDER PRACTICES

	General surgeons*	Anesthesiologists*	RN anesthetists†
Inquired about patients' tobacco habits	98%	98%	98%
Advised patients to stop smoking	24%	5%	48.3%
Provided smoking cessation counseling	13%	1%	38%

*Yankie VM, Price HM, Nanfito ER, Jasinski DM, Crowell NA, Health J. Providing smoking cessation counseling: A national survey among nurse anesthetists. *Crit Care Nurs Clin North Am.* 2006;18(1):123-129.

†France, EK, Glasgow, RE, Marcus, AC. Smoking cessation interventions among hospitalized patients: What have we learned? *Prev Med.* 2001;32:376-388.

delayed wound healing and wound infections; increased risk of deep venous thrombosis, hypertension, and myocardial infarction; shortness of breath and risk of respiratory infections; and implant and graft loss (see figure, this page).

Most surgeons have spent at least some time counseling patients to quit smoking before they undergo surgical procedures (see Table 1, this page). Studies show that most patients are asked about their smoking habits but are not routinely offered advice and counseling on how to quit. Elective surgery consultations provide a teachable moment, and the perioperative time may be an ideal opportunity for patients to quit, as abstinence is mandatory during hospitalization, and postoperative withdrawal symptoms may decrease due to the absence of smoking cues.

Despite the higher reimbursement associated with billing for smoking cessation counseling to Medicare patients through the use of Current Procedural Terminology (CPT) codes

TABLE 2. SMOKING-RELATED COMPLICATIONS BY SPECIALTY

Specialty	Complications
General surgery	Superficial and deep wound infections, sepsis, anastomotic leaks, myocardial infarction, pneumonia, prolonged intubation, stroke
Cardiac	Pulmonary complications, sternal wound infection, vein graft failure, prolonged ventilator support, intensive care unit readmission
Plastic	Increased scarring, asymmetry, delayed wound healing, reduced skin flap survival, implant loss (breast)
Orthopaedic	Pneumonia, surgical site infections, impaired bone healing, increased postoperative pain, stroke
Pediatrics (parents smoking)	Anesthesia-related respiratory complications

Source: Khullar D, Maa J. The impact of smoking on surgical outcomes. *J Am Coll Surg.* 2012;215(3):418-426.

99406, 99407, G0436, G0437, the adverse consequences of tobacco use continue to be documented in the postoperative period. Examples of these negative outcomes include increasing incidence of wound infections and incisional hernias, which necessitate subsequent operations; use of expensive mesh products; and additional hospital stays, which, in turn, create the opportunity for further postoperative morbidity and mortality. (See Table 2, this page, for complications by specialty.)

ACS efforts to encourage surgeon action

The antismoking campaign of the last half-century can be viewed as a major public health success, but have we done enough in our individual discussions with patients relative to the adverse consequences of smoking?

This issue of the *Bulletin* includes the American College of Surgeons (ACS) "Statement on the effects of tobacco use on surgical complications and the utility of smoking cessation counseling" (see page 55). The statement reviews the mounting evidence against smoking since the Surgeon General's warning in 1964 and supports the following recommendations to reduce smoking-related surgical complications and smoking prevalence:

- Smoking cessation counseling at all non-emergent patient consultations
- Education programs on effective smoking cessation strategies and proper coding of interventions
- Development and dissemination of quality educational materials for surgeons to use in conjunction with their smoking cessation counseling
- Support for government regulation of tobacco products and incentives for individuals to avoid tobacco use
- Continued measurement and reporting of surgical outcomes of smokers versus nonsmokers

In addition, the ACS 2013 Clinical Congress featured a panel discussion, It Pays for Your Patients to Quit Smoking before Surgery: Outcomes, Interventions, and Reimbursement. The moderators and speakers provided details on the physiologic effects of nicotine and smoking on the public and on surgical outcomes. The panelists also described the various smoking cessation methods, the types and benefits of counseling, the incentives available to surgeons through the Affordable Care Act, and essential resources available to patients (see Tables 3 and 4, pages 72 and 73).

The ACS has developed a one-hour continuing medical education webinar, Quit Smoking, to help surgeons thoroughly understand smoking's deleterious

TABLE 3. TOBACCO CESSATION COUNSELING

Counseling	Type	Details
Individual	Face-to-face patient contact Intermediate: Greater than 3 minutes and less than 10 minutes Intensive: Greater than 10 minutes	Patient must be competent and alert at counseling Counseling by a qualified physician or practitioner
Group	Nicotine Anonymous Quit for Life coaching (American Cancer Society)	Search by state or call 877-TRY-NICA (877-879-6422) 1-800-227-2345
Quitlines	Telephone-based support programs with trained counselors	All 50 states have free quitlines, smokefree.gov, or 1-800-QUIT-NOW 1-800-784-8669

RESOURCES FOR PATIENTS

- American College of Surgeons Surgical Patient Education: Quit Smoking Before Your Operation, *www.facs.org/patienteducation*
- *http://smokefree.gov*, 1-800-QUIT-NOW, or 1-800-784-8669
- *http://teen.smokefree.gov/*
- *http://espanol.smokefree.gov/*
- *http://women.smokefree.gov/*
- *http://www.cdc.gov/tobacco/state_system/index.htm*
- Access to all online state tobacco information and quitlines
- American Society of Anesthesiologists: *www.asahq.org/stopsmoking/provider*
- American Lung Association: *www.lungusa.org*
- National Cancer Institute: Tobacco line: 1-877-448-7848 (also in Spanish)

effects on surgical outcomes, the importance and methods for smoking cessation counseling, motivational interviewing, effective pharmacotherapy agents for a quit program and quitlines, and resources for patients. The launch date of the webinar will be announced in an upcoming issue of the weekly ACS *NewsScope*.

The ACS Quit Smoking brochure is a detailed and valuable resource to inform and help patients prepare an action plan for their smoking cessation initiative. (See sidebar, this page, for resources to which surgeons may refer patients.)

The brochure is also information-button ready, and meets all meaningful use and electronic health record requirements. The ACS patient resource, Quit Smoking Before Your Operation, is available at *http://www.facs.org/patienteducation/quitsmoking.html*.

In addition, the ACS supports a series of informational podcasts that are dedicated to topics of interest to the College, its Fellows, and the public. A recent episode of *The Recovery Room* was dedicated to smoking cessation and approaches to the patient who smokes.[7] In this segment, host Frederick (Rick) Greene, MD, FACS, a surgical oncologist from Charlotte, NC, and an author of this article, interviews Eric Skipper, MD, FACS, chief of adult cardiothoracic surgery at the Sanger Heart & Vascular Institute, Charlotte; and Michael Rosen, MD, FACS, professor of surgery and chief of gastrointestinal and general surgery at Case Western Reserve University, Cleveland, OH, on how they approach and educate surgical patients who smoke.

Recommit to helping patients kick the habit

Throughout the last several decades, increasing attention has been given to smoking cessation, especially with respect to children and adolescents in the U.S. Landmark legislation banning the sale of cigarettes to those under the age of 21 in New York, NY, has spread throughout the country, perhaps reflecting a national desire to

TABLE 4. CODING FOR TOBACCO CESSATION INTERVENTIONS

Type of code	Eligible codes for symptomatic patients	Eligible codes for asymptomatic patients
CPT codes	99406, Smoking and tobacco-use cessation counseling visit Intermediate: Greater than 3 minutes; up to 10 minutes 99407, Smoking and tobacco-use cessation counseling visit Intensive: Greater than 10 minutes	G0436, Smoking and tobacco cessation counseling visit for the asymptomatic patient Intermediate: Greater than 3 minutes, up to 10 minutes G0437, Smoking and tobacco cessation counseling visit for the asymptomatic patient Intensive: Greater than 10 minutes
ICD-9 Diagnosis codes	305.1, Tobacco use disorder and ICD-9 of condition adversely affected or condition for which treatment is adversely affected by tobacco use 649.0x, Tobacco use disorder complicating pregnancy, childbirth, or puerperium 989.84, Toxic effect of other substances, chiefly nonmedicinal as to source, tobacco*	Not specified

*2011 American Academy of Family Physicians.

recognize that smoking is the primary inciting agent for a number of diseases and that the consequences of smoking are additive over time.[8]

E-cigarettes

More recently, we are challenged with the unknown consequences of electronic cigarettes and their possible addictive nature, raising the question: Is it only the carcinogens in cigarette and tobacco smoke, or is it nicotine as an antismoking crutch that has its own deleterious consequences? As 2014 marks a significant anniversary in our nation's antitobacco campaign, perhaps now is the time for surgeons to recommit to educating patients about the consequences of smoking and potential life-threatening adverse outcomes for their surgical procedures. The best time in the elective surgical setting to begin educating and encouraging patients to work with their surgeon to reduce operative complications is at the preoperative stage.

The surgical community must continue to take the lead and highlight the significant consequences of smoking. All of the nation's efforts to improve health care and to support health care reform will be meaningless unless we challenge patients to take responsibility for their own health and to reduce habits that, if nothing else, portend poor and preventable surgical outcomes. ◆

REFERENCES

1. Terry L. Smoking and Health: Report of the Advisory Committee to the Surgeon General of the United States. U-23 Department of Health, Education, and Welfare. Public Health Service Publication No. 1103. 1964. Available at: http://profiles.nlm.nih.gov/ps/retrieve/ResourceMetadata/NNBBMQ). Accessed June 27, 2014.
2. Federal Cigarette Labeling and Advertising Act of 1965. Public Law 89-92, U.S. Statutes at Large 79 (1965). Available at: http://www.gpo.gov/fdsys/pkg/STATUTE-79/pdf/STATUTE-79-Pg282.pdf. Accessed June 27, 2014.
3. Reducing Tobacco Use. Public Law 91-222. Surgeon General's Report. Available at: http://www.surgeongeneral.gov/library/reports/50-years-of-progress/sgr50-chap-1.pdf. Accessed June 27, 2014.
4. World Health Organization. Report on the Global Tobacco Epidemic: 2009. Available at: http://www.who.int/tobacco/mpower/2009/mpower_report_2009_executive_summary_EN_11b.pdf. Accessed June 30, 2014.
5. U.S. Department of Health and Human Services. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014.
6. Tonnesen H, Nielsen PR, Lauritzen JB, Moller AM. Smoking and alcohol intervention before surgery: Evidence for best practice. *Br J Anaesth*. 2009;102(3):297-306.
7. American College of Surgeons. *The Recovery Room,* Episode 23: Smoking Cessation and the Surgical Patient. Available at: http://www.facs.org/recoveryroom/episodes/023-smoking-cessation.html. Accessed June 24, 2014.
8. American Lung Association. State of tobacco control. Available at: http://www.stateoftobaccocontrol.org/state-grades/new-york/highlights.html. Accessed June 30, 2014.

EVIDENCE-BASED DECISIONS IN SURGERY

MOBILE POINT-OF-CARE GUIDELINES

The American College of Surgeons (ACS) proudly announces the Evidence-Based Decisions in Surgery online modules. Derived from practice guidelines to help address diagnoses and conditions most relevant to general surgeons, these "point-of-care" modules were developed through a rigorous, peer-reviewed process.

Five new modules are available:

1. Management of Symptomatic Cholelithiasis
2. Surgical Management of Cutaneous Melanoma
3. Surgical Management of Colon Cancer
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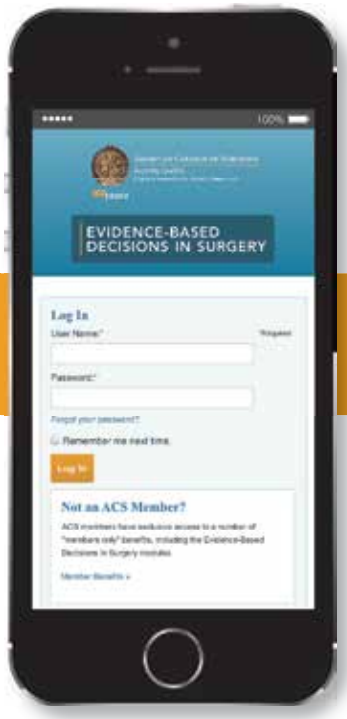

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Members in the news

Dr. Friedlaender (right) with AAOS President Joshua Jacobs, MD.

Dr. Koreishi

Dr. Poenaru

Gary E. Friedlaender, MD, FACS, is the 2014 recipient of the William W. Tipton, Jr., MD, Leadership Award from the American Academy of Orthopaedic Surgeons (AAOS). The Tipton Leadership Award recognizes one academy member each year who has demonstrated outstanding leadership qualities that have benefitted the orthopaedic community, patients, and/or the American public. The award honors the life of the late William W. Tipton, Jr., MD, FACS, an orthopaedic surgeon, educator, and former AAOS chief executive officer. Dr. Friedlaender, a preeminent orthopaedic oncology surgeon, researcher, and mentor to hundreds of young orthopaedic surgeons, received the award earlier this year at the 2014 AAOS annual meeting.

Faruk Koreishi, MD, FACS, of Buffalo, NY, was recently recognized by the Ross Eye Institute, Buffalo, as Community Ophthalmologist of the Year. The Ross Eye Institute provides diagnostic, treatment, and surgical services; serves as a research center for diseases of the eye; and provides education to medical personnel in Western New York. Dr. Koreishi received the award, which recognizes his leadership and community service, at the Vision Beyond Sight Foundation's first annual "Eye Ball." Dr. Koreishi established his practice in Buffalo in 1975 and currently is with the Retina Consultants of Western New York. He is a clinical assistant professor at the State University of New York, Buffalo.

Dan Poenaru, MD, FACS, FRCSC, originally from Kingston, ON, and now practicing at MyungSung Christian Medical Center in Addis Ababa, Ethiopia, received the seventh annual Teasdale-Corti Humanitarian Award, sponsored by the Royal College of Physicians and Surgeons of Canada, in recognition of his longstanding commitment to providing surgical care to needy children throughout Eastern Africa. The prestigious award is given annually to a physician or surgeon who exceeds expectations by providing health care throughout the world while exhibiting altruism, courage, and integrity.

In 2003, Dr. Poenaru moved with his wife and two children to Kenya to pursue a humanitarian surgical practice with Africa Inland Mission and BethanyKids, two faith-based organizations. Since then, Dr. Poenaru has helped build a quality pediatric surgical unit that provides care and treatment to thousands of children each year, often in the middle of civil unrest and in refugee camps. Dr. Poenaru also established the first accredited pediatric surgery training program in Eastern Africa and is now assisting former graduates of the program to set up BethanyKids pediatric surgical units across the continent in an effort to treat more children. ◆

Puerto Rico Chapter meeting, from left: Dr. Turner; Yvonne Baerga-Varela, MD, FACS, Past-President, Puerto Rico Chapter; Norma Cruz-Korchin, MD, FACS; Fernando Joglar, MD, FACS, Chair, Regional Committee, Trauma, Puerto Rico.

Puerto Rico Chapter meeting, from left: Dr. Baerga-Varela and Antonio Pavía-Cabanillas, MD, FACS, ACS Governor from Puerto Rico.

Chapter news

by Donna Tieberg

Puerto Rico Chapter meets in San Juan in February

The 64th Annual Meeting of the American College of Surgeons (ACS) Puerto Rico Chapter took place February 20–22 in San Juan. The meeting began with concurrent grand rounds on February 20 at the University of Puerto Rico Medical School, with a focus on the surgical specialties of urology, otolaryngology, and general surgery. This activity was followed by two days of presentations on developments in both general surgery and the surgical subspecialties at La Concha Resort in San Juan. Approximately 200 Fellows, faculty, non-member physicians, residents, and medical students were in attendance.

Guest speakers from both the U.S. mainland and Puerto Rico offered presentations. Jonathan Woodson, MD, FACS, Assistant Secretary of Defense for Health Affairs and Director of TRICARE, delivered two lectures: The Changing Face of Surgical Education—A Military Experience, and a keynote lecture on Lessons Learned from a Decade of Conflict. TRICARE is the worldwide health care program for more than 9.6 million active duty service members, U.S. National Guard and Reserve members, retirees, their families, survivors, and others. Peter A. Burke, MD, FACS, chief of trauma services at Boston University, MA, gave talks on The Boston Marathon Bombing and Acute Care Surgery. David Farley, MD, FACS, from the Mayo Clinic in Rochester, MN, spoke on Simulation and the Future of Surgical Education. Pablo Rodriguez, MD, FACS, Puerto Rico Chapter, and director of the Puerto Rico Trauma Center, gave a keynote lecture on The Past, Present, and Future of Trauma Care in Puerto Rico. Patricia L. Turner, MD, FACS, Director of the ACS Division of Member Services, presented an update on College activities and participated in several events at the meeting.

The meeting featured the 34th annual F.L. Raffucci Memorial Lecture and Surgical Research Forum. This year's guest speaker was David P. Winchester, MD, FACS, Medical Director of ACS Cancer Programs. Dr. Winchester spoke on Quality Improvement for the Cancer Patient through the ACS Cancer Programs. The

Dr. Foianini, Governor of the newly formed Bolivia Chapter.

Brooklyn and Long Island Chapter meeting, from left: John McNelis, MD, FACS, Chapter Vice-President; Susan H. Lee, MD, FACS, FACOG, Chapter President; Dr. Rikkers; and Jeffrey Weiss, MD, FACS, Chapter Secretary/Treasurer.

Raffucci Forum was initiated as part of the ACS Puerto Rico Annual Convention in 1972 and was established to honor the memory of Francisco L. Raffucci Arce, MD, a pioneer surgical educator and researcher from Puerto Rico. The Puerto Rico Chapter's 65th Annual Meeting is scheduled for February 2015 in San Juan.

Fellows in Bolivia form new chapter

Fellows in Bolivia have formed the newest chapter of the ACS. The ACS Board of Regents unanimously approved the establishment of the chapter at its June meeting in Chicago, IL, making it the 105th chapter of the College. Currently, the ACS has 66 domestic chapters, including two from Canada. With the addition of Bolivia, the College now has 39 international chapters, with several other proposed chapters currently in the formative stage. The newly elected officers of the Bolivia Chapter are as follows: Sergio O. Aparicio, MD, FACS, President; Jose Luis Gallardo, MD, FACS, Vice-President; Mario B. Goitia-Duran, MD, FACS, Secretary; Renan R. Antelo Cortez, MD, FACS, Treasurer; Tito Grageda, MD, FACS, Councilor; Gonzalo Aviles Caseo, MD, FACS, Councilor; Maiza D. Saavedra, MD, FACS, Councilor; and Esteban Foianini, MD, FACS, FASMBS, ACS Governor.

Brooklyn and Long Island Chapter holds 42nd Annual Young Surgeons dinner

The Brooklyn and Long Island Chapter was honored to have Layton F. Rikkers, MD, FACS, ACS First Vice-President, serve as the keynote speaker at the 42nd Annual Young Surgeons dinner on June 10 at the Garden City Hotel, Garden City, NY. Dr. Rikkers gave a keynote presentation titled ACS: Why Join? to the 86 Fellows, residents, and young surgeons who were in attendance, most representing the Brooklyn, Queens, and Long Island areas.

ACS staff speak at Ohio Chapter meeting

An enthusiastic audience of nearly 100 Fellows, residents, and guest speakers attended the ACS Ohio Chapter's two-day annual meeting at the Wyndham Cleveland at Playhouse Square. Representatives from the College included Donna Tieberg, Chapter Services Manager, Division of Member Services; Nina Miller, MSSW, OSW-C, Cancer Liaison Initiatives Manager, who facilitated a talk on Patient-Centered Standards and Commission on Cancer Advocacy; and John Hedstrom, JD, Deputy Director, Division of Advocacy and Health Policy, Washington, DC, who gave an enlightening talk on Partners in Advocacy: The Fellows and the ACS Washington Office. Mr. Hedstrom informed attendees about how they can become more involved in advocating and partnering with the ACS Washington Office to promote the College's health policy agenda.

Stephen Karp, MD, FACS, a general surgeon at Lahey Hospital & Medical Center in Burlington, MA, delivered the keynote address, Breast Update for the General Surgeon. Also presenting was Peter A. Burke, MD, FACS, chief of trauma services and professor of surgery at Boston University School of

Fellows in Bolivia have formed the newest chapter of the ACS. The ACS Board of Regents unanimously approved the establishment of the chapter at its June meeting in Chicago, IL, making it the 105th chapter of the College.

Medicine, who spoke on The Boston Marathon Bombing: Lessons Learned. Dr. Burke's presentation described in detail the events surrounding the April 15, 2013, bombing at the finish line of the Boston Marathon. More specifically, Dr. Burke addressed the hospital response to the bombing and the physics of blast injuries. The meeting concluded with a buffet dinner and lively social activities.

Metro Philadelphia Chapter Meeting

On May 19, at the 2014 Annual Joint Dinner Meeting of the ACS Metropolitan Philadelphia, PA, Chapter and the Philadelphia Academy of Surgery, more than 100 physicians were honored to hear Dr. Turner speak on The Surgical Workforce and Generational Change. Dr. Turner addressed the generational differences and composition of the surgical community and identified ways to effectively communicate strategies and ideas across generations.

Iran Chapter holds Sixth Annual Congress

The Iran Chapter presented its Sixth Annual Chapter Congress at the Razi Conference Center in Tehran. The meeting took place in conjunction with the 38th Annual Meeting of the Iranian Association of Surgeons. Heshmatollah Kalbasi, MD, FACS, President of the Iran Chapter, reported that the meeting sessions focused on obesity and laparoscopy. A lively panel discussion, coordinated by A. Pazouki, MD, featured seven discussants. The next Iran Chapter meeting will take place January 28–30, 2015, on Kish Island. Representing the College and offering presentations at the February meeting will be Andrew Warshaw, MD, FACS, who is currently ACS President-Elect.

Northern California Chapter Meeting

The Northern California Chapter held its 2014 Annual Meeting in Berkeley under the leadership of Shelley Marks, MD, FACS, Planning Committee Chair and Chapter President-Elect, and Christina McDevitt, Chapter Executive Director. The program highlighted chapter activities in global surgery, public health advocacy, and emerging technologies. A current focus of the Northern California Chapter is fostering the career development of surgical trainees and highlighting the activities of Fellows, residents, and medical students through the addition of an expanded Papers Session and Laparoscopic Skills Competition at the annual meeting.

The meeting began with a President's Dinner to celebrate the career of Thomas R. Russell, MD, FACS, former ACS Executive Director. David B. Hoyt, MD, FACS, the current ACS Executive Director, summarized Dr. Russell's important contributions to the ACS mission during his decade-long tenure as Executive Director.

Sherry Wren, MD, FACS, a member of the ACS Board of Governors Executive Committee and chief of general surgery and assistant chief of surgical services at the Palo Alto Veterans Affairs Hospital, moderated a panel discussion on global surgery. Other panelists included Thomas Weiser, MD, FACS, of Stanford University; Polyxene Kokinos, MD, of the South Bay Vascular Center; and Stanford University surgery resident Zach Kastenberg, MD. David Cooke, MD, FACS, moderated the Surgical Trainee Papers Competition. Winning presentations were offered by Hadiza Kazaure, MD, for Long-Term Results of a Postoperative Prevention Program for the Inpatient Surgical Ward, and Monica Dua, MD, for Transgastric Approach to Surgical Necrosectomy for Pancreatic Necrosis. Both Dr. Kazaure and Dr. Dua are from Stanford University.

ACS President Carlos A. Pellegrini, MD, FACS, delivered the keynote address. Expanding on his Presidential Address at the 2013 Clinical Congress, he offered his wisdom on the role that surgeons can play as leaders in the operating room, boardroom, and halls of government. At lunch, California Medical Association (CMA) chief executive officer Dustin Corcoran shared the

continued on page 80

Metro Philadelphia Chapter meeting: Dr. Turner (fifth from left) with the surgical residents from Temple University.

New York State Lobby Day

ACS members and New York State surgeon advocates gathered at New York State Lobby Day on May 20. From left: Arthur Cooper, MD, FACS; William Doscher, MD, FACS, (front); John Sherman MD, FACS; W. Douglas Bunn, Jr., MD, FACS; Steven Burger, MD, FACS; and James Goldszer, MD, FACS.

West Virginia Chapter Officers and councilors. Front row (from left): Richard Vaughan, MD, FACS, Chapter Immediate Past-President; William Burns, MD, FACS, Chapter Secretary/Treasurer; Gene Duremdes, MD, FACS, Chapter President; Sharon Bartholomew, Chapter Administrator; Bryan Richmond, MD, FACS, Chapter President-Elect; Rebecca Wolfer, MD, FACS, Chapter COT Chair; Frederick Martinez, MD, FACS, Chapter First Vice-President; and David Stuart, MD, FACS, Chapter Councilor.

Back row: Patrick Stone, MD, FACS, Chapter Councilor; Hannah Hazard, MD, FACS, Chapter Committee on Cancer Chair; Todd Wittsberger, MD, FACS, Chapter Councilor; Roger King, MD, FACS, Past-ACS West Virginia Governor; John DeLuca, MD, FACS, Chapter Councilor; and Gregory Schafer, MD, FACS, Chapter Councilor.

Nevada Chapter meeting. From left: Arthur A. Fusco, MD, FACS; Dr. Barber; Ms. Tieberg; Deborah Ann Kuhls, MD, FACS; Dr. Preskitt; and Stephen D. McBride, MD, FACS.

overarching strategy regarding the state's Medical Injury Compensation Reform Act (MICRA) initiative, which calls for raising MICRA's cap on noneconomic damages to $1.1 million. Mr. Corcoran explained how and why surgeons should get involved in efforts to defeat the measure. CMA president-elect Luther Cobb, MD, FACS, described opportunities for the CMA and the three ACS California chapters to collaborate with respect to advocacy. In addition, Mary H. McGrath, MD, MPH, FACS, provided an update on the ACS Foundation 1913 Legacy Campaign.

Formal presentations concluded with an address by the Chair of the ACS Board of Regents, Julie Freischlag MD, FACS, dean of the University of California-Davis School of Medicine, who spoke on the evolving health care environment. Rounding out the meeting was a laparoscopic skills competition, the Laparoscopic Bowl, which featured teams from area surgical training programs competing in three rounds of timed fundamentals of laparoscopic surgery exercises. The winning team was from the University of California-San Francisco.

Italy Chapter and New Jersey Chapter hold joint meeting in Catania, Italy

The New Jersey Chapter and the Italy Chapter held a joint scientific meeting in Catania, Italy, on May 13. The meeting was organized by Antonio Di Cataldo, MD, FACS, ACS Governor from Italy and professor of surgery at the University of Catania. Achille L. Gaspari, MD, FACS, former ACS Governor from Italy, chaired the joint meeting, according to Alessandro M. Paganini, MD, PhD, FACS, President of the Italy Chapter.

West Virginia Chapter Meeting

The annual meeting of the West Virginia Chapter took place May 9–11 at the Greenbriar Resort in Sulphur Springs. ACS Governor Tyler Hughes, MD, FACS, conducted an informal session on rural surgery at the meeting. Brian Eastridge, MD, FACS, director of trauma at the University of Texas at San Antonio, was the guest trauma lecturer. Well-attended trauma and surgical residency competitions enhanced the educational focus of the meeting. In addition, chapter members and other attendees welcomed students from a local osteopathic school.

Nevada Chapter Meeting

The Nevada Chapter held its annual meeting June 19 at Lawry's in Las Vegas. Approximately 40 chapter members and officers attended a social hour and dinner meeting, with attendees representing diverse specialties, such as ophthalmology, gynecology, and neurology. Chapter President Annabelle Barber, MD, FACS, welcomed as guests Ms. Tieberg and keynote speaker John Preskitt, MD, FACS, ACS Second Vice-President. Dr. Preskitt gave a presentation titled The American College of Surgeons: 100 Years of Relevance, which highlighted current ACS programs, with a particular focus on the recent reorganization of the College; ACS quality initiatives, including the ACS National Surgical Quality Improvement Program; advocacy; and the work of the Division of Member Services. Dr. Preskitt also reiterated the importance of strategic planning for chapters and provided an overview on what strategic planning entailed. ◆

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UNRIVALED REWARDS

2014 Australia-New Zealand, Japan, and German Exchange Travelers announced


Dr. Heriot


Dr. Zhou


Dr. Baba


Dr. Mullen


Dr. Lehwald


Dr. Farma

The International Relations Committee of the American College of Surgeons (ACS) sponsors three academic surgeon exchange programs. Exchange arrangements are in place with the Royal Australasian College of Surgeons with the ACS Australia-New Zealand Chapter, the Japan Surgical Society with the ACS Japan Chapter, and the German Surgical Society with the ACS Germany Chapter. In all three programs, the College sends a talented young U.S. or Canadian Fellow to the annual surgical meeting of the participating country. Afterward, they tour several health care institutions that conduct research tailored to the Fellows' specific interests. In exchange, the ACS makes it possible for young academic surgeon-scholars from the participating societies to attend the College's annual Clinical Congress, which will take place October 26–30 in San Francisco, CA.

The 2014 Australia-New Zealand Exchange Fellow is **Alexander G. Heriot, MB, BChir, FRCSEd, FRCSEng, FRACS,** director of surgical oncology and consultant colorectal surgeon at the Peter MacCallum Cancer Centre, Melbourne, Victoria. He has written extensively on major issues relating to surgery of the bowel, particularly colorectal and gastrointestinal oncological procedures. He is a reviewer for several notable surgery journals. His U.S. counterpart, **Wei Zhou, MD, FACS,** is professor of surgery, Stanford University, and chief of vascular surgery, Palo Alto Veterans Affairs Hospital, CA. She attended the Annual Scientific Congress of the Royal Australasian College of Surgeons held in Marina Bay Sands, Singapore, in May 2014 (see related article, page 84).

This October, the College will welcome Japan Exchange Fellow **Yoshifumi Baba, MD, PhD,** assistant professor of gastroenterological surgery at Kumamoto University's Graduate School of Medical Science. Dr. Baba's research focuses on colorectal, liver, and esophageal cancers. **John T. Mullen, MD, FACS,** assistant professor specializing in surgical oncology, Massachusetts General Hospital, Boston, attended the Japan Surgical Society meeting in Kyoto in April 2014. (Dr. Mullen's report will be published in the September *Bulletin*.)

For the German exchange, **Nadja Lehwald, MD, PhD,** assistant professor of surgery, department of visceral, general, and pediatric surgery at Heinrich Heine University in Dusseldorf, will attend the ACS Clinical Congress this year and visit several surgical sites under the guidance of her mentors both in North America and in Germany. Dr. Lehwald is a surgical oncologist performing hepatic and pancreatic surgery and researching mitochondrial function in liver homeostasis and disease. ACS Traveling Fellow **Jeffrey M. Farma, MD, FACS,** co-director, cutaneous oncology, Fox Chase Cancer Center, Philadelphia, PA, attended the German Surgical Society's annual meeting in Berlin in March 2014. (Dr. Farma's report will be published in the October issue of the *Bulletin*.) ◆

Applications for Resident Research Scholarships due September 2

The American College of Surgeons (ACS) is now accepting applications for six 2015 Resident Research Scholarships. Eligibility for these scholarships is limited to the research projects of residents in general surgery or a surgical specialty. The closing date for receipt of completed applications and all supporting documents is **September 2, 2014**.

These scholarships are supported by the generosity of Fellows, chapters, and friends of the College, to encourage residents to pursue careers in academic surgery. General policies covering the granting of the ACS Resident Research Scholarships are as follows:

- The applicant must be a Resident Member of the College who has completed two postdoctoral years at an accredited surgical training program in the U.S. or Canada at the time the scholarship is awarded on July 1, 2015, and must be on track to complete formal surgical training in June 2017 or later. Scholarships do not support research after completion of the chief residency year.

- The scholarship is awarded for two years, and recipients must commit to conducting research over the entire two-year period of the scholarship, July 2015 through June 2017. Priority will be given to the projects of residents involved in full-time laboratory investigation. Study outside the U.S. or Canada is permissible. Renewal of the scholarship for the second year is required and is contingent upon the acceptance of a progress report and research study protocol for the second year, as submitted to the Scholarships Section of the College by May 1, 2016.

- Application for these scholarships may be submitted even if comparable application to other organizations has been made. If the recipient is offered a scholarship, fellowship, or research award from another organization, it is the responsibility of the recipient to contact the College's Scholarships Administrator to request approval of the additional award. The Scholarships Committee reserves the right to review potentially overlapping awards and adjust its award accordingly.

- The scholarship is $30,000 per year; the total amount is to support the research of the recipient and is not to diminish or replace the scholar's usual or expected compensation or benefits. No indirect costs are paid to the recipient or to the recipient's institution.

- The scholar is expected to attend the ACS Clinical Congress in 2017 to present a report on the research as part of the Surgical Forum and to receive a certificate at the annual meeting of the Scholarships Committee.

- Approval of the application is required from the administration (dean or fiscal officer) of the candidate's institution. Supporting letters from the head of the department of surgery or the surgical specialty and from the mentor who will be supervising the applicant's research must be submitted. Only in exceptional circumstances will more than one scholarship be granted in a single year to applicants from the same institution.

Application forms may be obtained from the College's website at *www.facs.org*, or upon request from the Scholarships Administrator at scholarships@facs.org. ◆

ACS/ANZ Traveling Scholar reports on trip to Singapore and Australia

by Wei Zhou, MD, FACS

It was my distinct privilege to be selected as the 2014 American College of Surgeons (ACS) Traveling Fellow to Australia and New Zealand (ANZ). I had a wonderful experience on my trip to Singapore and Australia. I made many new friends and reconnected with old ones in those busy two weeks. I met many experienced clinical surgeons, accomplished academicians, and motivated trainees, with whom I discussed clinical experiences and research interests, as well as training paradigms and practice patterns. The traveling scholarship afforded me the opportunity to present my work and to learn from surgical colleagues in Australia.

RACS meeting in Singapore

The Royal Australasian College of Surgeons (RACS) and the Australian and New Zealand College of Anaesthetists (ANZCA) held their first combined meeting this year in Singapore, which made travel arrangements a little challenging. To maximize the experience in Australia, I had to make strategic decisions and plan my travel schedule in advance. I worked with Matthew Claydon, MB, BS(Hon), BMedSci(Hon),

Dr. Zhou (second from right, front) at the vascular specialty dinner, with (from left) Drs. Taylor, Claydon, unknown, and Thompson.

Dr. Zhou and her family at the Puff Billy train station with Dr. Abbott (second from right) and her family.

Dr. Zhou in the lobby of Epworth Hospital with Dr. Grigg.


Dr. Zhou with Dr. Devine (left) and Tim Buckenham, MB, ChB, FRANZCR, FRCR, in an angiography suite at Danenong Hospital.

FRACS(Gen Surg), FRACS(Vasc), the vascular surgery convener, to accommodate my travel arrangements. Richard Hanney, MB, BS, a general surgeon from Sydney and a close friend of the Association for Academic Surgery (AAS), helped me to identify hospitals to visit. Michael Findlay, MB, BS, PhD, a visiting plastic surgeon from Australia, connected me to Prof. John Quinn, MB, BS, FACS, FRACS, president of the ANZ Society for Vascular Surgery. Professor Quinn recommended that I contact John Harris, MS, FACS, FRACS, FRCS, in Sydney and Prof. Michael Grigg, MB, BS, FRACS, in Melbourne. I also reached out to industry partners for suggestions. Jackie Ho Pei, MB, BS, FRCSEdin, FCSHK, an academic vascular surgeon from Singapore National Hospital, graciously hosted me during my weeklong stay in Singapore.

I arrived in Singapore on May 4 and attended the faculty dinner for Developing a Career in Academic Surgery (DCAS) a few hours later. The jetlag passed quickly when I saw many familiar faces from the AAS. It was a busy few days afterward. I met many residents, fellows, and students at the DCAS course the next day. At the vascular specialty dinner, I was welcomed like an old friend and seated with Professor Quinn, Professor Harris, Dr. Claydon, and two other college visitors from the U.K., Peter Taylor, BM, BCh, PhD, FRCP, and Matthew Thompson, MD, FRCS.

At the congress, I presented my research work on cognition and carotid disease at the dedicated 30-minute ACS lecture, where I was introduced by Geoff Cox, MB, BS, FRACS, from Melbourne. Current ACS President Carlos Pellegrini, MD, FACS, FRCSI(Hon), was in attendance. I also gave two talks at the vascular and anesthesia sessions: Radiation Exposure beyond Endovascular Interventions, and Embolic Protection Device in Lower Extremity Interventions.

Dr. Ho Pei also arranged several meetings for me to interact with local physicians, in addition to the activities in RACS. I presented my work on endovascular aortic aneurysm repair-related endoleak to local Singapore vascular surgeons and interventional radiologists. I had an opportunity to visit National University Hospital, and to speak to neurology and surgical groups on the clinical and translational research projects related to carotid disease. The week passed by quickly. I left Singapore one day before the conclusion of RACS and bundled up for Melbourne, where temperatures were 50 degrees cooler than in Singapore.

Melbourne

My husband Van and daughter Madison Chiem met me in Melbourne. My first stop in that city involved reconnecting with Ann Abbott, PhD, MB, BS, FRACP, a stroke neurologist whose primary interest is carotid disease. Although Ann and I have many differences with regard to how to manage carotid disease, our common research interest connected us. With Ann's family, we rode the Puffy Billy train on Mother's Day. Puffy Billy is one

Dr. Zhou with (from left) Drs. Vicaretti and Mohan, and Nicole Rübesamenro, MD, a German surgical trainee, at Westmead Hospital.

of the finest preserved steam railways in the world and runs along the Dandenong Ranges east of Melbourne. The scenery was spectacular, and we had an incredible time, dangling both feet outside the window, and enjoying the beautiful mountain ranges.

Box Hill Hospital

My next stop was Box Hill Hospital to meet with Dr. Grigg, the newly elected president of the Royal Australasian College of Surgeons and the head of surgery at Box Hill Hospital. We started the day with an overview of the hospital system in Melbourne, and Dr. Grigg explained the health care system and practice patterns in Australia. He also explained the difference between public and private hospitals and showed me Epworth Eastern Medical Center, the private hospital where he works.

I observed a percutaneous endovascular aortic aneurysm repair (PEVAR) case with Jason Chuen, MB, BS, FRACS, a young academic vascular surgeon. These interactions gave me a better appreciation of the training systems in Australia and New Zealand.

Dandenong Hospital

The next day, I met with Terry Devine, MB, BS, at Dandenong Hospital, another large public hospital in Melbourne. Dr. Devine is the head of vascular surgery at the hospital. I was fortunate to observe Dr. Devine treating two cases of type II endoleak embolization and a PEVAR. I have an interest in long-term outcome and management of type II endoleaks and have been performing computed tomography-guided translumbar embolization in a suite equipped with both CT scan and fixed C-arm. It was a great learning experience to see Dr. Devine and his radiology colleague skillfully embolizing type II endoleaks through a translumbar approach without using CT-guidance and using a glue agent that was probably one-tenth of the cost of the agent that I typically use. We went through technical details and the options for endoleak treatment.

Despite a packed schedule each day, I had some opportunities to spend time with my family, enjoying relaxing walks and wonderful restaurants along the Yarra River. Soon, it was time to go to Sydney.

Sydney

Sydney was, surprisingly, warmer than Melbourne. After our arrival in Sydney, we spent an afternoon at the beautiful Bondi Beach. The following day, I visited Mauro Vicaretti, PhD, FRACS, and his vascular surgery group at Westmead Hospital—one of the largest public hospitals in Sydney. I attended a morning conference, observed operations, and toured the hospital. Westmead places a strong emphasis on teaching vascular trainees, including international trainees. I also presented my research work on carotid artery disease and cognition and candidly discussed the treatment of carotid disease

Dr. Zhou with (clockwise from left) Drs. Nammuni, Harris, Lao, and May at RPAH in Sydney.

with the vascular surgery group at the Westmead Hospital.

The last stop in Australia was Royal Prince Alfred Hospital (RPAH) in Sydney. On Friday morning, Prof. John Harris, MS, FRACS, FACS, showed me around the campus of the University of Sydney. I enjoyed learning about the university's rich heritage from the highly knowledgeable Professor Harris, who is the chief of surgery at the University of Sydney Royal Prince Alfred Hospital and editor of the *ANZ Journal of Surgery*. I had a welcoming breakfast with Professor Harris, legendary Prof. Jim May, MD, MB, BS, and Isuru Nammuni, BSci(Med), MB, BS(Hons), FRACS(Vasc), as well as the vascular fellow Jack Lao, MD. After breakfast, Drs. Nammuni and Lao showed me around the Royal Prince Alfred Hospital. It was a relatively short but, nonetheless, informative day.

During these two weeks, I got to know many surgeons from Australia and New Zealand, and I learned a great deal from our colleagues on the other side of the world. I also got a glimpse of local practice patterns and health care systems in Singapore, Melbourne, and Sydney. I will always treasure the friendships I made during the trip. ◆

Dr. Robert Goldstone

Resident Research Scholarship change

In the May 2014 edition of the *Bulletin of the American College of Surgeons,* Andrew B. Goldstone, MD, of the University of Pennsylvania, was announced as one of the 2014–2016 Resident Research Scholars. Since then, he has received another award, and remitted his scholarship for use by the First Alternate, his identical twin brother, **Robert N. Goldstone, MD,** PGY-3, at Massachusetts General Hospital, Boston.

Dr. Robert Goldstone's research project is titled "Photochemical tissue passivation for the prevention of vein graft intimal hyperplasia in a large animal model." His projected specialty is vascular surgery. ◆

Calendar of events*

*Dates and locations subject to change. For more information on College events, visit http://www.facs.org/cmecalendar/index.html or http://web2.facs.org/ChapterMeetings.cfm

AUGUST

Tennessee Chapter
August 8–10
Buchanan, TN
Contact: Wanda McKnight, wanda@tnacs.org/

Georgia Society Chapter
August 22–24
St. Simons Island, GA
Contact: Kathy Browning, kdb@georgiaacs.org, www.georgiaacs.org

Hawaii Chapter
August 23
Honolulu, HI
Contact: Gary Belcher, gbelcher@hawaii.edu, http://hawaiifacs.org

SEPTEMBER

Kansas Chapter
September 6
Wichita, KS
Contact: Gary Caruthers, gcaruthers@kmsonline.org, www.kansaschapteracs.org/

Egypt Chapter
September 10–12
Cairo, Egypt
Contact: Mohey Elbanna, moheyelbanna@yahoo.com

7th Annual ACS AEI Postgraduate Course
September 12–13
Tampa, FL
Contact: Catherine Wojcik, cwojcik@facs.org, www.facs.org/education/accreditationprogram

New Mexico Chapter
September 12–13
Albuquerque, NM
Contact: Gloria Chavez, gchavez@nmms.org

Arkansas Chapter
September 13
Little Rock, AR
Contact: Linda Townsend, LATownsend@uams.edu

Kentucky Chapter
September 16
Louisville, KY
Contact: Linda Silvestri, lsilv2@email.uky.edu

Canadian Surgery Forum
September 17–21
Vancouver, BC
Contact: Cassandre Boland, cboland@cags-accg.ca, www.canadiansurgeryforum.com

Illinois Chapter
September 18–20
Champaign-Urbana, IL
Contact: Luann H. White, lhwhite26@gmail.com, http://www.ilchapteracs.org/

Iowa Chapter
September 25–26
Iowa City, IA
Contact: Sue Hyler, hylerse@q.com

OCTOBER

Bolivia Chapter
October 8–10
Tarija, Bolivia
Contact: Jorge Esteban Foianini, efoianini@hotmail.com

Italy Chapter
October 12–15
Rome, Italy
Contact: Giuseppe Nigri, giuseppe.nigri@@uniroma1.it, www.facsitaly.com

ACS Clinical Congress
October 26–30
San Francisco, CA
www.facs.org

FUTURE CLINICAL CONGRESSES

2014
October 26–30
San Francisco, CA

2015
October 4–8
Chicago, IL

2016
October 16–20
Washington, DC