OVERVIEW OF GENERAL SURGERY TRAINING IN THE USA:
HISTORY AND PRESENT*

STANLEY J. DUDRICK, MD, FACS
Chairman Emeritus, Department of Surgery
Director Emeritus, Program in Surgery
Saint Mary’s Hospital/Yale Affiliate
Professor of Surgery, Yale University School of Medicine

A brief history of the development of surgery and early surgical training and practice is presented, starting in colonial America in the 18th century and extending to modern times in the USA. An abridged, but comprehensive overview of the metamorphosis and transformation of training programs in the United States is described and discussed, together with some of the most relevant rationale and justifications for the changes mandated, established and in progress. The current status of the accreditation requirements, oversight, and governance of general surgery training programs, together with the incorporation of the multiple technical and technological advances in general surgical practice; and, therefore, the addition of the required training modules and systems concurrently to the training programs; and their secondary implications, consequences, and impact upon the programs, are discussed. These include financial and other resource impediments, the 80 hour work week constraints, the technological explosion, the demands of the required expanded general surgical curriculum and operative case experience, the continued erosion of general surgery by surgical and medical specialists, the increasing workload coupled with decreasing reimbursement for general surgeons and their services, together with the difficulties of amalgamating all of these confounding or conflicting factors into an effective general surgery program which will be successful in attracting, recruiting, and retaining the best and brightest surgical candidates in the future in order to ensure the continuation of optimal general surgical care. Finally, the insights, opinions, experiences, and philosophy of the author regarding general surgery training and practice, accumulated during the more than half century served as a student, resident, clinician, scientist, administrator and educator, are incorporated into the presentation.

The first surgeons in America were European physicians who had acquired their rudimentary experiences or training primarily in England or Scotland prior to immigrating to the new world. The young immigrants who aspired to become surgeons apprenticed themselves virtually as indentured servants either to practicing surgeons in the colonies, or they sailed across the Atlantic Ocean to gain whatever training they could arrange with surgeons in Europe for a few years before returning to America to serve their fellow colonists. Thus, experience and training, in any case was unstructured, non-standardized and extremely variable among those who practiced surgery in America until the latter half of the 18th century. Surgical apprentices learned the current practices of the time, treated wounds,

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applied dressings and generally assisted in the care of their surgery mentor’s patients. They were usually indentured for 5 years of service and instruction in the art and practice of medicine and surgery, and then received a certificate verifying their credentials for independent practice if their performance had been satisfactory. When the Medical School of Philadelphia, which later became The University of Pennsylvania School of Medicine, was established, science was added to the experience of the apprentices, primarily as anatomy lectures and dissections.

In 1794, Phillip Syng Physick, a native young Philadelphian and a graduate of The University of Pennsylvania, spent three years as an apprentice to Dr. Adam Kuhn, the foremost surgeon in the new nation, and ultimately became the first American-born physician to train in surgery abroad and then return to the USA. He served two years as an apprentice surgeon in London with John Hunter, arguably the premiere surgeon of that time, and an additional two years in Edinburgh. He then returned home to join the staff of the Pennsylvania Hospital, the new nation’s first hospital, chartered in 1751; served as its first Chairman of Surgery; and was appointed Professor of Surgery at The University of Pennsylvania School of Medicine, the first medical school in America founded in 1765. In 1819, he subsequently became Chairman of Anatomy at The University of Pennsylvania where surgeons and surgical candidates were quite active in teaching and learning anatomy, respectively. When he died in 1837 at the age of 69 years, he was described in his Eulogy thusly: “As an operator, he had a correct and discriminating eye, a hand delicate in touch, dextrous in movement, and unwerving in firmness; a perfect composure and self-possession which rose in time and deepened in steadiness with the complication of the case at hand. He was a discoverer, thinker, worker, but not an author. He wrote only 9 or 10 papers.” He also was clearly the best trained and qualified surgeon, teacher and leader of his time in the USA; and his talents and accomplishments have earned him the distinction of being known today as the “Father of American Surgery” (1).

The top floor of the Pennsylvania Hospital is the home of the nation’s oldest surgical amphitheater, which served as the first operating room in America from 1804 to 1868. Operations were performed under the glass dome on sunny days between 11:00 am and 2:00 pm since electricity did not exist for lighting. Candles were also used to help illuminate the amphitheater for anatomic dissections and lectures, but did not provide adequate light to perform operations.

The surgeons who first used this operating room were considered primarily to be skilled craftsmen by their medical colleagues. Unfortunately, this attitude regarding surgeons as “blue collar” technicians rather than cognitively competent peers still prevails today among many members of the medical profession. At that time, the most common surgical procedures included: amputations, removal of external and internal tumors, removal of bladder stones, extraction of cataracts, repair of hernias, and setting of bone fractures. General anesthesia was not used at Pennsylvania Hospital until 1846. Historical records document that prior to that time, in order to prepare the surgical patients for operations, the surgeons “got them blind drunk with a pint or two of spirits, and/or gave them opium or laudanum, or administered a sharp tap on the head with a padded wooden mallet enough to render the patient unconscious, but hopefully not dead.” Another alternative was to hire four or five strong men to restrain the patient physically during the operation.

Sterile technique was not used in operating theaters in the USA, until the 1890’s. Before then, surgeons washed their hands after the procedure. They wore long coats to protect their clothing and afterward hung the coats outside the surgical amphitheater on hooks on the walls. Their coats were unwashed for years at a time, and the extent of the encrusted blood emphasized the prestige of the surgeon. Such was the surgical condition regarding practice, education and training during the 19th century in the USA.

About 100 years ago, in the early 20th century, one of the most significant changes in the education and training of surgeons in America was proposed by William S. Halsted, and inaugurated in the Department of Surgery at Johns Hopkins Hospital (2). He formalized the apprentice system into a residency program based on science, practical bedside and operating room teaching and graduated responsibility, initially over an indeterminate number of
years, until he decided that the resident was competent and skilled sufficiently to assume surgical independence. His plan was based primarily on the German system of surgical training, including a defined structure, standardization of training, and graduated increased responsibility with each year of training. To this, Halsted added a pyramidal system in which some residents would be eliminated each year resulting in the emergence of a Chief Resident who had achieved the highest levels of skill, merit and accomplishment, usually after eight years as a house officer. Although Halsted’s philosophy and model were not embraced or adopted enthusiastically initially by many surgeons or hospitals involved in surgical training, most academically-oriented institutions incorporated his fundamentals into formalized training programs in surgery by mid-century, stimulated in large measure by the less than optimal success achieved by American surgeons in World War II. Objections by some surgeons to Halsted’s training program proposal included its ill-defined and lengthy duration; and having multiple residents at different levels working as a team under the supervision and mentorship of one or more faculty members, rather than the customary existing model of the one on one mentor/apprentice relationship. However, the most controversial aspect of his program was his steadfast advocacy of, and adherence to, a pyramidal system, which was subsequently transformed by other surgical educators to a rectangular system starting in the post-war period; and established as an accreditation mandate by the 1960’s (3). However, in my opinion, the straight rectangular system is more flawed and much less conducive to training elite surgeons than is the pyramidal system. It is based on the hypothesis that all candidates embarking upon a 5-6 year surgical training program are equal in intellect; knowledge; skill; eye-hand coordination; emotional, physical and motivational strength; and the potential to achieve the six fundamental competencies of a master surgeon. This simply never has been, and still is not, a valid assumption. Moreover, it has introduced a large number of confounding factors into the surgical training program system, making it difficult to achieve uniformly optimal training of surgeons. Rather than promoting and tolerating the attitude of entitlement to advancement as exists today, I firmly believe that a modified pyramidal system should be revisited together with the introduction of benchmark achievements which must be met prior to advancement at each level, in order to preserve and augment the achievement of more uniform excellence in surgical training. Fortunately, and gratifyingly, it appears that we might be heading in that direction.

In his Presidential Address before the Southern Surgical Association, entitled, “Surgical Education: Foundations and Values,” James J. O’Neill, Jr., aptly stated the following: “During World War II, and particularly after it, the potential contributions of surgery were reorganized, and this prompted the creation of many more surgical training programs and multiple initiatives to improve and ensure the quality of the educational process. But even before this, there were efforts to promote quality in the practice of surgery through dissemination of information and establishment of standards. The establishment of the American Surgical Association and the Southern Surgical Association are prime examples of the activities directed toward excellence in surgical education and training. In addition, other examples include establishment of the American College of Surgeons in 1913, the American Board of Surgery in 1937, and the Conference Review Committee for Surgery in 1950, which later became the Residency Review Committee for Surgery” (3).

“One might also say that the establishment of these latter organizations began an era of regulation, which, although good on balance, had some unintended consequences. In 1948, Robert Zollinger pointed out that postwar trends in specialization were changing the field of general surgery into a narrow specialty, and that the best solution was to promote broad training in general surgery as being essential before specialization, which of course was Halsted’s original plan (4). Around this time, a large number of specialty surgery boards were established and although they promoted excellence and standardization in their individual specialties, the end result was that they gradually separated themselves from general surgical education, and surgical education itself became balkanized. One visionary, H. William Scott, President of the Southern Surgical Association in 1977, stands out because he recognized the interlocking needs of gen-
eral surgery and the surgical specialties in residency training” (5).

“Because of this, in 1961, Dr. Scott suggested that surgeons of all types have 1 year of internship with rotations on all specialty services, as well as general surgery, followed by a 2-year basic surgical residency that was half general surgery and the other half specialties (5). This was to be followed by a basic board examination, after which surgeons would branch off into the individual specialty training programs, including general surgery, which at that time included thoracic surgery as well” (3).

“To some degree, our standards and regulations have stifled innovation and creativity in the design of educational programs in surgery, an unintended consequence in the quest for quality. In the end, the standardization and monitoring provided by the Accreditation Council for Graduate Medical Education (ACGME) has probably been a good thing, but now new variables are appearing that are providing challenges to the apprenticeship model that has served us well for more than 200 years. It is ironic that we have seen a number of new challenges and disruptive changes in surgical education at a time when surgical education in America and the status of surgical practice is the envy of the world” (3).

The Accreditation Council for Graduate Medical Education (ACGME) is a separately incorporated organization, responsible for the accreditation of approximately 8,355 allopathic graduate medical education programs in all specialties (6). It has five member organizations: the American Board of Medical Specialties, American Hospital Association, American Medical Association, Association of American Medical Colleges, and Council of Medical Specialty Societies. Each member organization nominates four individuals to the ACGME’s Board of Directors. In addition, the Board of Directors includes three public representatives, a resident representative, and the chair of the Residency Review Committee (RRC) Council. A representative for the federal government and the chair of the RRC Resident Council also serve on the Board in a non-voting capacity.

The mission of the ACGME is to improve the quality of health in the United States by ensuring and improving the quality of graduate medical education experience for physicians in training. The ACGME establishes national standards for graduate medical education by which it approves and continually assesses educational programs under its aegis. It uses the most effective methods available to evaluate the quality of graduate medical education programs. It strives to develop evaluation methods and processes that are valid, fair, open, and ethical.

In carrying out these activities, the ACGME is responsive to change and innovation in education and current practice, promotes the use of effective measurement tools to assess resident physician competency, and encourages educational improvement.

Under the aegis of the ACGME, the accreditation of graduate medical education programs is carried out by 28 review committees and a committee for the review of sponsoring institutions. These committees have been delegated accreditation authority by the ACGME. A Residency Review Committee (RRC) consists of representatives appointed by the American Medical Association, the appropriate specialty board, and, in some cases, a national specialty organization. The Institutional Review Committee assumes the responsibility for reviewing institutions which sponsor multiple programs. It evaluates institutions for substantial compliance with the Institutional Requirements.

Graduate medical education programs are accredited when they are judged to be in substantial compliance with the Essentials of Accredited Residencies in Graduate Medical Education (6). The Essentials consist of (a) the Institutional Requirements, which are prepared by the ACGME and apply to all programs, and (b) the Program Requirements for each specialty and subspecialty. The requirements are developed and periodically revised by a review committee for its area(s) of competence, and are approved by the ACGME. The activities of the ACGME extend only to those institutions within the jurisdiction of the United States of America.

In its Program Requirements for Graduate Medical Education in Surgery, the ACGME includes a definition and scope of the specialties as follows. The goal of a surgical residency program is to prepare the resident to function as a qualified practitioner of surgery at the advanced level of performance expected of a board-certified specialist. The education
of surgeons in the practice of general surgery encompasses both didactic instruction in the basic and clinical sciences of surgical diseases and conditions, as well as education in procedural skills and operative techniques. The educational process must lead to the acquisition of an appropriate fund of knowledge and technical skills, the ability to integrate the acquired knowledge into the clinical situation, and the development of surgical judgment.

The ACGME also defines the duration and scope of education as follows. The length of a surgery residency program is five clinical years. Each resident must be notified in writing of the length of the program prior to admission. Programs must comply with the resident eligibility and admission prerequisites as outlined in the Institutional Requirements.

In the surgical education program, the ACGME mandates that the curriculum must contain the following educational components: overall educational goals for the program; competency-based goals and objectives for each assignment at each educational level; regularly scheduled didactic sessions; delineation of resident responsibilities for patient care, progressive responsibility for patient management, and supervision of residents over the continuum of the program; and the program must integrate the following six ACGME competencies into the curriculum: (1) patient care; (2) medical knowledge; (3) practice-based learning and improvement; (4) interpersonal and communication skills; (5) professionalism; and (6) systems-based practice.

Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health. Residents will demonstrate manual dexterity appropriate for their level; will develop and execute patient care plans appropriate for the resident’s level, including management of pain; will participate in a program that must document a clinical curriculum that is sequential, comprehensive, and organized from basic to complex. The clinical assignments should be carefully structured to ensure that graded levels of responsibility, continuity in patient care, a balance between education and service, and progressive clinical experiences are achieved for each resident. The 60-month clinical program should be organized as follows: at least 54 months of the 60-month program must be spent on clinical assignments in surgery, with documented experience in emergency care and surgical critical care in order to enable residents to manage patients with severe and complex illnesses and with major injuries; 42 months of these 54 months must be spent on clinical assignments in the essential content areas of surgery. The essential content areas are: the abdomen and its contents; the alimentary tract; skin, soft tissues, and breast; endocrine surgery; head and neck surgery; pediatric surgery; surgical critical care; surgical oncology; trauma and non-operative trauma (burn experience that includes patient management may be counted toward non-operative trauma); and the vascular system. Formal rotations in burn care, gynecology, neurosurgery, orthopaedic surgery, cardiac surgery, and urology are not required. Clearly documented goals and objectives must be presented if these components are included as rotations. Knowledge of burn physiology and initial burn management is required. A formal transplant rotation is required. It must include patient management and cover knowledge of the principles of immunology, immunosuppression, and the management of general surgical conditions arising in transplant patients. Clearly documented goals and objective must be presented for this experience. No more than six months total may be allocated to research or to nonsurgical disciplines such as anesthesiology, internal medicine, pediatrics, or surgical pathology. No more than 12 months may be devoted to surgical disciplines other than the principal components of surgery. Clinical assignments at the chief resident level should be scheduled in the final (5th) year of the program. Operative cases counted as the chief cases must be performed during the 12 months designated as the chief year. The clinical assignments during the chief year must be scheduled at the primary clinical site or at a participating integrated site. Clinical assignments during the chief year must be in the essential content areas of general surgery. No more that four months of the chief year may be devoted exclusively to any one essential content area. Non-cardiac thoracic surgery and transplantation rotations may be considered an acceptable chief resident assignment as long as the chief resident performs an appropriate number of complex cases with documented participation in pre-operative and post-operative care. The
program must document that residents are performing a sufficient breadth of complex procedures to graduate qualified surgeons. All residents must enter their operative experience concurrently during each year of residency in the ACGME case log system. A resident may be considered the surgeon only when he or she can document a significant role in the following aspects of management: determination or confirmation of the diagnosis, provision of preoperative care, selection, and accomplishment of the appropriate operative procedure, and direction of the postoperative care. When justified by experience, a PGY 5 (chief resident) may act as a teaching assistant (TA) to a more junior resident with appropriate faculty supervision. Up to 50 cases listed by the chief resident as TA will be credited for the total requirement of 750 cases. TA cases may not count toward the 150 minimum cases needed to fulfill the operative requirements for the chief resident year. The junior resident performing the case will also be credited as surgeon for these cases. Each program is required to provide residents with an outpatient experience to evaluate patients both pre-operatively, including initial evaluation, and post-operatively. At least 75% of the assignments in the essential content areas must include an outpatient experience of one-half day per week.

Residents must demonstrate medical knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care. Residents will critically evaluate and demonstrate knowledge of pertinent scientific information, and will participate in an educational program that should include the fundamentals of basic science as applied to clinical surgery, including: applied surgical anatomy and surgical pathology; the elements of wound healing; homeostasis, shock and circulatory physiology; hematologic disorders; immunobiology and transplantation; oncology; surgical endocrinology; surgical nutrition, fluid and electrolyte balance; and the metabolic response to injury, including burns.

Regarding practice-based learning and improvement, residents must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning. Residents are expected to develop skills and habits to be able to meet the following goals: indentify strengths, deficiencies, and limits in one’s knowledge and expertise; set learning and improvement goals; identify and perform appropriate learning activities; systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement; incorporate formative evaluation feedback into daily practice; locate, appraise, and assimilate evidence from scientific studies related to their patients’ health problems; use information technology to optimize learning; and, participate in the education of patients, families, students, residents and other health professionals; participate in mortality and morbidity conferences that evaluate and analyze patient care outcomes; and utilize an evidence-based approach to patient care.

Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals. Residents are expected to: communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds; communicate effectively with physicians, other health professionals, and health related agencies; work effectively as a member or leader of a health care team or other professional group; act in a consultative role to other physicians and health professionals; maintain comprehensive, timely, and legible medical records; counsel and educate patients and families; and effectively document practice activities.

Regarding professionalism, residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles. Residents are expected to demonstrate compassion, integrity, and respect for others; responsiveness to patient needs that supersedes self-interest; respect for patient privacy and autonomy; accountability to patients, society and the profession; sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation; high standards of ethical behavior; and a commitment to continuity of patient care.
Regarding systems-based practice, residents must demonstrate an awareness of, and responsiveness to, the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents are expected to work effectively in various health care delivery settings and systems relevant to their clinical specialty; coordinate patient care within the health care system relevant to their specialty; incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care as appropriate; advocate for quality patient care and optimal patient care systems; work in inter-professional teams to enhance patient safety and improve patient care quality; participate in identifying system errors and implementing potential systems solutions; practice high quality, cost effective patient care; demonstrate knowledge of risk-benefit analysis; and demonstrate an understanding of the role of different specialists and other health care professionals in overall patient management.

Finally, regarding residents’ scholarly activities, the curriculum must advance residents’ knowledge of the basic principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care. Residents should participate in scholarly activity, and the participation of residents in clinical and/or laboratory research is encouraged. The sponsoring institution and program should allocate adequate educational resources to facilitate resident involvement in scholarly activities.

Achieving surgical competence is a complex, multi-factorial process that requires not only mastery of an enormous body of didactic information and knowledge, but also years of practical experience and training. Ample appropriate educational opportunities must be available to the residents in order to allow them to acquire necessary knowledge, experience, judgment, and skills. A strong, broadly based understanding of anatomy, physiology, immunology, pathology, nutrition, metabolism, and surgical principles is a fundamental requirement. Similarly, surgical judgment, which is particularly challenging to teach, is critical to providing optimal patient care. Although knowing what to do (knowledge), how to do it (experience), and when to do it (judgment) are essential aspects of surgery, having the requisite skills is also mandatory.

As previously discussed, Halsted’s model placed a heavy emphasis on the science of surgery and related disciplines while simultaneously immersing trainees in a supervised clinical setting with increasing levels of responsibility. In essence, his introduction and advocacy of this structured apprenticeship formed the basis of the modern American residency system (7).

However, surgical training has undergone virtually continuous scrutiny and modification during the past 50 years. With the introduction of new technologies, more complex procedures, and a plethora of external constraints at an unprecedented rate, the doctrine of learning primarily through supervised patient care experiences has been inexorably eroded and, therefore, increasingly superseded by efforts to teach in nonclinical environments (8). The primary emerging concern has been the acquisition of technical skills, a goal that has been somewhat neglected or taken for granted (“see one, do one, teach one”) in the past. Teaching technical skills outside of the operating room makes intuitive sense, but was not pursued during the past 30 years in large part because of the pressures on teaching in animal laboratories by antivivisectionist activists, regulators and legislators.

Additionally, in the late 1980s, the concept of skills training at bench stations for general surgery residents was introduced. Subsequently, refinements were made in these novel teaching modules that incorporated feedback and performance assessment with validated ratings (9, 10, 11). Thus, the stage was set for a paradigm shift in training and re-training general surgeons using simulation-based training as an adjunct to, and in preparation for, hands-on clinical surgery. The introduction of laparoscopy in the 1990’s acutely accentuated the interest and activities of surgical education in pursuing simulation-based training. Laparoscopic procedures absolutely required surgeons to develop new skills.

In their treatise on ‘Surgical Skills Training and Simulation,’ Daniel B. Jones and his colleagues have summarized adroitly the events which have led to the sea-change in the education, training and practice of general surgery during the past two decades (12). “All too often,
they were ill prepared and had not received adequate training to become proficient with 2-dimensional imaging, diminished tactile feedback, and hand-eye coordination required for laparoscopic procedures. Accordingly, the incidence of complications, including common bile duct injuries, skyrocketed 5-fold (13). It became apparent that many of these skills could be effectively taught in laboratory settings, using either animate or inanimate models (14-19). As a result, the surgical community began to embrace the use of models and simulators” (12).

The 1999 National Academy of Sciences Institute of Medicine report, “To Err is Human: Building a Safer Health System,” raised awareness of patient safety issues. It documented that as many as 98,000 deaths per year could be attributed to medical errors, many of which were classified as “preventable” (20). Although this report largely ascribed the occurrence of errors to system factors, including a wide range of nonsurgical areas, “error in the performance of an operation” was cited as one of the many root causes. The uncontrolled introduction of laparoscopic cholecystectomy made the public and surgical community more aware of the implications that surgical training could have on patient safety. Costs of adverse events were also an issue. Complications related to surgery can triple the length of stay and increase costs by more than 600% (21). Cost issues have made third party payers keenly aware of training and surgeon competency, and have prompted movements to link reimbursement with quality of care (22).

“In addition to increased global awareness of patient safety and complication-related expenses, other financial constraints have spurred changes in surgical training practices. Operating room time is a precious commodity. Although training residents in the operating room is essential, this practice prolongs procedure duration, and thus, expense. A 1999 study by Bridges and Diamond (23) documented that operations in which residents were trained lasted 12.6 minutes longer than cases in which faculty operated alone. Although this difference in operative time does not seem very large, the costs approach $53 million a year when extrapolated to more than 1,000 general surgery residents who each graduate having accumulated about 1,000 cases. A 2004 study by Babineau and colleagues documented an 8- to 44-minute increase in operative time for resident training cases and emphasized the tremendous costs for faculty time (24). Given the financial pressures on hospital systems to curtail costs, administrators scrutinize additional operating room expenses, and their actions or decisions often limit training opportunities. With many surgical training programs heavily reliant on faculty reimbursements, there has been mounting pressure on faculty to increase efficiency. The more time faculty spend teaching, the less time they have to take on additional cases (generating more income) or to pursue other income-generating (seeing patients) or academic activities. Coupled with decreasing reimbursements and escalating malpractice premiums, economic pressures on graduate medical education have fostered a shift in training practices” (12).

“Several flaws in the old system have been exacerbated by other recent changes in resident training. In the immersive, experiential model, it took long hours and few days off to give each trainee a fair likelihood of seeing all of the index cases and gaining ample experience. However, the introduction of the 80-hour work week by the Residency Review Committee (RRC) in 2003 limited clinical exposure for residents. The surgical community questioned whether resident training and quality of care could be maintained despite compromised case volumes and clinical experience.”

“Studies have indicated that the 80-hour work week has not adversely affected case volume. However, current case volume may be insufficient for training residents, especially in areas of new technologies. Furthermore, the growing prevalence of minimally invasive procedures has made it more difficult to acquire adequate experience performing traditional operations. For example, because open common bile duct explorations have become increasingly rare, there has been a dramatic rise in the incidence of technical complications. This problem suggests that training methods to overcome this experience gap should be improved” (12, 25).

“In response to the multitude of factors currently influencing graduate medical education in surgery, there have been concerted efforts to reform training practices (26). Given the limitations in clinical exposure, a change in curricula and reorganization of resident educa-
tion may be the solution (27-30). The use of new technologies for educational purposes is a central component in reorganization. Traditional textbooks are being augmented and largely replaced by interactive Web-based and digital media platforms. Video education has become mainstream in the learning of new procedures. Similarly, the use of simulators has gained significant momentum. Simulation plays an increasingly important role in the educational process, and serves to fill the most important gap in the current training model – operative exposure” (12).

“Simulation provides the opportunity for trainees to learn in a controlled environment free of any adverse consequences to actual patients. The high-pressure atmosphere of the real operating room is replaced with simulators. From an ethical standpoint, simulation makes sense. From a learning perspective, separating practice from performance in the real environment has proven invaluable in mastering skills and gaining expertise in other fields, such as sports, music, chess, and aviation (31, 32). Simulation affords a unique opportunity for deliberate practice, as proposed by Ericsson, whereby expert performance can be developed through intentional and continuous practice of essential tasks (33). With continued advances, simulation may provide important opportunities for surgeons to practice operation before ‘show time’ (eg, performance in the clinical environment). Certainly, professional musicians would never perform a concert without extensive rehearsing” (12).

“Although surgical simulation is comparatively new, simulation in other high-stakes fields is more mature. The use of simulators in aviation dates back to the development of the Link trainer in the late 1920s and early 1930s (34). Even though this system was relatively simple, it was quite effective in providing pilots with a means of training without actually flying an airplane. This practice was cost effective and dramatically improved flight safety. Today, flight simulators are extremely sophisticated, replicating all facets of the actual aircraft environment and costing as much as $20 million. ‘Checking out’ on a simulator, as mandated by the Federal Aviation Administration (FAA) for commercial airline pilots, is an integral part of initial training, and an annual requirement for ongoing certification. Moreover, pilots must repeat the sequence of simulator-based training any time they wish to change to another aircraft model. These requirements are in place despite the absence of randomized, prospective trials demonstrating the value of simulation for pilot training to passenger safety. Simulation requirements for pilots far surpass those currently used for surgical education, and may serve as a model for our field as it continues to evolve” (12, 35).

“The complexity of the human body – with its variability in anatomy, disease states, and physiology – broadens the range of unpredictable situations compared with piloting of a precision-engineered aircraft. Nonetheless, similar lessons have been learned regarding surgeon training using simulators. By mastering basic hand-eye coordination skills before a procedure is performed, residents can focus their attention on the nuances of anatomy, surgical technique, and other aspects of the procedure. Residents who are pre-trained in skills may possibly reach proficiency with a fewer number of cases. Residents could arguably learn more efficiently in the skills laboratory than in the clinical environment, since skills laboratory training is a focused and structured endeavor specifically designed for explicit learning objectives. This is far different from the complex operating room environment, where many factors can hinder the degree to which the experience is organized for the purpose of teaching. At a minimum, skills laboratory training has demonstrated effectiveness in improving operative performance. Numerous studies document faster operations with fewer errors and better objective measures of performance during actual operations following focused curricula in the skills laboratory. Several investigations now under way are expected to document improved patient safety as a result of simulator-based training” (8, 12, 36-41).

“Despite the available evidence for effectiveness of carefully structured curricula, surgical simulation has been slow to reach widespread use in residency programs. In 2004, a survey by Korndorffer and colleagues documented that of 162 programs, only 55% had skills laboratories (42). Moreover, only 55% of the programs with skills laboratories had mandatory training requirements – indicating that only approximately one-fourth of the 253 programs in the United States were conducting
skills laboratory training using structured curricula. The study also showed that equipment and resources varied widely, with no standardized curricula or training practices. Nonetheless, 85% of residency programs considered skills training laboratories effective in improving operating room performance. In 2006, a survey by Kapadia and colleagues indicated that of 34 skills laboratory programs that responded (85% response rate), only 62% had a documented curriculum (43). This study also confirmed that physical and personnel resources varied widely. Importantly, there was strong agreement among programs in the positive value of skills training facilities: 96% of programs supported a national skills curriculum (12).

“Fortunately, significant momentum is being gained at a national level, with several organized initiatives underway. In 2004, the American College of Surgeons (ACS) and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) launched the Fundamentals of Laparoscopic Surgery (FLS) program, which represented the first validated simulation module to be standardized, packaged, and made widely available. This program has been tremendously successful. In 2008, it had sufficient industry grant support to provide every residency program in the United States with adequate simulator and didactic materials, along with testing vouchers for the training and certification of all graduating residents. To raise the standards for surgical education, the ACS established a program for accrediting Education Institutes in 2006 (44). The goal of the program was to enhance patient safety and care through simulation-based education, with the overarching vision of improving training for residents, practicing physicians, and other learners. By 2007, there were 10 ACS accredited centers; by 2008, there were 27, indicating that approximately 10% of residency programs had met rigorous criteria for resources, personnel, curricula, and research” (12, 45).

“The Residency Review Committee (RRC) for Surgery has also stressed the need for skills training and has implemented a requirement for all programs to have access to a basic skills laboratory starting in 2008. Although the RRC has not established a framework of standards governing minimum skills laboratory requirements, this mandate marks a turning point in the history of simulation-based training in surgical education. Practicing outside of the operating room will no longer be optional for residency training. Many programs are now working toward acquiring the resources needed to establish skills laboratories and identifying the best methods for incorporating skills laboratory training into their residencies while adhering to the 80-hour work week. A national skills curriculum has been created by the ACS in conjunction with the Association of Program Directors in Surgery (APDS), and will undoubtedly serve as an invaluable resource for programs organizing their skills laboratory efforts (46). This national skills curriculum is Web-based and available free of charge (47). Importantly, this curriculum uses, to the maximum extent possible, proven methods for training, including distributed, deliberate, and structured practice using performance-based endpoints” (12).

Along with the ACGME, the American Board of Surgery (ABS) has adopted the core competencies and has instituted several initiatives aimed at ensuring the competency of practicing physicians. Although many aspects of the ABS guidelines can be verified using conventional methods, new strategies for assuring competency are needed, especially for evaluating performance in practice, which currently relies on clinical outcomes derived from databases. To ensure more uniform acquisition of the knowledge necessary for board certification, the ABS has also developed an initiative for a national curriculum for surgery residents (48).

“Given the numerous parallel efforts toward educational reform, major stakeholders have joined forces and formed the Surgical Council on Resident Education (SCORE) (26, 48). This council – a voluntary consortium with representation from the American Board of Surgery (ABS), the American College of Surgeons (ACS), the American Surgical Association (ASA), the Association of Program Directors in Surgery (APDS), the Association for Surgical Education (ASE), and the Residency Review Committee for Surgery (RRC) – is coordinating comprehensive efforts regarding national curriculum initiatives for both cognitive and skills training. Of note, SCORE has embraced the ACS/APDS Surgical Skills Curriculum for inclusion in the nation’s residency curriculum. Skills training and simulation in surgical education have evolved from a practice
pursued by a few pioneers to a mainstream modality that is likely to undergo significant expansion as patient safety concerns, work hour limitations, costs of training, and emerging technologies continue to drive its development” (12).

“For the past few years, the education of U.S. general surgeons has been the sole agenda of the Surgical Council on Resident Education (SCORE). The goal of SCORE is to develop a new competency-based curriculum focusing on the skills, knowledge, and attitudes general surgery residents should possess by the time they complete training. For the past 100 years, general surgery residency has been a time-based experience; the assumption has been that 5 years of association with skilled faculty surgeons should be sufficient. This system largely worked for many years and produced many excellent surgeons. However, today’s residents are exposed to so many subjects, specialties, and procedures that a time-based system is not sufficient. This is why we must move from a time-based to a competency-based curriculum” (49). No longer will it be valid to assume that simply because a period of at least 5 years have been spent in surgical training that the resident is qualified to practice general surgery independently. Evidence that requirements have been met in achieving the expected competencies will necessarily be tested and documented before credentialing the residency graduate as a safe, competent general surgeon.

“Building a curriculum requires defining the competencies expected of graduates, creating or choosing instructional materials, delivering the instruction, and testing the learners. In defining the competencies, SCORE has used the six competencies developed by the Accreditation Council for Graduate Medical Education: patient care, medical knowledge, professionalism, communication, practice-based learning, and systems-based practice. To this list, SCORE has added technical skill” (49).

“To define the patient care competencies, SCORE committee members first identified which diseases general surgeons should be able to treat and which operations they should be able to perform, and then established the level of knowledge or skill required. Ultimately, the SCORE group recommended that diseases be divided into two groups, broad and focused, and that operations be distinguished as essential or complex” (49).

Richard H. Bell, Jr., Assistant Executive Director of the American Board of Surgery, in a recent editorial in the American College of Surgeons “Surgery News,” summarized his opinion with the following. “For those concerned that such an approach diminishes general surgery, I would argue that this process gives an identity to general surgery. There are more than 200 diseases in the broad category and more than 100 operations in the essential category. Surely that’s enough to allow for a gratifying and varied practice. The list of diseases and operations and an explanation of the methodology can be found at www.absurgery.org” (49).

In their monograph on “Surgical Skills, Training and Simulation” in Current Problems in Surgery, D.B. Jones and his colleagues have summarized and outlined how these new technologies have affected, and how they will be integrated in the future with, the national surgical curricula, credentialing, and certification as follows, with modifications. “In response to the changing landscape of surgical education, the American College of Surgeons (ACS) and the Association of Program Directors in Surgery (APDS) have collaborated to form a National Skills Curriculum with the goal of providing access to uniform curricula for surgical residency programs. The motivation behind this undertaking is several-fold. The Resident Review Committee mandate for the 80-hour work week in 2003 placed considerable constraint on the ability of program directors to achieve educational goals and case volume. In addition, the American Council for Graduate Medical Education (ACGME) recently increased the minimum case volume requirements for graduating general surgery residents in the United States from 500 to 750 major cases. To resolve the conflict between decreased training opportunities and increased case requirements, together with the cost of training residents in the operating room and the heightened national awareness of patient safety issue, a change in the training paradigm is likely required. Accordingly, surgical skills and simulation training will play a large role in this shift” (12).

“The ACS has begun to support a shift in the landscape of surgical training by their accreditation process. In addition, the Residency
Review Committee for Surgery has mandated that all surgical residency programs must have a skills curriculum. Despite these measures, significant lack of uniformity regarding skills curricula remains among training programs (42, 43).

“In 2005, the ACS and APDS formed the Surgical Skills Curriculum Task Force. Their goal was to form an accessible and affordable curriculum that prepared trainees for the operating room and the care of patients with appropriate assessment of their proficiency. The ACGME Core Competencies of medical knowledge, patient care, interpersonal and communication skills, professionalism, practice-based learning and improvement, and systems-based practice served as the scaffolding for the task force curriculum, which was outlined in 3 phases. The basic model of the curriculum was to have uniform practice modules preceded by a video tutorial, followed by practice with defined performance goals, and verification of performance. Verification is accomplished by a global rating scale through either direct proctoring or video-taped review. Failure to achieve benchmarks can be remediated. Verification of proficiency allows the trainee to check off the task and to progress to more advanced tasks” (12).

“The ACS-APDS National Skills Curriculum is designed for implementation within a 5-year pathway for all surgery trainees. Phase I has identified skills that could be taught using inexpensive models and low fidelity simulators (tab. 1). All modules establish clear objectives, common errors, assessment metrics, and provide selected readings. Phase I is available to surgery program directors online at the ACS web site. Phase II identifies a core of operations that might be better understood using video and simulators (tab. 2). Phase III proposes the use of whole-body simulation scenarios to reinforce key concepts of leadership and team training, such as what to do if the sponge count is incorrect or how to respond in a laparoscopic crisis” (tab. 3) (12).

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cal tasks (sutting, knot tying), critical care skills (airway management, central venous access), endoscopic skills, laparoscopic skills, and open surgery/speciality surgery skills (arterial anastomosis, bone fixation). Many of the tasks are based on established systems of training such as the Fundamentals of Laparoscopic Skills (FLS) for the basic and advanced laparoscopic skills modules. They follow the conceptual guidelines of tutorial, practice, and verification proficiency. In the case of the laparoscopic modules, a video tutorial is followed by proctored pretesting for baseline performance, self-practice to the level of expert benchmarks, followed by a proctored posttest. Remediation is allowed for failure” (12).

“The Phase II modules, Advanced Procedures, were adapted and launched in 2008, and were designed to build on the core tasks of Phase I and applied to procedure modules. Several validated global ratings are being applied to these modules for proficiency verification” (12).

“The Phase III modules are based on Team-Based Training and are distinguished from the first 2 modules by the inclusion of nontechnical skills assessment. Because of the necessity of a high level of fidelity, the use of multidisciplinary team members or confederates, and the more complicated nature of assessing nontechnical skills, Phase III is perhaps the most ambitious of the curricula. However, the basic model of tutorial, practice, and assessment remains the same as with all the phases of the curriculum” (12).

“The credentialing and certification of surgeons as part of continuing education is not a new concept. Advanced Trauma and Life Support and Advanced Cardiac Life Support are just two examples of national, uniformed curricula that have been widely adopted. Currently, the American Board of Surgery utilizes the 6 core competencies established by the ACGME for their Maintenance of Certification (MOC), a program to supplant the traditional 10-year recertification examination. The concept behind MOC is to allow continual learning over time. The program is divided into 4 parts: 1) evidence of professional standing through maintenance of unrestricted medical license, hospital privileges, and satisfactory references, 2) evidence of commitment to lifelong learning through continuing education and periodic self-assessment, 3) evidence of cognitive expertise based on performance on a secure examination, and 4) evidence of evaluation of performance in practice, using tools such as outcome measures and quality improvement programs, and the evaluation of behaviors such as communication and professionalism (50). However, technical skills training and simulation are not yet a part of a cohesive national curriculum” (12).

“Nationalization of skills certification is also emerging in the form of the Fundamental of Laparoscopic Surgery (FLS) program. The CD-ROM-based curriculum and practical examination is expanding among surgical trainees and practicing surgeons, and now also includes a training box, test vouchers, and access to on-site or regional proctoring. The military has also adopted efforts to provide regimented FLS training to all military hospitals. To execute this, Uniformed Services University of Health Sciences (USUHS) provides lectures based on slides produced from the FLS didactic material, followed by mentored practice on the FLS trainer box and a proctored examination. Furthermore, the primary insurance provider for the Harvard teaching hospitals has provided, as part of a Patient Safety Incentive Program, a one-time $500 incentive for participating in a FLS postgraduate course and proctored examination. This represents an unprecedented collaboration between an insurance carrier and major surgical societies (the ACS and SAGES) to provide incentive-based skills training to practicing surgeons for the purpose of malpractice risk reduction and patient safety. Finally, in 2009, the ABS mandated FLS as a prerequisite for certifying surgeons” (12).

“Integrating new procedures or surgical devices into surgical practice can occur with formal fellowships, industry-directed courses, other postgraduate courses, or proctoring. A landmark example of the use of proficiency-based simulation is virtual reality (VR) training for carotid stenting, which is supported by the Society for Cardiovascular Angiography and Interventions, the Society for Vascular Medicine and Biology, and the Society for Vascular Surgery, as well as being adopted by the FDA as a component of physician training for carotid stenting (51). Multiple studies have demonstrated validity of using the simulator for training surgeons in endovascular techniques. It remains to be seen if the precedent set by simulated training for endovascular
techniques, and industry-driven or malpractice carrier-driven proliferation of the FLS program will serve as early examples of skills training and simulation becoming an integral part of surgical education and continuing education as a whole.”

“With skills training and the concept of learning curves, the idea has been generated that innate ability may impact the time to proficiency. Prescreening of surgical candidates for technical skills and nontechnical skills may be an area of discussion and controversy. Currently, the Objective Structured Clinical Examination (OSCE) is incorporated into the United States Medical Licensing Examination (USMLE) Step 2, and involves patient simulation into training and assessment. Currently, there is no technical or procedural skills component involved in the evaluation of medical students or residency candidates. Indeed, there may be no role for establishing a basic technical skills set before enrollment in a postgraduate training system designed to teach such skills. However, innate skills may be construed to predict the success of future physicians involved in procedurally based fields such as surgery. Although a basic set of innate abilities may predict future technical performance, there may be considerable controversy regarding the assessment of such skills as a gatekeeper for recruiting candidates for surgical training (52). At this time, sufficient data are lacking to demonstrate an advantage of assessing the baseline or innate skills of candidates seeking training in surgery” (12). However, several studies are currently in progress to evaluate this hypothesis.

“A unique potential exists with the advent of Natural Orifice and Transluminal Endoscopic Surgery (NOTES) as simulation and skills training approaches the forefront. As with the new set of skills required that has accompanied the development of the laparoscopy and minimally invasive procedures, NOTES will require a new set of tools, technical skills, and collaboration between GI endoscopists and minimally invasive surgeons. However, the progress of skills and simulation training already has a head start, and can be integrated with the actual procedural development of NOTES. This means that benchtop or VR models that can be developed with their laparoscopic and endoscopic counterparts as a foundation can serve both as a practice medium as well as an environment for procedure development” (12).

“Furthermore, high-fidelity immersive simulation may have application in studying the human factors involved in crisis management of NOTES scenarios where surgeons, anesthesiologists, and endoscopists interact closely during an operation. A tangential area which has been emerging rapidly in clinical practice is single-incision laparoscopic surgery (SILS) or single-port surgery (53). Similar challenges unique to NOTES are evident in the form of poor triangulation of instruments, difficult retraction, and decreased visualization. Although the clinical experience with laparoscopic surgery using a single access point continues to mount, the use of existing dry-laboratory modalities in the form of video trainers or virtual reality has yet to be developed” (12).

Finally, the evolution, refinement and application of robotic technology, and its increasing translation to complex surgical procedures, continues to stimulate excitement among its pioneers and advocates, and may well eventually require that acquisition of unique skills, techniques, and experiences indigenous to its mastery be incorporated into general surgery training programs. Training modules in the use of robotic technology are already in use in a few centers, and are likely to propagate as clinical application increases, and the high cost of the investment in this sophisticated technology and its associated training equipment decreases. However, at this time, there appears to be less than enthusiastic interest, incentive or indication for incorporating robotic technology uniformly into general surgery training programs.

“In an era of rapidly expanding technology, a shorter training work week, and ever increasing public scrutiny of surgical outcomes, the surgical skills training and simulation center has been embraced for training and competency assessment. The adage of ‘see one, do one, teach one’ has been replaced with a new educational heuristic of ‘perfect practice makes perfect.’ The new ethos advances patient safety through simulation and proficiency-based skills training” (12).

In the words of Charles Darwin, “It is not the strongest species that survives, nor the most intelligent, but the one most responsive
to change.” The education and training of surgeons will continue to evolve, adapt, and change, as it always has in the past, in response to new concepts, technologies, techniques, approaches and advances in experience and knowledge gained not only from the practice of surgery (routine and experimental), but also from information and data derived from basic science research and from the generation of new knowledge and experiences in other medical disciplines; and indeed, incorporated or adapted from other professional, commercial and industrial fields of endeavor. However, those of us who are dedicated to maintaining and advancing excellence in general surgery currently and in the future must confront and overcome the many challenges which exist today and continue to emerge, if we are to succeed in nurturing the growth and development of our students and residents not only to acquire competence, but also to achieve elite status as general surgeons.

The major deterrents to students choosing a career path in general surgery are the tremendous financial sacrifices which are daunting to most of them and must be overcome if interest in general surgery is to be revived and stimulated. Funding for medical education has been grossly inadequate for decades and has resulted in the accrual of medical student debt at the $200,000 level at graduation from medical school and, therefore, faces them at the beginning of their residency training. This is an onerous negative incentive for students to embark upon a 5-6 year period of additional substandard subsistence, also likely to be associated with the further accumulation of debt; which is usually the case in general surgery training programs. They will favor shorter training programs in other specialties, especially those which are less stressful and labor intensive, and which have better reimbursements for their services after completion of training. Thus, general surgery has lost its former large candidate pool of exceptional and gifted medical students, and is likely to continue to do so unless prompt corrective action is taken to overcome this major impediment. Moreover, the currently inadequate, unfair, and decreasing reimbursements for general surgery services upon completion of training make it almost impossible to not only overcome the incurred debt load of education and training, but then to fulfill the significantly large financial obligations of embarking upon a general surgery practice and of raising a family.

This situation is compounded further in addressing the need for, and needs of, women in general surgery. Currently, virtually one-half of all medical school graduates in the USA are women; they are generally as highly intelligent, talented and motivated as their male counterparts; some of them aspire to becoming general surgeons and more should be actively encouraged to do so; they de facto must be considered seriously and unconditionally in the candidate pool if optimal excellence is to be achieved in the general surgery training program recruitment process; and, therefore, special attention must be directed toward making a career in general surgery as appealing to women as possible by accommodating their unique requirements and incorporating the appropriate modifications into general surgery training and practice without compromising patient care. It can be done, it must be done, and it will be done if general surgery is to survive and thrive as an elite professional goal.

It is an obvious fact, and seldom discussed, that all surgeons, but especially general surgeons, have made an extraordinary personal sacrifice for the privilege of serving society. Because of spending a prolonged portion of their early lives dedicated to pursuing their dreams, surgeons obligatorily, but willingly, sacrifice their youth to achieve their personal and professional education, training, competence and goals. By the time they complete their 14 to 20 years of sustained, intense study and training after high school in order to prepare themselves to provide service to their patients, they have surrendered and lost the flower of their lives. They are more than 30 years old; they are “over the hill” biologically; and they are usually saddled with economic, cultural, responsibility and maturity burdens and handicaps. Thus, they are significantly disadvantaged and “behind” their peers of the same age who have chosen to pursue other less demanding professions or livelihoods. This sacrifice had formerly been accepted and acknowledged as both an obligation and a privilege indigenous to this noble vocation. However, in today’s world, idealism, values, and self-sacrifice are eroding and all too often are being replaced by practical, economic and self-gratification considerations. We must do what-
ever we can to reverse this trend before the quality of general surgery patient care becomes an unacceptable embarrassment to our profession, and the status of general surgeons declines to the level of “barber surgeons” and technical assistants.

Accordingly, we must increase the appeal and desirability of general surgery as a career choice in order to attract the best and the brightest students into our training programs. Some suggestions for potential achievement of that goal, in addition to correction of the aforementioned problems, are as follows. The burdensome and demanding workload of the general surgeon must be decreased as much as is possible without compromising patient care and safety. This can be accomplished in part by increasing the numbers of general surgeons trained; increasing the efficiency of general surgeons individually and of the systems in which they operate; increase the numbers of trained support personnel, including nurses and their assistants, physician associates, and other physician extenders; increasing the use of team, group or other associations in the practice of general surgery, in preference to the demanding and unyielding constraints of solo practice; and learning to live with, and accommodate to, the 80 hour work week, especially by maximizing efficiency, patient care continuity and safe, timely, effective transfers of patient information and care among the members of the general surgery team. Moreover, all efforts to reduce the 80 hour work week to lower levels should be resisted adamantly and defeated soundly. General surgery is not a 40 or 50 hour a week job; it is a vocation and a responsible profession which requires a greater investment of time and talent than is possible to achieve in a minimal work week.

For the first time in history, we have the co-existence of four distinctly different generations, not only of our total population, but also comprising our general surgery healthcare teams at all levels. Each of these generations thinks and acts differently, and has prejudices against, and conflicts at times, with the others. Accordingly, optimal success in creating a cohesive and effective team is absolutely dependent upon adroit management of the strengths and weaknesses of each group. The following observations regarding the characteristics of the individual generations are made in general, are not hard and fast, do not fit everyone in the generation, and may cross over, especially for those who were born on the cusp of two generations. Each generation consists of a group of people born essentially during the same lifespan; they share common life experiences; they share the same historical events and influences; and they share characteristics manifested in their professional performance of training and workplace duties.

The oldest generation, those over 65 years of age, are known as the Traditionalists, and make up much of the leadership of academic general surgery. They identify with traditional values such as religious faith, loyalty and pride of country. They grew up living under the influence of the Great Depression, World War II, and Social Security. They have a profound respect for authority, and they work well in a hierarchical system. They expect decisions to be made from the top-down, and they may not feel comfortable thinking “outside of the box.” Traditionalists are motivated by verbal or written praise or awards, and they aspire to receive the “gold watch” at retirement.

The Baby Boomers are those between ages 47 and 64 years. Their generation is defined by the civil rights and women’s rights movements, the Vietnam War and Watergate, and they make up much of the active practitioners and teachers in general surgery. They want to lead and succeed by building consensus, and they strive to accomplish this by having frequent meetings. They crave formal recognition and want to be the heart of the team. They like to see their names in newspapers or in other printed materials. Their leadership style is to delegate and to want others to work together as a cohesive team.

Generation X consists of those between ages 27 and 47 years, who grew up with rapidly advancing technology, the Internet and MTV. They observed current events from around the world develop and unfold on their computers and television screens. They are comfortable with diversity in part because of this readily available exposure to other cultures. They do not care about authority, and they are not motivated by what is good for the institution or organization. They are not comfortable with bureaucracy or micromanagement, and they appreciate open two-way communication. They want to know what is going on; how things are
going; and they crave feedback from the other members of the team or staff regarding their own performance. Technology is important to them, and it is a priority for them to be provided with adequate technological resources such as computers, software, cell phones, "Blackberries," I-Pods, etc.

The youngest generation currently in the workforce is known as Generation Y, or the Nexters, and is made up of people below the age of 27 years. They are the most technologically savvy and able generation, and they are comfortable with multitasking, which has its good and bad aspects and results. Similar to the Generation Xers, the Nexters are globally minded, and one of their highest priorities is spending time with their families. They love information. They enjoy continuing education opportunities and networking. They will follow a strong leader, but not one who they perceive as incompetent or unworthy. They believe in allowing themselves and others to get jobs done on their own schedules rather than being required to “punch a time clock.” They want to excel, and they will live up to, or down to, the expectations of their leadership, depending upon how effectively they are motivated and supported. This generation, and the Xers, comprise a majority of our students, residents, and trainees in general surgery today.

To build an effective and successful team and program in general surgery, one must be cognizant of, and pay attention to, the characteristics and needs of the different generations. The most important way to manage or overcome a generation gap is through communication. However, the groups differ in their preparedness in this regard. For example, Traditionalists do not like emails and prefer formal documents, rules and regulations, business plans, etc. On the other hand, generations X and Y prefer the fast pace of electronic communication. Expectations must be managed for each generation. Traditionalists and Baby Boomers will gladly work more than 40 hours a week; however, the younger generations, Xers and Yers, want to finish their work and get on with enjoying life outside the hospital. They appreciate flexible schedules and opportunities for telecommuting and telecommunicating. To accommodate the needs of each group, the focus must be on flexibility, involvement in the decisions that affect them and the group, and seeking new scheduling opportunities and care delivery models (54).

Regardless of generational considerations and difficulties, it is my firm belief and philosophy, after spending a half century in academic pursuits, that the following requirements, principles and practices apply to all members of the general surgery profession, and especially to the surgical residents. They must possess, or strive to achieve, to the best of their potential, the intrinsic, manifest, and practical personal core virtues essential to an elite surgeon (tab. 4, 5, 6). From among these can be gleaned what I believe to be the most important, or cardinal surgical virtues, which include resourcefulness, equanimity, proficiency and courage. Resourcefulness is the ability to act effectively, imaginatively, spontaneously, and consistently, especially in dif-

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<td>Dudrick SJ</td>
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<th>Table 5. Surgical Virtues – Manifest</th>
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<td>Altruism</td>
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<td>Character</td>
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<td>Kindness</td>
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<td>Persistence</td>
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<td>Caring</td>
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<td>Industry</td>
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<td>Accountability</td>
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<td>Communication</td>
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<td>Professionalism</td>
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<td>Strength</td>
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<td>Skill</td>
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<td>Excellence</td>
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<td>Equanimity</td>
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<td>Sense of Humor</td>
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<td>Attention to Detail</td>
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<td>Affability</td>
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<td>Good Attitude</td>
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<td>Respect</td>
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<td>Advocacy</td>
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<td>Dudrick SJ</td>
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 dificult situations and/or under trying circumstances. Equanimity is the state of evenness of mind or temper; the quality or condition of being undisturbed by elation, depression, or agitated emotion; in short unruffledness. Proficiency is the virtue of being exceptionally efficient, trained, competent, and advanced in an act, skill, or branch of knowledge; it is being expert, adept, and masterful. Lastly, courage is the ability or virtue of not fearing failure, but confronting and combating it, and subsequently, should it occur, acknowledging it and enduring it initially; but then overcoming and recovering from it, while learning from it so as not to repeat it.

The entire concept and system of practice and training in medicine, especially in general surgery, is based on trust. The patient, surgeon, colleagues, residents, students, and all of the other members of the healthcare and education teams must trust each other, and perform consistently and conscientiously to justify that trust, or the system fails. A bond of unconditional mutual understanding, caring and trust must develop, usually between two strangers, such that one (the patient) consents to allow the other (the surgeon) to assume virtually complete control of the patient’s sensibilities; to render the patient unconscious and totally incompetent; and to violate the integrity and sanctity of the patient’s body physically to perform whatever surgical procedure is perceived to be indicated or required for the patient’s benefit. Can one imagine a more genuine act of trust on the part of the patient and a more awesome individual responsibility and privilege on the part of the surgeon? This interaction represents to me the ultimate human contract of trust. In large part, it is the reason why I continue to be challenged, grateful, proud, and happy to be a general surgeon. Happiness is derived from the satisfaction of doing what you want to do and like to do, and doing it well enough to be successful. We spend most of our adult lives working. Hard work breeds success; success leads to happiness; happiness encourages more hard work; more hard work results in more success and increased happiness; and the cycle continues to repeat itself. A busy successful surgeon is usually a happy surgeon.

Training in general surgery or a surgical specialty gives one the chance to become part of something special; the opportunity to discipline one’s mind; to learn how to think; to develop technical skills; to make crucial clinical decisions; to dream; to be creative; to discover new knowledge; to achieve optimal personal performance; and to earn the privilege and honor of having patients who entrust their safety and very lives into your hands. On the other hand, surgery is not for everyone. Despite the multiple methods and instruments we use to evaluate candidates for general surgery residency, no set of metrics or assessments has proven infallible, and medical students and others who have been recruited into training programs are sometimes unable to achieve minimally acceptable hallmarks of merit and quality performance, acquisition of essential cognitive knowledge and skills, etc. The conundrum is that if they cannot be remediated effectively, they must be redirected to other career pathways, which can be devastatingly disappointing to them and may even result in unpleasant, expensive, and painful litigation. However, it is clear that the program generally, and the program director specifically, are under the mandate of the ACGME to ensure that the established credentials for competency and safety in the practice of general surgery include adequate experience, judgment and wisdom. This is our absolute obligation and responsibility to society. We are the “keepers of the flame” and must maintain the highest standards of the profession. Prophylaxis or correction of this persistent enigma remains inadequate and represents a continu-

Table 6. Surgical Virtues – Practical

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<tr>
<th>Resourcefulness</th>
<th>Self-Confidence</th>
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<tr>
<td>Knowledge</td>
<td>Self-Discipline</td>
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<td>Ingenuity</td>
<td>Self-Control</td>
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<td>Innovation</td>
<td>Self-Sufficiency</td>
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<td>Adaptability</td>
<td>Proficiency</td>
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<td>Patience</td>
<td>Imperturbability</td>
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<td>Attentiveness</td>
<td>Focus</td>
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<td>Competence</td>
<td>Enthusiasm</td>
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<td>Accessibility</td>
<td>Experience</td>
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<td>Service Ethos</td>
<td>Leadership</td>
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<td>Good Judgment</td>
<td>Decisiveness</td>
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<td>Wisdom</td>
<td>Prudence</td>
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<td>Motivation</td>
<td>Availability</td>
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<td>Tolerance</td>
<td>Work Ethic</td>
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<tr>
<td>Spiritualism</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>Collegiality</td>
<td>Indefatigability</td>
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Dudrick SJ
ing major challenge to be solved or overcome in the selection, advancement and optimal training of general surgeons.

We must strive to imbue medical students, surgery residency candidates and general surgery residents with the concept of the general surgeon as the consummate physician, who has the most complete and exhaustive training, credentials, and experience to provide the most comprehensive patient care. As specialists in all areas of medicine and surgery increasingly narrow their focus onto their primary interests, someone must be available, willing, and competent to “pick up the slack” and to provide the total spectrum of management and care the patient needs to achieve the optimal overall desired result or outcome.

We must also resist and combat the evolution and emergence of a technically adept, but cognitively challenged “new breed” of minimally invasive “video-game surgeons” who will use their highly specialized technical skills and interests to form a coalition including cardiologists, gastroenterologists, interventional radiologists, general surgeons, advanced laparoscopic surgeons, and other surgical and medical specialists and endoscopists who will likely siphon off patients from general surgery training programs in order to showcase their technocratic skills, while being incapable of providing comprehensive care to the patients or to manage their inevitable complications. Again, we cannot allow regression of surgery to the state of “barber surgeons” or technical assistants without severely compromising the ideals of our profession and our honorable and inviolate covenant of trust with our patients.

We must dispel the notion that general surgery represents the residue after the specialists have commandeered their primary areas of interest piecemeal. We must advocate that if there is only one physician left on earth, he/she had best be a general surgeon, who is ready, willing and able to handle any pathophysiologic condition more competently than anyone else in the profession. In the future, it will be the general surgeon who will be there, when needed, fully prepared to do what is expected to be done. It will be the general surgeon who will be the best qualified and most experienced and competent physician provider for the care of the severely injured, multiply traumatized or major burn patient; for the acute non-trauma surgical emergency patient at any time of the day, night, weekend or holiday; for the critically ill or complicated patient in the intensive care units; for the patients in shock, sepsis, septic shock and multiple organ/system failure; for the management of the severely malnourished and/or metabolically imbalanced surgical or medical patient whose life may depend upon specialized nutritional and metabolic support expertise; for the achievement of respiratory, thoracic, cranial, urinary and vascular access in urgent or emergency situations; for the support of resuscitation efforts during cardiac or cardiopulmonary arrest; for continuing to acquire proficiency in state of the art thoracoscopic, minimally invasive, robotic and other new technologies and techniques as they develop and advance; for the adjunctive support of cancer patients who have received maximum anti-neoplastic therapy and are in pain or are left alone to die; for offering upper and lower endoscopy services, including feeding access, to those who have no gastroenterologists or other endoscopists available to them (one third of the USA population); for undertaking the increasingly challenging surgical care of the rapidly increasing numbers of geriatric patients; and in general, for making surgical services available to patients to whom no other surgical specialists are willing, eager, or able to provide. We will be there to provide “whatever it takes to get the job done.” Such is the mantle of general surgery, and the challenge for general surgery educators and training programs for the future in order to preserve the integrity and dignity of our “specialty.”

REFERENCES


COMMENTARY

During the 64th Congress of Society of Polish Surgeons in Wrocław, prof. Stanley J. Dudrick gave a lecture titled “Overview of General Surgery Training in the U.S.A: History and Present”. This is an extensive, 37-page paper that contains 54 references. The author presents history and current status of general surgery training and general surgery profession in the USA from the position of professor of surgery with more than 50 years of experience, from medical university, residency and practice of surgery, research, academic and administrative point of view.

According to the author, general surgery survived the crisis related to its fragmentation and creation of specific operative specialties and additional skills. An effort to create new specific specialties is aimed at the most precise performance of procedures that is subject of interest of representatives of narrow medical specialties. However, as it turned out, these specialists are unable to take care for patients who require wider approach. Only general surgeons are the best equipped to perform interventions in patients with multiple injuries, with complications beyond the scope of narrow specialties, elderly patients, as well as meet the challenged, now and in the future, related to new technologies (robotics, laparoscopy, surgery through natural body orifices, robotics and other minimally invasive procedures).

The author of the paper admits that it is ironic that U.S. system of specialist training and surgery practice is considered the best in the world while Americans know how many challenges it must meet and how many destructive changes it includes. This system is the subject of interest of a separate U.S. institution – ACGME (The Accreditation Council for Graduate Medical Education) – responsible for accreditation of 8 355 education curricula in any medical specialties.

General surgery, as other operative specialties, requires not only acquisition of medical
knowledge, patient care but also predisposition to perform surgical procedures. The above mentioned predisposition is currently more and more emphasized and requires searching for proper doctors for the profession of a surgeon. It is also appreciated in Poland where candidates for the profession of a surgeon are searched for as early as during medical studies; clinics of surgery put big emphasis on student’s scientific clubs.

The specialty of general surgery in the USA requires a lot of time and devotion. During 5-year residency, a surgeon-to-be must perform 750 surgical procedures, including 50 operative assists for younger surgeons. These procedures may be included in the overall number of procedures but apart from that, during the last year of his/her residency, he/she must perform 150 surgical procedures, showing that he/she is a trained surgeon. Experience indicates that it is difficult to perform such number of surgical procedures during residency. Furthermore, implementation of a 80-hour week of work by Residency Review Committee raises concerns whether a resident will be able to complete his/her program without decreasing the number of treated patients and limitation of acquired experience. Conducted studies showed that 80-hour week of work of a resident does not result in decreased number of treated patients but can reduce training in new technologies, in particular after implementation of minimally invasive methods may limit the number of performed conventional procedures which are necessary to acquire adequate training. As an example, doctors – experts in laparoscopic cholecystectomy, do not have adequate experience in biliary tract surgery due to lack of adequate number of open surgical procedures. Countries of European Union, where a weekly time of work of a doctor (including overtime) may not exceed 48 hours, face the same problem. In consequence, 6 years of residency in general surgery may be not enough to complete the training and perform the required number of surgical procedures.

An interesting proposition is to implement new training methods after working hours, i.e. use of phantoms, video presentations and other training methods using general informative technologies and access to internet to supplement surgery training. This is an additional help especially in acquisition of practical surgical skills and general knowledge by internet-based presentations or using telemedicine lectures.

However, whatever any supplementary technologies, learning surgery is an enormous challenge for young doctors. It takes a lot of time and comes at a cost of family life, personal contacts and essential social isolation. As the author of the paper emphasizes, awareness of being in an elitist specialty is not sufficient since surgery takes a lot of time and financial compensation is not adequate to the effort, not only during surgery training but also thereafter. These obvious facts have been known for years but except for opinions, proposals and even monitorys from surgeons, there was no response from competent government institutions that at most implement partial regulation of salaries.

In conclusion, I must emphasize that it is a valuable paper, demonstrating general surgery training in the USA for Polish surgeons. It must be pointed out that the process of resident training in general surgery should equip them with necessary knowledge, experience, proper assessment (judgment) and skills. However, essentially general problems are the same although some solutions differ. That is why the above mentioned paper will be a basis for wide discussion about the profession of a general surgeon at the sessions of the Association of Polish Surgeons and in the Polish Journal of Surgery.

Prof. dr hab. Jan Kulig
Department of Gastroenterological Surgery,
Collegium Medicum Jagiellonian University
in Cracow
Both after the session on surgery training during Conference of Polish Surgical Society in Wroclaw that I had the pleasure to participate along with prof. Dudrick, as well as after having read his paper written for Polish Journal of Surgery, I came to certain conclusions. I feel that these conclusions may contribute to discussion over curriculum of general surgery training in Poland that is currently being prepared.

Prof. Stanley Dudrick is one of the most active U.S. surgeons. For more than 50 years he has been forming foundations for the modern surgery. He is a pioneer in basic science of nutrition through central venous access, he created a method of complete parenteral nutrition. According to universally held opinion, widespread acceptance of complete parenteral nutrition is one of the 4 principal advances in the development of modern surgery, among such developments as: principles of aseptics and antiseptics, general anesthesia and antibiotic prophylaxis and therapy (JAMA 1978; 239: 192). Furthermore, complete parenteral nutrition is one of the three most important events in medical sciences that had most important effect on development of surgery in 20th century, among open heart operations and organ transplantation.

Biography of prof. Dudrick underlies his exceptional position in the community of U.S. surgeons. He is considered as one of the most prominent surgeons worldwide. He was born in 1935, in Nanticoke, Pennsylvania. His education and professional career from the very beginning indicated his exceptional professional skills as a surgeon, researcher, renown academic teacher and finally an excellent manager that contributed and is still actively contributing to creation of surgery training system in the United States that is regarded the best in the world.

In 1957 prof. Dudrick graduated with honors from Franklin and Marshall College in Lancaster. He was a honorary member of a prestigious fraternity Phi Beta Kappa and received Williamson medal. He obtained his medical doctor degree from University of Pennsylvania School of Medicine in 1961. In 1967 he completed his general surgery training, under supervision of dr. Jonathan E. Rhoads in Hospital of the University of Pennsylvania. Between 1972 and 1988 he was a Professor and Founding Chairman of the Department of Surgery at a newly founded University of Texas Medical School in Houston. Concurrently he was a Chief of Surgical Services in Hermann Hospital/The University Hospital.

In 1988 he returned to Pennsylvania and started working at Pennsylvania Hospital in Philadelphia as a Chairman of the Department of Surgery, Surgeon to the Hospital, Director of the Residency Training Program in General Surgery and Clinical Professor of Surgery at the State University. In 1990 prof. Dudrick became a head of Center for Cardiovascular Disease and a director of Nutrition and Human Performance Center, the Nutritional Support Service, and the Nutritional Science Center at Hermann Hospital and Clinical Professor of Surgery at the University of Texas Medical School at Houston.

Since 1994 he started administrative work in the area of active participation in creation of general surgery training system. He was a director of Program in Surgery at Saint Mary’s Hospital, at Yale Affiliated Teaching Hospital in Waterbury, Connecticut, and Professor of Surgery at Yale University School of Medicine. Furthermore, since 1995 he was responsible at this hospital for the whole pregraduate and postgraduate training program not only in surgery, but whole medical sciences. In 1999 he received a degree of Master of Arts Honoris Causa from Yale University. Another posts document essentially unseen professional activity of prof. Dudrick: head of Department of Surgery and director of Surgical Education for the newly integrated Bridgeport Hospital/Yale New Haven Health System (2000-2002).

Then prof. Dudrick, apart from heading Department of Surgery, became a director of Training Program in Surgery and Designated Institutional Official for Graduate Medical Education at Saint Mary’s Hospital/Yale Affiliate in Waterbury, Connecticut.

Currently, prof. Dudrick, as an emeritus head of Clinic of Surgery, is concurrently an emeritus director of Training Program in Surgery at Saint Mary’s Hospital and professor of surgery at Yale University School of Medicine.

Prof. Dudrick published more than 700 papers which indicates his exceptional profes-
sional and research position. For more than 13 years he was the most commonly cited author or co-author among general surgeons worldwide. According to Current Contents data and Institute for Scientific Information, during this time papers by prof. Dudrick were cited 2535 times! Of particular importance were papers related to systemic nutrition of surgical patients, especially patients requiring complete parenteral nutrition as well as papers on metabolic abnormalities, intensive medical care and reoperation problems.

Since 1974, prof. Dudrick was a member of editorial boards of more than 15 scientific journals. Many times he was an editor of medical journals in the area of surgery, editor of the following books: “American College of Surgeons Manual of Surgical Nutrition”, “Manual of Preoperative and Postoperative Care”, “The Surgical Clinics of North America-Current Strategies in Surgical Nutrition” and “The Biology and Practice of Current Nutritional Support”.

Prof. Dudrick is a member of American College of Surgeons, former chairman of Texan ACS Branch. He received numerous prestigious awards: American College of Surgeons Jacobsen Innovation Award in 2005, and Distinguished Service Award of the American College of Surgeons Connecticut Chapter in 2008. He was one of the founding members of American College of Nutrition.

In recognition of his contribution in the area of education and program of general surgery training, American Board of Surgery presented him a prestigious certificate of an examiner. For more than 26 years he has been a member and then senior member of Board of Directors w American Board of Surgery. He was granted a similar position by Certification Board of Nutritional Specialists. Prof. Dudrick received a total of approximately 100 prizes, medals, distinctions; furthermore he is a member of more than 100 scientific societies, including an honorary member of Society of Polish Surgeons.

Prof. Dudrick was, among others, a president of International Society for Parenteral Nutrition, the first president of American Society for Parenteral and Enteral Nutrition, a chairman of Surgery Section of the Southern Medical Association, and a president of American Society of Nutritional Support Services. Since 1985 he has been a member of Board of Trustees of Franklin and Marshall College. Furthermore he was a chairman of National Alumni Council of the University of Pennsylvania School of Medicine. In most editions of Who’s who, the name of prof. Stanleya Dudricka can be found from nearly half a century, e.g. Who’s Who in the South and Southwest, Who’s Who in America, International Who’s Who in Medicine and Healthcare, Who’s Who in Science and Engineering, Who’s Who in American Education, Who’s Who in the East and Who’s Who in the World.

When I have read in detail the paper by prof. Stanley Dudricka, most of all I was amazed by wonderful understanding of the problem of general surgery training which was the subject of the author’s paper. Using historical examples, the author reviews a changing strategy of U.S. surgeons with regard to practical surgical training. Since the very beginning, pragmatic and professional approach of people responsible for the system of surgical training in the United States of America and since the beginning of 20th century – also Canadian surgeons. Leading or even dominant role of scientific associations of U.S. surgeons American College of Surgeons and American Surgical Association in shaping the system of surgery training in the USA must be emphasized. Administrative considerations, state organizations and federal administrations came second; they were responsible for surgery training in strict cooperation with scientific associations. Later on this system was expanded to cover all training system in medical sciences. Their formation was a logical consequence of the need to institutionalize the system of surgery training, by successively American Board of Surgery in 1937, Conference Committee on Graduate Training in Surgery in 1950 that eventually evolved into Residency Review Committee for Surgery founded by 5 Pan-American organizations and representatives of U.S. government. However, irrespective of the presence of various organizations involved with shaping of the educational policy or its accreditation with regard to surgery in the United States, eventually scientific associations are responsible for the contents of the training program and practical skills that any candidate for a general surgeon must have. Despite the fact that the progress in medical sciences, including surgery, resulted in emancipation of multiple subspecialties, including narrow operative specialties,
the basic strategy of surgery training remained predominantly under control of scientific associations. Prominent surgeons, members of the pantheon of U.S. surgeons, including the father of U.S. surgeons – Philip Syng Physick from University of Pennsylvania, William Halsted from John Hopkins Hospital w Baltimore, James O’Neill, Jr, Robert Zollinger, William Scott and others always took part in these works. Prof. Stanley Dudrick can be undoubtedly listed as one of these prominent surgeons.

Since the very beginning, the system of surgery training in the U.S. had solid methodological foundations, including educational rationale of the training curriculum, competence aims of a trained surgeon, principles of verification of knowledge and practical skills, a system of gradual knowledge gaining, increasing professional responsibility, principles of supervision of education within the training curriculum both from a resident as well as an institution conducting the training. For many years, the surgery training system had to meet requirements of complete integration with national training and education system according to ACGME (Accreditation Council for Graduate Medical Education), covering 6 divisions: patient medical care, medical knowledge, practical training of the profession of surgeon, ability of teamwork and interdisciplinary cooperation, professionalism and knowledge of functioning of surgical practice system in the health care system.

Ability to quickly and effectively react to any changes in medical sciences, in particular in surgery, is particularly impressive, especially in the context of Polish situation. Technological advances, changing knowledge in the area of basic sciences – genetics, molecular biology, immunology, pathophysiology and others, is immediately reflected by adjustment of the whole organization of the training system and curriculum of the surgery training. Curriculum, methodological, economic needs are constantly monitored and are quickly verified for optimization of the training curriculum and surgery training.

Prof. Dudrick emphasizes certain evolutionary changes in the surgery training system that are related to civilization progress, changing society needs, legal and economic considerations. New challenges in this area are associated with concern over the highest level of functioning of surgery training. The same applies to the system of surgery training in Poland. This is related to preparation of mechanisms allowing for identification of the best candidates for the surgery, features that predispose to the profession of a surgeon, optimization of the surgery curriculum, theoretical knowledge, practical skills, duration of surgery training, duration of a surgeon’s work, payment, legal considerations, etc.

An important item of considerations by prof. Dudrick is an emphasis on the training program requiring multidisciplinary exercises aimed not only on gaining theoretical knowledge, but also continued practical exercises and regular practical surgery training. This could be achieved in a conventional manner but the past two decades unequivocally indicate the basic changes in the modern perception of specialty. This is related to widespread acceptance of evidence base medicine and good clinical practice, new, objective definition of surgical experience – high volume surgeon, requirement to collect and document certain number of educational points. This requires a radical change of methods of education, predominantly wider use of informative progress and related technological progress. Informative educational programs, virtual patient, virtual operating theatres, trainers, simulators, audio-visual bases of medical knowledge and surgical procedures start to play more and more important role in the current system of surgery training in the United States. However, we should be aware of the fact that this process also applies to necessary systemic modifications in Poland with regard to any operative discipline, including predominantly surgery as a basic specialty for narrower specialties.

Quick reaction to any new trends in surgery is particularly impressive. For many years now United States have had educational programs that become a part of surgery training almost immediately after a new method or surgical technique is implemented. This particularly applies to educational programs related to minimally invasive techniques in general surgery and narrower operative specialties, endoscopic techniques, methods of invasive imaging, acquisition of practical skills using virtual reality and others as well as ability to use databases, use of EBM and GCP etc. There are ongoing efforts to prepare a new educational module involving using robotics in surgery or
ability to perform operations through natural body orifices using NOTES technology.

Despite the fact that over 20 years have passed since the widespread acceptance of minimally invasive techniques, predominantly laparoscopy, efficient system of training in this area has still not been developed in Poland. Some organizational inertia, lack of efficient cooperation of all institutions responsible for the postgraduate education system and surgery training, including government institutions, payer, scientific associations, medical organizations, medical universities, in view of lack of adequate financial resources, makes the curriculum of surgery specialty somewhat suboptimal, besides theoretical preparation of solutions in this regard. It is even worse with using technology of virtual reality in the surgery training, while in many Western countries it is treated as a basic item of gaining knowledge and practical skills, in particular in the first period of general surgery training. When we compare practical requirements, number of independently performed operations or time of a surgeon’s work per week, time of resident’s work in Poland and United States, organizational solutions, amount of required knowledge and practical skills, it is easy to see basic differences between our training system and training system in the USA or even other countries of European Union. We have to be aware of enormous work that is to be done in this area.

It is easier to understand these needs after reading an excellent paper by prof. Dudrick.

Prof. dr hab. Grzegorz Wallner, M.D.
Chairman of Committee of Management Board of Association of Polish Surgeons for Postgraduate Education and Specialization
Head of 2nd Chair of General, Gastroenterological Surgery and Gastrointestinal Malignancies,
Medical University of Lublin