

Interventions to address challenges associated with the transition from residency training to independent surgical practice

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Background. Concerns regarding preparation of residents for independent surgical practice are widespread and support for junior surgeons entering practice is variable across institutions and practices. The American College of Surgeons (ACS) Division of Education partnered with the Accreditation Council for Graduate Medical Education (ACGME) to convene a National Invitational Conference to define key issues relating to the transition to practice and develop recommendations to address various challenges.

Outcomes of the National Invitational Conference. Leaders from ACS, ACGME, certifying boards, residency review committees, program director organizations, and professional societies representing the breadth of surgical specialties, along with other key stakeholders, were invited to participate in the 1.5-day conference in July 2012. Key recommendations generated during the conference included the need to focus on the transition to practice within the context of the continuum of professional development; definition of specific levels of knowledge and skills expected of graduating surgery residents; development and adoption of competency-based methods for training, assessment, and advancement of residents; implementation of special interventions during the chief resident year to prepare residents for practice; robust evaluations of residents before graduation; intake assessments of junior surgeons during the onboarding processes; and effective mentorship for junior surgeons as they enter practice. Recommendations also highlighted major regulatory, legal, and financial issues. The key role of ACS and other national organizations in implementing the recommendations was underscored.

Conclusion. The recommendations from the conference should be of great help in addressing various challenges associated with the transition from surgery residency to independent practice. (*Surgery* 2014;155:867-82.)

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MONUMENTAL DEVELOPMENTS in recent years have significantly impacted residency training and preparation of surgery residents for independent

practice. Many conditions previously requiring surgery are now treated medically; technical and technological advances have resulted in expansion of minimally invasive procedures and performance of fewer major open procedures; new regulations have decreased independence of residents as a result of close faculty supervision; and restrictions on resident duty hours have negatively impacted the experiences of surgery residents, especially as they pertain to emergency conditions.¹ Data relating to operative experiences of surgery residents have demonstrated disturbing trends. A

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study involving general surgery residents who completed training in 2005 revealed that the residents had performed only 18 of 121 procedures considered essential by program directors an average of >10 times during residency, and 31 essential procedures were performed less than once.² Also, for 63 of 121 procedures considered essential, the mode experience was zero. A more recent report on data relating to residents completing training in 2010 and 2011 revealed that median numbers of total, basic, and complex laparoscopic operations had increased during the time interval since 2005, as had the numbers of several other major operations; however, approximately 34% of essential–common operations, as defined in the Surgical Council on Resident Education (SCORE) Curriculum, were performed a median of <5 times during residency, and 4 had a median frequency of zero.³ These gaps and variable experiences with essential procedures are disconcerting because of the limited transfer of skills across procedures, other than skills associated with basic technical tasks.⁴ Another worrisome trend has been the increase in failure rates on the Certifying (Oral) Examination of the American Board of Surgery (ABS) from around 16% in 2006 to around 28% in 2012.^{1,5}

The impact of resident duty hour restrictions, especially the recently implemented restrictions on postgraduate year (PGY)1 residents, on resident training has been a source of significant concern within the surgical community. The training needs in surgery are unique and must be central in any strategy designed to offset the impact of duty hour restrictions.⁶ A recently published systematic review of studies focusing on the impact of resident duty hour restrictions on patient care and educational outcomes highlighted significant differences between surgical and medical specialties.⁷ Several studies on resident duty hour restrictions involving surgery residents demonstrated a negative impact on quality and safety of patient care, and on educational continuity. Another area of concern is the significant decrease in the experiences of PGY5 residents as teaching assistants and of PGY1 residents as first assistants.⁸ These experiences are necessary in effective technical skills training. The negative impact of restricted duty hours extends to patient assessment and management, as well. A study comparing the competence of surgery residents at the completion of training in Canada and Holland revealed no significant differences in cognitive and integrative skills, as assessed by the Comprehensive Integrative Puzzle, nor in technical skills, as assessed by the Objective Structured Assessment of Technical

Skills (OSATS); however, residents in Holland, where the duty hours are even more restricted than in Canada, performed significantly worse on managing complex patient problems, as assessed by the Patient Assessment and Management Examination (PAME).⁹ Another major concern relates to the professional development of future surgeons trained in the era of restricted duty hours.¹⁰ Results of studies relating to the impact of resident duty hour restrictions on patient outcomes and resident training need to be interpreted within the context of other factors that have also influenced the training environment during the same time period.

Perspectives of individuals accepting graduates of residency programs and of residents completing training are especially relevant with regard to preparation for independent practice. A survey of clinical department chiefs in an integrated health care system revealed a range of perceived gaps in the readiness of recent graduates of residency programs.¹¹ Nearly half of the respondents reported deficiencies in skills of these graduates relating to management of routine conditions or performance of simple procedures encountered frequently in office-based practice. Also, one-third of the respondents reported deficiencies in skills of the graduates in coordinating patient care. A recent survey of surgery fellowship program directors revealed major gaps in both surgical skills and patient management skills of individuals entering fellowship training, along with deficits relating to autonomy in the operating room and personal responsibility toward patients.⁵ In addition, a national roundtable convened to ascertain the readiness of physicians to function effectively within new health care delivery systems identified several major gaps in knowledge and skills.¹² These gaps related to systems-based practice and accountability for the health of a population, professionalism, health policy and advocacy, coordination of care, office-based practice, and lifelong learning.

The residents themselves have expressed concerns about their preparation for practice. In 2008, a survey involving 4,402 categorical general surgery residents from 248 of 249 residency programs revealed that 1,185 residents (27.5%) expressed concerns that they will not be confident to perform procedures independently before they finish training. In addition, 2,681 residents (63.8%) felt they must complete additional specialty training to be competitive.¹³ In another study, 6 classes of residents from a general surgery program were surveyed 1 year after graduation.¹⁴ Overall, the respondents felt prepared to perform only 16 of 67 general surgery operations listed in the survey, and

≥50% of the respondents did not feel that they were competent to perform several major procedures. Further, a survey of graduates of thoracic surgery residency training identified the need for better education in nonoperative areas, such as echocardiography, esophageal motility studies, and oncology protocols.¹⁵

Issues relating to preparation of residents for independent surgical practice are not limited to clinical and technical domains; they also extend to practice management and other skills. A survey of graduates of otolaryngology residency training programs revealed that almost one-half of the respondents rated their training in the business of medicine as poor.¹⁶ Similarly, a survey of recent graduates of ophthalmology training programs demonstrated that the majority of the respondents did not feel well-prepared in business operations and finance, practice management, coding and reimbursement, and advocacy.¹⁷

Concerns regarding preparation of surgery residents for practice have become more acute in recent years. Unless concrete steps are taken to address specific problems associated with this transition, the quality and safety of surgical care are likely to be impacted negatively. The American College of Surgeons (ACS) Division of Education partnered with the Accreditation Council for Graduate Medical Education (ACGME) to convene a National Invitational Conference to identify specific issues relating to the transition from surgery residency to independent practice, discuss ongoing efforts to address various problems, and develop recommendations to address challenges associated with this transition. The goal of this endeavor was to make the transition to practice safer for patients, and to support the needs of junior surgeons entering practice and of institutions and practices accepting these surgeons. The recommendations developed as a result of the conference would be addressed by the ACS Division of Education in concert with other national organizations and stakeholders. After 1 year of planning and considerable background work, the conference was convened at ACS Headquarters in Chicago in July 2012. Details relating to planning and outcomes of this conference are provided herein.

PLANNING AND IMPLEMENTATION OF THE NATIONAL INVITATIONAL CONFERENCE ON TRANSITION TO PRACTICE IN SURGERY

The Planning Committee for the ACS/ACGME National Invitational Conference on Transition to Practice in Surgery included key representatives from both organizations and several surgical specialties. A recent graduate of a surgery residency program who

was in fellowship training was also invited to serve on this committee. The list of Members of the Planning Committee appears in [Appendix A](#).

The committee reviewed the pertinent literature on this subject and identified specific issues that needed to be addressed. This process resulted in the design of a 1.5-day conference, definition of the meeting format, and selection of speakers. The conference program included a balance between plenary presentations and interactive small group discussions.

National leaders from the ACS and ACGME and from various certifying boards, professional organizations, residency review committees, and program director organizations representing the spectrum of surgical specialties were invited to the conference. Given the importance of engaging other major stakeholders, invitations were also extended to the American Hospital Association, Kaiser Permanente Healthcare System, US Armed Forces, and The Joint Commission. The names of the 65 individuals who participated in the conference and the 8 skilled recorders are listed in [Appendix B](#). Participants were assigned to small groups and small group leaders were selected. Before the conference, all participants received reading materials that included key references from the published literature and abstracts of selected articles.

The conference commenced with plenary presentations on the perspectives of ACS and ACGME regarding transition to practice. This was followed by presentation of data from recent surveys conducted by the ACS Board of Governors and the American Hospital Association. A panel then shared information on models used to support the transition to practice in 3 different settings—a large academic medical center (Houston Methodist Hospital), US Armed Forces (Army), and an integrated health care system (Kaiser Permanente). These plenary presentations set the stage for the small group discussions that addressed the following 7 topics.

- Redesign of the surgery residency training model
- Interventions aimed at chief residents to prepare them for independent practice
- Evaluation and verification of knowledge and skills of residents before graduation
- Evaluation and verification of knowledge and skills of individuals entering practice
- Mentoring, preceptoring, and proctoring of individuals entering practice
- Use of new technologies, including telementoring, telepreceptoring, and teleproctoring, to support individuals entering practice
- Regulatory and legal issues; credentialing and privileging; and financial considerations

Participants were assigned to small groups based on their areas of expertise. Each small group was asked to identify the key issues relating to the assigned topic, discuss advances that had been made in these areas, and make specific recommendations to address the gaps identified. Results of the small group discussions were presented to the entire body of conference participants by the respective small group leaders and additional ideas were generated through interactive discussions. The rich discussions resulted in a wealth of far-reaching recommendations.

OUTCOMES OF THE NATIONAL INVITATIONAL CONFERENCE

Results of the National Invitational Conference are summarized in the following sections: Perspectives from ACS and ACGME, Results of Surveys Regarding Preparation of Residents for Independent Practice, Successful Models to Support Transition to Practice, and Recommendations from Small Groups Discussions.

Perspectives from ACS and ACGME. Efforts of the ACS Division of Education have been aimed at promoting excellence in surgery and have focused specifically on transitions across the professional careers of surgeons and surgery trainees. Specific interventions have been designed to address the gaps in knowledge and skills often associated with these transitions. Changes in surgical practice, advances in science and technology, new regulations, and self-efficacy of individuals have been considered during development of the interventions. The division has used the 6 core competencies defined by the ACGME and American Board of Medical Specialties as the framework for development and implementation of structured education and training programs that involve blended approaches to maximize learning. Several standard-setting, competency-based curricula focusing on cognitive knowledge, surgical skills, and nontechnical skills have been launched, and additional curricula are under development. Valid and reliable assessment models and tools have been designed to ensure achievement of goals and objectives and to document specific accomplishments. Use of simulation in surgical education, training, and assessment has been central to these efforts. Future directions of the ACS Division of Education include expansion of mastery-based training; validation of knowledge and skills using specific standards and benchmarks; mentoring, precepting, and proctoring for surgeons and trainees; and monitoring of patient care outcomes. These efforts of the ACS Division of Education

should be very helpful in addressing challenges associated with the transition from residency training to independent surgical practice.

Efforts of the ACGME have been directed at improving health care and advancing the quality of resident education through accreditation. The Next Accreditation System is being designed to meet future challenges in the changing health care environment. Goals of the new accreditation model are to increase emphasis on educational outcomes, improve efficiencies in residency education, enhance the learning environment, foster innovation, reduce the burden of the accreditation process, and promote communication and collaboration. The Next Accreditation System will involve collection of robust outcomes data from residency programs annually, a Self-Study every 10 years, and a Clinical Learning Environment Review site visit every 18 months. Specialty-specific milestones are currently being developed to assess the trajectory of progress of individual residents within the framework of the 6 core competencies and to support competency-based advancement of residents. The focus of the Next Accreditation System on outcomes and innovation should support efforts aimed at better preparation of residents for independent practice.

Results of surveys regarding preparation of residents for independent practice. In 2011, the ACS Board of Governors and the ACS Young Fellows Association jointly conducted a survey of the senior ACS Fellows (>45 years of age) and young ACS Fellows (≤45 years of age) to solicit their opinions regarding the preparation for independent surgical practice.¹⁸ The discord between the opinions of the senior and junior surgeons was noteworthy. Compared with the junior surgeons, considerably fewer senior surgeons felt that individuals hired soon after completion of their residency training were adequately prepared to assume the surgery attending role and had adequate training in surgical skills and decision making to serve as attending surgeons. The majority of senior surgeons felt that a transition to practice program that included mentorship from senior surgeons would be beneficial to individuals entering practice. Interestingly, the majority of young surgeons felt that the availability of a senior colleague to provide mentorship and support during their transition to practice was important; however, fewer than one-half of the young surgeons expressed interest in a formal program that would allow them to function as junior attendings with mentorship from senior surgeons. Senior surgeons also expressed concerns regarding the interpersonal and communication

skills and professionalism of young surgeons entering practice. Although the response rate in this survey was low, the data provide valuable information about the differences in perceptions of senior and young surgeons regarding preparation of residents for surgical practice. These differences need to be bridged for successful development and implementation of interventions aimed at this transition.

The American Hospital Association (AHA) recently surveyed its regional policy boards, governing councils, and committees to gather information on their perceptions relating to preparation of residents for practice. Individuals were asked to rate the importance of various core competencies, along with the knowledge and skills of individuals entering practice relating to these competencies. For each item, the importance of the specific competency was rated higher than the perceived level of knowledge and skills of individuals entering practice. These differences were most marked for systems-based practice, including delivery of cost conscious, effective medical care, and coordination of care with other health care providers; and for interpersonal and communication skills, including effective teamwork.¹⁹ In addition, skills relating to palliative and end-of-life care, informatics, and customer service were perceived to be inadequate. The AHA constituents made several important suggestions relating to education and training, as well as to the roles of hospitals and health care delivery systems in addressing the gaps identified.

Successful models to support transition to practice. *The academic medical center perspective.* Academic medical centers are required to deal routinely with issues relating to onboarding of junior surgeons soon after they complete residency training. Robust processes for intake assessments, credentialing and privileging, and effective mentorship are necessary to address various needs during this transition.²⁰ Given the evolution of general surgery over the past several years, individuals may enter practice with varying levels of skills in different domains; thus, valid and reliable assessments of junior surgeons during the onboarding process are critical. These assessments must use a variety of strategies to address the broad range of knowledge and skills. The assessments should involve critical analyses of the experience of the individual during residency training, review of case logs from the residency years, and consideration of special training beyond residency. The ability of the entering junior surgeon to assess his or her own skills relating to various competencies

should also be evaluated. Simulation may be useful in assessing certain skills in controlled and safe environments. Decisions regarding initial credentialing and privileging of junior surgeons need to be made based on these assessments. Requests for credentialing and privileging to perform new procedures learned outside structured residency training should generally be supported by evidence of appropriate training through a formal course, proctored experience for the first 5 or more cases, and outcomes data for the first 20 or more cases. These numbers may be different for various procedures and may vary based on performance and outcomes data. Principles of surgical credentialing and privileging previously articulated provide a useful framework that may be adopted or adapted to meet local needs.²¹ During the initial period of practice, a range of metrics must be used to evaluate both performance and outcomes. Focused Professional Practice Evaluations (FPPE) and Ongoing Professional Practice Evaluations (OPPE), as required by The Joint Commission, could be very helpful in this regard. In addition, risk-adjusted outcomes data from programs such as the ACS National Surgical Quality Improvement Program and results from Morbidity and Mortality Reviews should provide valuable information. Gaps in the domains of surgical skills, decision making, judgment, professionalism, and levels of confidence identified during the intake assessment or through monitoring of outcomes during the initial stages of practice must be addressed through a variety of targeted interventions.

Mentoring is a key component of the support that needs to be provided to all junior surgeons entering practice. The mentoring should focus on a spectrum of domains, including clinical skills, technical skills, practice management, and socialization into the specific practice environment. Mentors should not be assigned to junior surgeons by department chairs or division chiefs without the involvement of the junior surgeons and mentors. For successful mentoring, the mentor and junior surgeon need to willingly choose to work together. Successful mentoring needs a close match between the expertise of the mentor and the needs of the junior surgeon, common areas of interest, and complementary personalities. Mutual expectations should be established early in this professional relationship. The role of the mentor is multifaceted. During the preoperative period, support from the mentor may include prospective discussion of cases and review of management plans. During intraoperative care, the mentor could partner with the junior surgeon, discuss critical decisions, provide

consultation, and offer technical help as needed. During the postoperative period, the mentor could debrief with the junior surgeon, provide guidance with regard to managing complications, and participate in a reoperation, if necessary. In addition, the mentor should help the junior surgeon to assimilate into the culture of the organization. Guidance provided by the mentor regarding the norms and policies of the medical center, practice management strategies, and regulatory matters should be beneficial to the junior surgeon entering practice. Regular interactions between the mentor and the junior surgeon are essential, and these should involve open, bidirectional communication and sharing of constructive feedback. The feedback should encompass the entire spectrum of activities of the junior surgeon.

The wide array of resources at an academic medical center should be brought to bear to implement a comprehensive system to support junior surgeons entering practice. Strong leadership at both the organizational and departmental levels is necessary to establish and support such a system. Department chairs and division chiefs should establish the requisite standards for onboarding and foster effective mentorship of junior surgeons. The goal of these initiatives should be to bring structure to the ad hoc guidance and coaching often provided by senior surgeons to their junior partners.

The US Armed Forces perspective. Military and civilian surgery training programs are similar in many respects. Common features include rotations at multiple sites, variable experiences at different locations, issues relating to workload and case mix, lesser autonomy of residents than in the past, duty hour restrictions, and increasing external regulations. The unique features of military training programs include large numbers of offsite and out-of-town rotations, major focus on teamwork, and inclusion of military-specific curricula.²² Residents also participate in experiential exercises, such as field medical unit training events. Of note, most military programs include rotations at civilian hospitals. Assessments of surgery residents in military programs include officer evaluation reports, 360-degree evaluations, in-training examinations, and summative examinations. The military programs offer transition to practice seminars and military-specific curricula that focus on administration and leadership. These programs can be helpful in preparing residents for practice. Deployment soon after completion of residency training presents many challenges because the junior surgeons may not possess the requisite skills or

experience to function independently in the new environments. Also, at the conclusion of the deployment, individuals need to be reintegrated into their regular practice settings. This requires special attention to surgical and medical conditions that have not been seen frequently and to procedures that have not been performed often enough to maintain necessary surgical skills.²³

Madigan Army Medical Center has implemented an exemplary program to support the preparation of surgery residents for practice. This includes a transition to practice seminar and a pre-graduation capstone course that focuses on combat trauma. The latter course includes a trauma refresher along with exposure to simulated combat medical environments. The unique features of battlefield medicine, trauma surgery, and resource-constrained environments are addressed. Preparation for battlefield and combat surgery has been impacted significantly with the shift from open to minimally invasive surgery. Simulation has been helpful in addressing some of the surgical training needs; however, new simulators need to be developed to address a range of open surgical procedures and potentially catastrophic situations. The experience from the military could be transferred successfully to civilian environments.

The integrated health care system perspective. Onboarding of surgeons within an integrated health care system, such as Kaiser Permanente, requires use of special strategies beyond those employed in other settings.²⁴ The unique culture and values of the system need to be considered in this context. The Kaiser Permanente System provides coordinated, team-based care and disease management. Special emphasis is placed on disease prevention, early detection of disease, and effective resource management. Knowledge, experiences, and best practices are shared routinely across the system to improve performance. New physicians need to learn the special culture and values of the system to uphold the overall mission of the organization. The unique features of the Kaiser Permanente System that impact delivery of care and support individual practices are stressed during the onboarding process. All new physicians participate in a system-wide onboarding program within 3 months of their hiring. This program is supplemented by additional local onboarding activities at specific locations within the system. Educational support is readily available to help individuals practice more effectively and to adopt best practices during the period of transition and beyond.

Surgical onboarding is the responsibility of local facilities, and generally at least 12 cases of new

surgeons are monitored. A system-wide model for onboarding of surgeons within the Kaiser Permanente System is being developed. Opportunities are being explored to evaluate surgical skills using video-supported analyses and to offer targeted interventions to address specific needs identified through these analyses.

Recommendations from small group discussions. *Redesign of the surgery residency training model.* Redesign of the traditional surgery residency training model is needed to address various concerns. The new approaches should build on the advances that have been made in surgery residency training in recent years. Strategies to redesign surgery training must be broad-based and multifaceted. The desired knowledge and skills of graduating residents need to be clearly defined, and curricula and experiences across all years of training specifically tailored to achieve these outcomes. Residents must receive sufficient exposure to the essential elements of their respective surgical specialties, including appropriate operative and nonoperative experiences, to achieve proficiency. The training should include adequate experiences with diagnosis and management of complex conditions as well as complications, and with the continuum of surgical care. Work in practice settings needs to be complemented by structured training in simulated environments.

Competency-based assessment and advancement of surgery residents are key to strategies aimed at redesigning residency training. Valid and reliable assessment methods should be used to gather requisite data for competency-based advancement. These data should also be used in progressive privileging of residents to perform specific procedures. Competency-based advancement is attractive because it requires attainment of specific standards at each level. It may, however, result in variable numbers of residents advancing from one level to the next, which would be very disruptive to implementing a structured training program and delivering high-quality patient care. Complexities and logistical problems associated with a pure competency-based model may be addressed using hybrid approaches that include a combination of time and competency-based advancement.

Over the past several years, a number of innovative methods to train and assess residents have been developed, implemented, and incorporated into surgery residency training. These endeavors have focused on all 6 core competencies, and special efforts have been directed at enhancing teamwork and patient safety. A major advance has been the development and adoption of standardized

curricula and assessment programs to address essential domains.²⁵⁻³⁰ These include the Surgical Council on Resident Education (SCORE) Curriculum, as well as a number of curricula developed by the ACS Division of Education in concert with the Association of Program Directors in Surgery (APDS) and the Association for Surgical Education (ASE). The ACS/APDS National Surgical Skills Curriculum focuses on a range of procedural skills and addresses basic tasks, complete operations, and teamwork. It is aimed at surgery residents across various levels of training. The ACS Fundamentals of Surgery Curriculum, ACS Surgery Resident Objective Structured Clinical Examination (OSCE), and a few modules of the ACS/APDS National Surgical Skills Curriculum are aimed at first-year surgery residents. These resources can be used to assess the entering skills of surgery residents, make appropriate decisions relating to the need for direct or indirect supervision, and create a solid foundation for further training. The ACS/APDS/ASE Resident Prep Curriculum is designed especially for fourth-year medical students to prepare them to commence residency training, and is being pilot tested at a number of institutions. ABS has recommended that fourth-year medical students should be offered courses to prepare them for residency training in surgery, and the ACS/APDS/ASE Resident Prep Curriculum is ideally suited to address this recommendation. Similar advances have also been made in several other surgical specialties. The Society of Neurological Surgeons and the Thoracic Surgery Directors Association have both developed “Boot Camps” to address training needs of entering residents in their respective specialties.^{31,32} Efforts need to continue to design and test additional structured training and assessment methods that will address the core competencies in an integrated fashion rather than in isolation.

Regular assessments, specific and timely feedback, and opportunities for remediation are essential components of effective residency training. Experiences with targeted remediation strategies have demonstrated that they can address successfully certain gaps in performance. For example, problems with poor hand-eye coordination and with intraoperative judgment have been addressed in ophthalmology training programs through extra practice and laboratory time, pairing residents with the best teaching surgeons, and providing counseling. These measures were helpful in residents overcoming several difficulties before graduation.³³

A number of other challenges in surgery residency training need to be addressed as well.

Resident training has been negatively impacted by granting of less autonomy to surgery residents than in the past. This has resulted from the regulatory and legal climate, and from pressures on faculty to increase efficiencies and generate additional revenues. New models need to be designed to offer residents greater autonomy at appropriate stages in their training. These models require changes in systems and the involvement of other stakeholders to address a range of regulatory and legal issues. Also, surgery faculty should be trained to use teaching opportunities more effectively through major train-the-trainer efforts. Diminishing resources to support education and training continue to be a challenge. There are inherent inefficiencies associated with training residents, which should be factored into resource allocations for graduate surgical education. Restrictions on resident duty hours have also created vexing issues. In view of the published literature on the impact of resident duty hour restrictions on patient care outcomes and resident training in surgery, these regulations should be revisited. Duty hour restrictions should be limited only to the 80-hour per week requirement, with few other constraints, and the 16-hour limits on first-year residents should be reversed. Various surgical specialties have different needs with regard to resident training. These need to be considered; a single solution cannot be applied uniformly across all surgical specialties.

Interventions aimed at chief residents to prepare them for independent practice. Both competence and confidence of chief residents have been impacted negatively as a result of the recent developments previously outlined in this article. Insufficient independent experiences with critical conditions during the earlier years of residency training have eroded preparation of junior residents for the chief year. Chief residents need to acquire and demonstrate requisite surgical skills and judgment before graduation. They also need to learn time management, practice administration, and regulatory compliance.

Efforts aimed at preparing chief residents for practice need to address specific gaps from the earlier years of training and provide residents appropriate operative and clinical experiences to achieve the defined goals. Chief residents should be granted greater autonomy and assume independent patient care responsibilities under supervision of the faculty. Progressive privileging of residents to perform specific procedures should help them to transition into the role of practicing surgeons. Because of the uniqueness of different practice environments, preparation for practice

should also involve focus on the anticipated needs at future practice locations based on the aspirations of individual chief residents.

The University of Florida Neurosurgery Department has designed an innovative model aimed at final year residents to prepare them for independent practice. These residents are provided a 6 to 12-month mentored experience that offers significant independence. They are responsible for both operative and nonoperative care, and also participate in practice management and billing activities. Their cases are reviewed regularly by the faculty, and the faculty are available to provide backup support, as needed. The experience with this model has been very positive.^{34,35} Transition to practice courses used by the military are other examples of how chief residents can be prepared for independent practice. These experiences could be adapted to address the needs of various surgical specialties and residency programs. Interventions directed at the chief residents must be implemented in concert with redesign of the overall residency training model and not considered in isolation.

Evaluation and verification of knowledge and skills of residents before graduation. Traditional methods used to assess residents have generally been subjective; however, close interactions between the faculty and residents over considerable periods of time have helped to overcome many shortcomings of the subjective assessments. These shortcomings have been amplified by recent duty hour restrictions. The restrictions have eroded close working relationships between faculty and residents and have made longitudinal tracking of residents difficult. Also, many competing priorities in the current health care environment have made faculty involvement in time consuming assessment activities more difficult.

A variety of tools are currently available for formative and summative assessments of surgery residents. Examinations offered by the certifying boards are reliable assessment tools, but they focus primarily on cognitive knowledge and surgical judgment. A number of relatively new assessment methods and tools have been developed, psychometrically tested, and successfully implemented. These include Objective Structured Assessment of Technical Skills (OSATS),³⁶⁻³⁸ Global Operative Assessment of Laparoscopic Skills (GOALS),³⁹ Patient Assessment and Management Examinations (PAME),⁴⁰ Objective Structured Clinical Examinations (OSCE),^{28,41} and Fundamentals of Laparoscopic Surgery (FLS).⁴² Courses with standardized testing include the Advanced Trauma Life Support

(ATLS) Course,⁴³ the Advanced Trauma Operative Management (ATOM) Course,⁴⁴ and the Advanced Surgical Skills for Exposure in Trauma (ASSET) Course.⁴⁵ ABS now requires completion of ATLS and FLS for certification.

Evaluation of operative performance has improved through use of structured assessment methods and faculty training. Major progress has been made with regard to assessment of residents in skills laboratories, remediation of deficiencies and evaluation of operating room readiness of residents.⁴⁶⁻⁴⁸ The Operative Performance Rating System provides a useful tool to assess and record residents' performance relating to index cases.^{47,49} Some of the valid and reliable assessment methods are resource intense and may be difficult to implement in fiscally constrained environments. This has raised concerns about the widespread adoption of these methods.

The first step in developing a model for evaluation and verification of knowledge and skills of residents before graduation should be the generation of national consensus regarding desired levels of knowledge and skills of graduating residents. Specific standards need to be defined, and these standards should be accepted by residency programs across the country. The overarching goal should be to ensure proficiency and safe surgical practice. Further subspecialty training must be considered while establishing standards; expectations may be different for graduating chief residents who are planning to pursue additional training versus those planning to enter practice directly. Assessment of residents before graduation should address all 6 core competencies and include a combination of workplace assessments and assessments in simulated environments. The subjectivity and poor reliability of workplace assessments can be reduced through use of structured methods, training of faculty, and inclusion of sufficient numbers of assessments. Surgical skills of residents should be specifically assessed to affirm their proficiency in performing specific procedures. The methods and tools listed previously should be very helpful in this regard. New models need to be developed to assess technical skills across varying degrees of difficulty, along with models that assess perioperative decision making, judgment, and nontechnical skills. Assessments should focus specifically on transitions in patient care, which are associated with inherent risks to patient safety. New assessment methods should also address interprofessional interactions and teamwork, and encompass delivery of care in continuity clinics and ambulatory care settings. A

repository of best practices could be very helpful to surgery program directors and faculty. Assessment of residents before graduation must not be considered in isolation. It should be linked with robust assessments and demonstration of achievement of milestones across all years of training. Reports from residency programs to certifying boards and future employers should be framed within the context of the core competencies and include comprehensive assessment of the readiness of residents for independent practice.

Evaluation and verification of knowledge and skills of individuals entering practice. Accurate assessments of the knowledge and skills of junior surgeons entering practice are essential to ensuring delivery of surgical care of the highest quality. These assessments should be helpful in identifying specific gaps that require targeted interventions. The assessments should be conducted by senior surgeons accepting the junior surgeons in practice and by other members of the team. Despite the importance of such intake assessments, standardized processes to assess the knowledge and skills of individuals entering practice do not exist and there is significant variation from setting to setting. Anecdotal experiences from various institutions provide a general framework that may be used to evaluate the knowledge and skills of junior surgeons entering practice. Minimum national standards for the onboarding process need to be established, with the flexibility to adapt them to meet the needs of local environments.

Assessment of individuals entering practice should involve review of data from the period of residency training and collection of additional data after entry into practice. Results of Qualifying and Certifying Board Examinations yield helpful information on the cognitive skills and judgment of the junior surgeons, but these results may not be available when the surgeon enters practice. Case logs from the period of resident training can be useful in assessing the experiences of the individual. Also, reports from the residency program director may be helpful if they are comprehensive and specific. Direct communication between the respective residency program director and the senior surgeon or surgeons accepting the individual in their practice should be a routine part of intake assessments. Some of the information from residency training may already have been collected during the selection process of the junior surgeon and should become part of the surgeon's record.

Once the junior surgeon enters practice, a range of competencies needs to be assessed, including clinical and technical skills, judgment,

communication skills, professionalism, teamwork, and skills relating to practice management and systems-based practice. The confidence of the individual to practice independently should also be assessed. These assessments should be conducted within the context of the specific practice environment to ensure relevance. Psychometrically sound assessment models and tools should be used for these assessments to gather meaningful data. Standardized workplace assessments need to be complemented by assessments in simulated environments. Global, 360-degree evaluations may be especially helpful in assessing the range of competencies of the junior surgeon. A sign-off process to affirm proficiency of the junior surgeon entering practice should be implemented and used in initial credentialing and privileging of the individual. Feedback regarding the junior surgeon's performance and outcomes should be provided to the respective program director, which would be helpful in making changes in the residency program to better prepare future residents for practice. Assessment of the knowledge and skills of the entering surgeon should not be considered in isolation; this needs to be part of lifelong learning, assessment, and feedback to ensure performance at the highest levels throughout the surgeon's career.

Mentoring, preceptoring, and proctoring of individuals entering practice. Because of the significant heterogeneity of junior surgeons entering practice with regard to their competence and confidence, mentoring, preceptoring, and proctoring are pivotal in supporting the needs of these individuals. Such interventions should also be valuable throughout the professional careers of the surgeons. Mentorship is an intense longitudinal experience, whereas preceptorship involves focused and defined experiences.⁵⁰ Proctoring involves observation and validation of the skills of individuals, without direct involvement of the proctor in the activity or task being assessed.

Based on the intake assessment, the onboarding process should ideally include pairing the junior surgeon entering practice with a senior surgeon for mentorship, using the strategies previously outlined herein. Mentoring programs should be considered supportive and not punitive, and should be framed within the context of supporting junior surgeons to help them succeed. A period of conditional independence under the direction of a mentor should be considered. The duration of mentorship needs to be individualized and should be based on the needs of the junior surgeon and the characteristics of the practice environment. Training of mentors and monitoring

of their success in serving as mentors is essential. Training guidelines for mentoring need to be defined and widely disseminated. Establishment of robust mentoring arrangements can be challenging. The potential risk to the reputation of the mentor if the junior surgeons do not meet expectations may be a deterrent. Also, regulatory and financial considerations may present barriers to the establishment of mentoring programs. The competitive environment of surgical practice might also negatively impact these relationships.

In addition to mentoring, preceptoring and proctoring should also be integral parts of the onboarding process of junior surgeons. Preceptors can be very helpful in providing focused support to individuals in specific situations and during performance of unfamiliar procedures. Proctors should be used to assess the operative and nonoperative skills of individuals, and to monitor their performance and outcomes. Results of mentoring, preceptoring, and proctoring should be very useful in credentialing and privileging of individuals.

Experiences with mentoring, preceptoring, and proctoring at academic medical centers, integrated health care systems, and the military have yielded valuable insights regarding the logistics and resources needed, which may be helpful in establishing similar programs at other institutions. Academic medical centers and integrated health care systems are well-equipped to implement comprehensive systems of onboarding that include robust intake assessments, mentoring, preceptoring, and proctoring. They are also in a strong position to support other health care institutions. Creative models should be explored to offer regional support to junior surgeons through specially trained mentors. A host of organizational, legal, and financial issues need to be addressed to make this concept a reality. The culture of surgery needs to change to utilize mentoring, preceptoring, and proctoring during the routine course of professional maturation, and to not carry a stigma. Models and standards for mentoring, preceptoring, and proctoring should be defined by national bodies such as ACS. Also, ACS could develop training packages, design support systems for mentors, preceptors, and proctors, and disseminate best practices.

Use of new technologies, including telementoring, telepreceptoring, and teleproctoring, to support individuals entering practice. In-person engagement of mentors, preceptors, and proctors is critical during the onboarding process of junior surgeons entering practice; however, such engagement may be difficult to operationalize outside the confines

of academic medical centers, integrated health care systems, and large practices. New technologies could be helpful in supporting the needs of junior surgeons in remote locations through telementoring, teleprecepting, and teleproctoring. Telementoring and teleprecepting should be useful in helping junior surgeons acquire new skills, and teleproctoring could be used to validate the skills of the junior surgeons. Surgeons in rural practices may especially benefit from these approaches.

New education, training, and assessment methods based on sound scientific principles are needed to implement effective telementoring, teleprecepting, and teleproctoring. The specific methods used should be tailored to the needs of the junior surgeon and the expertise of the senior surgeon. Specialty-specific differences need to be considered as well. Expectations and roles must be defined for all parties and various responsibilities codified through appropriate agreements. Senior surgeons may need special training in the effective use of new technologies employed in telementoring, teleprecepting, and teleproctoring. An appropriate technology infrastructure and specially trained technicians are essential to support these activities. Early experiences with telementoring, teleprecepting, and teleproctoring can serve as the basis for further exploration of innovative approaches.^{51,52} Further studies are needed to demonstrate that telementoring and teleprecepting can improve patient outcomes without compromising safety.

Unresolved legal, ethical, licensing, and credentialing issues remain barriers to widespread use of telementoring, teleprecepting, and teleproctoring. Concerns regarding patient safety result from the inability of the senior surgeon to help the junior surgeon in person from a remote location to address a problem in the middle of a procedure. The senior surgeon has limited control and significant responsibility, which can be disconcerting to the senior surgeon. Also, there currently are no defined mechanisms to reimburse senior surgeons for telementoring, teleprecepting, and teleproctoring. Lack of access to state-of-the-art equipment and insufficient familiarity with new technologies are other limitations.

Telementoring, teleprecepting, and teleproctoring can also be implemented within the context of simulation-based training⁵³ to address the needs of junior surgeons entering practice and support the onboarding process. Simulated environments are not directly associated with the potential for risk to patients; thus, concerns

about liability are diminished significantly. In addition to telementoring, teleprecepting, and teleproctoring, other forms of technology-supported resources can also help junior surgeons entering practice. These include electronic decision support, web-based consultations, and web-based e-learning modules. This entire field is likely to grow as new models are developed, the positive impact of these approaches is demonstrated, technologies advance, and new solutions are found to address various concerns and limitations.

Regulatory and legal issues; credentialing and privileging; and financial considerations. A host of regulatory and legal issues impact the transition of residents to independent practice. Onboarding of junior surgeons needs to be carried out within the framework of The Joint Commission regulations, as well as the policies and procedures of the respective institutions. This process is frequently complicated by sharing of insufficient data between various parties because of legal concerns. Such concerns often preclude direct communication and transfer of detailed information between residency programs and surgical practices, and between institutions. Lack of complete information on the junior surgeon entering practice makes credentialing and privileging and compliance with various regulations challenging. Differences in credentialing and privileging processes across institutions and the diversity of surgical practice settings result in additional layers of complexity. Ideally, provisional privileges should be granted to junior surgeons entering practice and full privileges granted only after a period of monitoring and demonstration of satisfactory patient outcomes. Focused Professional Practice Evaluation (FPPE) and Ongoing Professional Practice Evaluation (OPPE) should be very helpful in strengthening the process of credentialing and privileging of junior surgeons entering practice.^{54,55}

The implementation of effective mentoring for junior surgeons entering practice is also impacted by legal concerns and financial considerations. National efforts are needed to reduce legal risks and incentivize mentors. This is not an easy task. Dialogues with insurance carriers might result in offering some protection to the mentors. The overall financial benefit of mentoring needs to be recognized by institutions and practices accepting junior surgeons. ACS needs to play a significant role in addressing the daunting challenges regarding regulatory and legal issues, credentialing and privileging, and financial considerations. ACS should convene meetings of the key

stakeholders to explore appropriate solutions, pilot test creative models, and disseminate best practices.

DISCUSSION

Monumental developments have impacted the preparation of residents for practice and their transition to independent surgical practice. Individuals accepting recent graduates of surgery training programs, leaders of surgery departments and health care systems, and residency program directors have all expressed concerns regarding training of residents in the current environment and preparation of residents for independent practice. The graduating residents have themselves expressed concerns about their competence and confidence. Many graduating surgery residents pursue further training through fellowships. These experiences provide additional training for the residents and enhance their skills in a variety of domains. Despite this additional training, specific interventions should be helpful in supporting the transition of the fellows to independent practice. These interventions are especially important because support for junior surgeons entering practice is not uniform across institutions and practices. A variety of strategies are needed to address the challenges associated with the transition from residency to independent practice. As solutions to various challenges are explored, transition to practice should not be considered in isolation. The solutions should be part of a global approach to addressing needs across the continuum of professional development, starting from the early stages of training and spanning the entire careers of practicing surgeons.

Different levels of emphasis need to be placed on specific competencies across the continuum of professional development. A model to address the core competencies based on this approach has been published in the literature.^{29,56} This model places practice-based learning and improvement at the center of all other competencies for practicing surgeons. Practice-based learning and improvement links patient care outcomes with education and training in a cycle of continuous learning and improvement, and guides efforts to address the other core competencies.

The desired levels of knowledge and skills of graduating residents should be clearly defined by national consensus and training across all years of residency redesigned accordingly. Structured and reliable workplace assessments need to play a critical role in resident training. These should be complemented by valid and reliable assessments in

simulated environments. Both formative and summative assessments are needed to guide training and demonstrate achievement of predetermined standards to support competency-based advancement at each level of training and before graduation. Assessments should be coupled with specific and timely feedback. The results of these assessments should be used in progressive privileging of residents to perform specific procedures. A number of innovative programs are available to support these efforts, and additional programs need to be developed to address unmet needs.

The chief resident year is a critical capstone year that needs to be restructured and individualized to provide residents the requisite experiences before graduation. This is the year when sufficient autonomy needs to be granted to residents to build both competence and confidence. Such autonomy should also be helpful in increasing the sense of personal responsibility of residents for patients. Progressive privileging of chief residents should build on similar privileging during the earlier years of training. Chief residents need to learn and embrace the model of practice-based learning and improvement as they transition to practice and advance in their professional careers.

Structured programs for onboarding of junior surgeons, including robust intake assessments and effective mentorship, are needed to support the junior surgeons entering practice. Many of the assessment methods and tools used in residency training can be adopted or adapted for use in assessing junior surgeons during the onboarding process. Challenges to effective mentoring, precepting, and proctoring include regulatory, legal, and financial issues. These need to be addressed through creative solutions, which require the involvement of major national stakeholders and strong commitment at local levels. Emerging technologies offer new options to support mentoring, precepting, and proctoring and require further exploration.

Simulation can be used in innovative models of training and assessment to address cognitive and clinical skills, judgment, technical skills, and teamwork. Simulation-based training has been shown to transfer to practice and can improve outcomes.^{57,58} Simulation-based assessments should be very helpful in ensuring achievement of specified standards for advancement from one level to the next, and for progressive privileging of residents. Simulation can also be used to assess the competence of residents at critical transitions and of junior surgeons entering practice during the onboarding process. Further efforts are

needed to advance the use of simulation, and new simulators need to be developed to address open procedures and complex tasks. This should be a national priority within the context of efforts aimed at enhancing quality of care and patient safety. The ACS Division of Education developed and launched a program for accreditation of simulation centers in 2005.⁵⁹ The Consortium of ACS-accredited Education Institutes (Simulation Centers) is making significant contributions and has the potential to play a major role in addressing needs relating to transition from residency training to practice.

A major impediment to advancing residency training and adopting innovative approaches to support the transition to practice is lack of sufficient resources, which are likely to get even more scarce in the future. Thus, the training and assessment models need to be scrutinized and specific efforts made to increase efficiencies. Also, mentors and faculty members will need to be trained through appropriate faculty development endeavors to use a variety of teachable moments effectively and to utilize education, training, and assessment resources available from national and local sources.

The unique needs of each surgical specialty should be considered within the context of transition to practice. For example, the expansion of minimally invasive surgery has impacted various specialties differently, and issues relating to continuity of care are also different. In addition, the impact of duty hour restrictions across surgical specialties has not been uniform because of different practice patterns. A single model to support transition to practice will not address the needs of all specialties and specialty-specific nuances will need to be considered.

The goal of this National Invitational Conference was to convene key stakeholders to further define various challenges and develop specific recommendations to address the spectrum of concerns. The focus of the conference was on both preparation of residents for independent practice and support for junior surgeons after they enter practice. The recommendations relating to competency-based education, training, and advancement of surgery residents are congruent with the Milestone Projects being pursued by the respective certifying boards and the residency review committees. Milestones for general surgery residency training were recently unveiled and will be implemented in July 2014.⁶⁰ These milestones have been defined at 4 levels within the framework of the core competencies. The milestones relating

to practice-based learning and improvement are especially relevant within the context of transition from residency to independent practice.

The recommendations from the conference are also aligned with the ongoing national work relating to entrustable professional activities (EPAs).^{61,62} EPAs are unique, integrated units of professional work that help to place the core competencies and milestones in a clinical context. They focus on the fundamental tenets of trust and involve consideration of the different levels of supervision. EPAs were originally designed for transition from residency to practice, which makes their use within the context of the recommendations of this national conference very relevant. The Association of American Medical Colleges has pursued the use of EPAs to support preparation of medical students for residency training and recently released a document defining "Core Entrustable Professional Activities for Entering Residency."⁶² These core EPAs are designed to complement the specialty-specific EPAs for medical students entering training in specific specialties.

A major outcome of the conference has been the ACS effort to design a special Transition to Practice (TTP) Program in General Surgery for residents completing surgery training. The TTP Program will involve accreditation by ACS, under the aegis of the ACS Division of Education. The education and training framework and the accreditation model for the program have been outlined.⁶³ The transition to practice experience will be 1 year in length, and the junior surgeon entering practice will function as a partner rather than a fellow. The program will include an intake assessment and a longitudinal mentored experience that will provide opportunities for progressive independence and privileging. Robust formative and summative assessments, coupled with regular feedback will be key to providing the junior surgeon the desired experience. The program will be offered at both university hospitals and independent practice locations. The sites will be accredited using stringent standards and criteria, and the accreditation process will involve review of applications and site visits by experienced surgeon educators. The initial response to the TTP Program has been very positive. The program will be pilot tested through 2014 and formally launched in 2015. Another national effort in its early stages is aimed at redesigning the general surgery residency training model. The overarching goal is to ensure better preparation of residents for practice. This effort is being led by the ACS and includes several other stakeholders, as well.

National organizations, such as ACS, are in a unique position to offer structured curricula and resources that may be readily adopted or adapted for use at various institutions. Collaborative efforts across surgical specialties should catalyze further advances in surgical education, training, and assessment. Also, dissemination of best practices will be key to supporting these advances. ACS needs to continue to play a pivotal role in convening leaders of regulatory bodies and other key stakeholders to support pilot programs that include innovative solutions to challenges associated with the transition to practice. The regulatory bodies will need to be flexible as solutions to various challenges associated with transitions to practice are explored, and new models are developed and tested. A well-coordinated national effort will help to ensure delivery of safe surgical care of the highest quality, and serve the best interests of the patients, the profession, and society at large.

DISCLAIMER

The opinions expressed in this article are those of the authors and do not necessarily represent the official position of the American College of Surgeons, the Accreditation Council for Graduate Medical Education, or any other national organization.

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APPENDIX A. ACS/ACGME National Invitational Conference on Transition to Practice in Surgery**Planning Committee**

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 Lena M. Napolitano, MD, FCCP, FCCM, FACS*
 Leigh A. Neumayer, MD, FACS
 David R. Nielsen, MD, FACS
 Patricia J. Numann, MD, FACS
 Bruce A. Orkin, MD, FACS
 David W. Parke II, MD, FACS
 Carlos A. Pellegrini, MD, FRCSI (Hon), FACS
 Ingrid Philibert, PhD, MBA
 John R. Potts III, MD, FACS
 Jan Rakinic, MD, FACS
 Jim Reeder, MS
 Charles L. Rice, MD, FACS
 J. David Richardson, MD, FACS
 Susan B. Rosero, BS
 Valerie W. Rusch, MD, FACS†
 Ajit K. Sachdeva, MD, FRCSC, FACS*
 Heena P. Santry, MD
 Paul M. Schyve, MD
 Michael J. Stamos, MD, FACS
 Paula Termuhlen, MD, FACS
 Thomas F. Tracy, Jr., MD, FACS
 Edward D. Verrier, MD, FACC, FAHA, FACS
 Nicholas J. Volpe, MD
 Andrew L. Warshaw, MD, FACS
 George D. Wendel, Jr., MD
 Thomas V. Whalen, MD, MMM, FACS†
 James Whiting, MD, FACS†
 Douglas E. Wood, MD, FACS
 Mark B. Woodland, MD, MS
 Gayle E. Woodson, MD, FACS

*Invited presenters.

†Small group leaders, including 2 co-leaders.