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# SHOULD THERE BE A MINIMAL SURGICAL EXPERIENCE FOR A GRADUATING ORTHOPAEDIC SURGERY RESIDENT?\*

BY MICHAEL A. SIMON, MD, DEMPSEY S. SPRINGFIELD, MD, AND STEVEN P. NESTLER, PHD

According to the *Graduate Medical Education Directory*, published by the American Medical Association, “the mission of the Accreditation Council for Graduate Medical Education is to improve health care in the United States by ensuring and improving the quality of graduate medical education experience for physicians in training. The Accreditation Council for Graduate Medical Education establishes national standards for graduate medical education by which it approves and continually assesses educational programs.”<sup>1</sup>

The *Directory* also states that “the Accreditation Council for Graduate Medical Education is a separately incorporated organization, responsible for the accreditation of approximately 8,000 allopathic graduate medical education programs. 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 Accreditation Council for Graduate Medical Education’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 Council. A representative for the federal government and the chair of the Residency Review Committee Resident Council also serve on the Board in a non-voting capacity.”<sup>1</sup>

The accreditation of graduate medical education programs is carried out by twenty-seven residency review committees. The orthopaedic surgery Residency Review Committee has ten members; nine are appointed for six-year terms each from three organizations (the American Board of Orthopaedic Surgery, the American Medical Association, and the American Academy of Orthopaedic Surgeons), and one resident is selected for a two-year term.

Through the accreditation process, the objective of the Accreditation Council for Graduate Medical Education (ACGME) is to assure the public of

the high-quality education and training of physicians for improving health care in the United States. It would be implicit in its mandate that, if physician education and training are to remain outside direct governmental regulation, the accrediting organization must act in the best interests of the public and put aside the personal biases and viewpoints of the member organizations. It is in this context that the Residency Review Committee members need to think about the accreditation process.

A major initiative across all medical, graduate medical, and continuing medical education is to ensure that physicians, including residents and medical students, achieve competence in six areas: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice. Organized medicine has measured medical knowledge by standardized testing for many decades, but knowledge has proved to be only a part of the skills and attitudes of a competent physician. Likewise, surgical skills are only one component of

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one competency, patient care, but this is very important for surgeons, patients, and the public. In this context, this symposium tries to address a critical issue: Should there be a minimal surgical experience for a graduating orthopaedic surgery resident?

### **The Case for Minimal Surgical Experience for an Orthopaedic Surgery Resident**

The orthopaedic surgery residency consists of five years of graduate medical education. Postgraduate year (PGY)-1 has recently been well defined, but the clinical curriculum for PGY-2 through PGY-5 has not. The specialty-specific requirements for orthopaedic surgery education “must include at least three years of rotations on orthopaedic services,”<sup>1</sup> and “the residents’ clinical experience must include adult orthopaedics, including joint reconstruction; pediatric orthopaedics, including pediatric trauma; trauma, including multi-systems trauma; surgery of the spine, including disc surgery, spinal trauma, and spine deformities; hand surgery; foot surgery in adults and children; athletic injuries including arthroscopy; metastatic disease; and orthopaedic rehabilitation, including amputations and post-amputation care.”<sup>1</sup> This is the only description of the clinical education in an orthopaedic surgery residency program by the special requirements, and it is very limited.

In addition, the orthopaedic program requirements do not address the surgical experience necessary for educating and training an orthopaedic surgery resident. In the past five to ten years, many surgical and procedural specialties, including orthopaedic surgery, have started to collect, by resident self-reporting, surgical and procedural data. These data now are collected through the Internet by the ACGME.

Some Residency Review Committees in surgical specialties have explicit special requirements as to the type and volume of the surgical experience. Plastic surgery requires “experience in all twelve specialties,” and thoracic surgery requires “125 major operations” with

“adequate distribution.”<sup>1</sup> The range in general surgery is 500 to 1000 major cases over five years and 150 to 300 major cases in the chief year. Neurosurgery requires 500 major cases per finishing resident. Some surgical Residency Review Committees require individual residents to have performed at least one standard deviation below the mean of certain sentinel surgical procedures. These standards are not a part of their special requirements, but they are nevertheless used by their pertinent committees to make accreditation decisions. For making accreditation decisions concerning surgical volume, there must be objective standards.

Even nonsurgical specialties have some specific objective requirements regarding the number of patients or procedures for an acceptable program or an acceptable resident clinical experience. Physical medicine and rehabilitation requires approximately 200 electrodiagnostic consultations per resident. For radiation oncology, 600 patients must receive external beam radiation in the parent institution, and each resident must treat at least 150 patients per year, with a maximum of 450 patients per year. Pathology requires all residents to perform fifty autopsies, examine 1500 cytology specimens, sign out at least 2000 surgical specimens, and examine 200 frozen sections. Diagnostic radiology specifies at least 7000 radiographic examinations per year per resident. All of these requirements have numbers.

Orthopaedic surgery has shied away from requiring residents to have an explicit or objective procedural experience. In the past, one justification was that orthopaedic surgery is so diverse a surgical field that it is too difficult to set minimal standards. Another valid concern is that some residents need less surgical experience than do others to learn a particular technique. Also, some faculty members are better teachers or allow more surgical independence for a resident than others do, so that a quantitative minimal standard is somewhat arbitrary.

An argument could be made that

other clinical and didactic experiences and curricula are just as necessary as surgical experience for acquiring the knowledge, attitudes, and skills for preventing and treating musculoskeletal diseases, disorders, and injuries by medical, surgical, and physical methods. Surgical skill is just a part of one component of the six competencies. However, besides medical knowledge, this is the only other competency that we presently document. The other four competencies are difficult to teach, document, and evaluate. Furthermore, the Residency Review Committee already has data on the surgical experiences of each program and resident. The documentation of evaluation and management activity could be measured in the future as part of the case log system. What must also be part of the curriculum is the teaching and assessment of the application of medical knowledge, ethics and professionalism, practice-based learning, interpersonal and communication skills, and systems-based practice. But until methods for teaching and assessing these competencies can be developed, one can measure surgical technical competence by at least a surrogate, the surgical experience. Just because we are not measuring other important competencies, we cannot deny that surgical skills are important to document, for fear that too much emphasis will be placed on technical skills. After all, we are surgeons; that is, orthopaedic surgery is the name of our specialty. The Residency Review Committee has the data that can be used. Along with the rest of medicine, we must develop methods to track and evaluate other competencies.

In view of these concerns, it seems to be in the best interest of the specialty, the public, and the residents that the Residency Review Committee requires minimal objective numerical procedural experiences for the most common surgical procedures carried out by each orthopaedic resident. The most common surgical procedures performed in practice are known through data collected by national databases, the American Academy of Orthopaedic

Surgeons, and the American Board of Orthopaedic Surgery Part-II oral examinations. These include knee and shoulder arthroscopy, knee and hip replacement, hip fracture repair, and carpal tunnel release. The Residency Review Committee, in consultation with the American Board of Orthopaedic Surgery, could set minimal standards for the number of surgical experiences per resident in these common procedures that would be required for a program to be accredited. The standards could also include a minimal number of the common surgical procedures that are believed to be sentinel in proving a specific clinical experience, e.g., amputation and the treatment of supracondylar fractures of the distal aspect of the humerus in children.

The Residency Review Committee should publish the median, mean, and standard deviation of key surgical procedures performed per resident across all accredited programs. These data would provide a powerful incentive for the individual programs to adjust their residents' surgical experience. Now that the Residency Review Committee has the data, they can be used to substantiate the surgical education and experience of each resident and assure the public and our specialty that each resident has minimal surgical experience in the commonly performed orthopaedic surgical procedures.

Before the symposium, we conducted a relatively unscientific survey of PGY-4 orthopaedic surgery residents, program directors, and chairs or chiefs of orthopaedic surgery residency programs through the American Orthopaedic Association, an organization of academic leadership comprising 219 program directors and chairs or chiefs of orthopaedic surgery. A total of 106 (48%) of the 219 program directors and chiefs or chairs replied. Of the 101 PGY-4 residents selected by the chairs or chiefs to attend the 2005 American Orthopaedic Association Resident Leadership Forum, forty-five (45%) replied. Seventy-one percent of the leadership and 89% of the residents said that an "orthopaedic surgery resident

should have a minimal surgical experience for some common orthopaedic procedures." The cohort of program directors and chairs favored the program directors, the American Board of Orthopaedic Surgery, and the Residency Review Committee as the organizations that always should set the standards. Of the common surgical procedures performed in the United States, knee arthroscopy and total hip and knee arthroplasty had the support of >90% of the academic leadership for inclusion as minimal standard requirements. Open reduction and internal fixation of a hip fracture, hemiarthroplasty for a hip fracture, carpal tunnel release, and open reduction and internal fixation of fractures of the femur, ankle, and tibia had the support of between 80% and 90% of the orthopaedic leadership for inclusion as minimal surgical requirements. Operative fixation of supracondylar fractures in children and fractures of the distal aspect of the radius in adults had the support of between 70% and 80% of the leadership for inclusion as minimal surgical standards. Lastly, below-the-knee amputation and lumbar laminectomy received the support of only about 50% of the leadership for inclusion as a minimal surgical standard. The replies of the residents to these standards were similar to those of the orthopaedic leadership except that even fewer residents thought that carpal tunnel release was as important as the orthopaedic leadership did. Notably, residents likewise rated lumbar laminectomy lowest and below-the-knee amputation second lowest for setting common surgical standards.

Eighty-seven percent of the orthopaedic leadership and 79% of the residents desired the Residency Review Committee to publish the median and standard deviation of common surgical procedures performed per resident in all accredited programs, whereas 67% of the program directors or chairs and 64% of the residents thought that the American Board of Orthopaedic Surgery should require a minimal surgical experience for each resident to qualify for Part I of the certification examination.

### **The Case Against Minimal Surgical Experience Required for Orthopaedic Surgery Residents**

During the five years of an orthopaedic residency, the recently graduated medical students are expected to become orthopaedic surgeons. Their education is not expected to be completed after only five years, but they are expected to have mastered sufficient knowledge, skills, and attitudes so that they can practice competently and independently. Does an orthopaedic surgeon need to have done every operation in a residency before doing it in practice? This is not possible, much less practical. So, what are the operations that must be done during a residency to prepare the resident for independent practice? How many total hip replacements does a resident need to do before he or she is competent? Is there a number that reliably assures a basic level of competence? It is apparent that some residents master surgical skills quickly with limited repetition, whereas others struggle even after doing an operation numerous times. Simply continuing the number of surgeries provides only a very approximate measure of competence, especially because residents are almost always supervised.

There are other competencies the resident must learn and master before the end of the residency. What nonoperative skills are required? Are we devoting so much time to these skills that we can spare some more time to attend to the surgical aspects of the residency? How much of the nonoperative education must be obtained during the residency, and how much is obtained before the residency? Do we expect residents to have sufficient education in the ethics of being a surgeon before the residency so that we do not need to teach ethics? Are residents expected to have sufficient communication skills before they enter the residency so that we do not need to teach communication skills? How much time should a resident spend reading? How many patients need to be evaluated in an outpatient setting before a resident has developed the skills necessary to come adequately to a manage-

ment plan or an accurate diagnosis? Under what conditions do residents learn best how to evaluate, how to communicate, and how to advise patients about their condition and the potential treatment options, including, but not exclusively, surgical options?

The answers to these questions are debatable. Everyone has a different view of the correct answers. Each resident needs a different amount of experience for each skill. Some residents start a residency with good operative skills, some with good communication skills, a few with reasonable diagnostic skills, but very few, if any, with them all. Each of us is still developing our own skills in all of these areas. It is, after all, called the practice of medicine.

Currently, the orthopaedic Residency Review Committee's specific quantitative requirements are minimal. There must be a minimum of four hours per week of conference—four out of eighty hours. "Conference" is not specifically defined, and a review of overnight patients seen in the emergency room during the night qualifies as a conference. One half-day of outpatient experience per week with at least ten patients is required. This requirement is only for PGY-2 and PGY-5. Therefore, a resident could finish an accredited residency having seen fewer than 2000 patients in an outpatient setting. It is implied that there is faculty supervision, but there is no specific requirement that any of these patients be presented to a faculty member. None of the patients are required to have preoperative evaluations. They all could be postoperative patients. The requirement for "continuity of care" and seeing "preoperative patients" is now often fulfilled by an assessment by the resident in the anesthesia holding area immediately prior to surgery. Residents are required to record every activity associated with a *Current Procedural Terminology* (CPT) code. They are not required or even asked to keep track of how many times they discuss a new diagnosis with a patient, how many times they help patients to decide whether surgery is what they need or

want, or how many times they talk to a family about a complication of a treatment.

The responsibility of the Residency Review Committee is to ensure that residency programs meet a minimally acceptable standard. Some would say that the Residency Review Committee should make more requirements of residency programs, but requiring a specific number of operations is not one of them. There are a number of reasons for this.

First, there is no evidence that residents are inadequately educated in surgical technique. The median number of procedures performed by an orthopaedic resident during the residency was 1572 in 2003 to 2004. Is that enough? Is it too many? Most residents seem to prefer the operating room to the clinic, anatomy laboratory, research laboratory, conference room, and library. Many faculty members often feel more comfortable teaching operative skills than teaching any other aspect of the program. Lack of interest does not seem to be an issue with education in surgical skills. We may not be teaching residents the specific surgical skills necessary for them to become the best surgeons, but simply requiring a specific number of operations will not solve that problem, because residents have different rates of learning technical skills. Some might say that in orthopaedic surgery the decision to operate is more important than a perfectly performed operation.

Second, there is no reason to believe that lack of surgical-skills education leads to poor performance on the American Board of Orthopaedic Surgery (ABOS) examination. On Part II of the ABOS board examination, surgical technique is infrequently a cause of failure. It is the orthopaedic surgeon with the best surgical skills and little clinical decision-making experience who gets into trouble trying to solve a problem by using a surgical solution when a nonsurgical solution would be better.

Third, the evidence suggests that the majority of medical-legal problems are related to nonsurgical aspects of

practice except possibly in trauma surgery, where the surgical-technique is often an important aspect of the case. However, in other areas of practice, it is more likely to be a missed diagnosis or a delay in diagnosis. The second edition of the American Academy of Orthopaedic Surgeons publication entitled *Managing Orthopaedic Malpractice Risk*, which was published in 2000, concludes, "In summary . . . most [claims] continue to be based on errors or misjudgments of principles well known to the orthopaedic community."<sup>2</sup>

Fourth, other surgical Residency Review Committee requirements are not very specific about the number of operations required<sup>3</sup>. In general surgery, a total of 500 to 1000 operations are required, with 150 to 300 done during the chief year. The requirements state that an excess of 1500 total cases, or more than 450 during the chief year, needs to be "justified by the program director."<sup>1</sup> For neurosurgery, the requirement is the total number of cases done "within the total clinical facilities available to the training program."<sup>1</sup> The requirement is that 500 cases be done per year by each finishing resident, not that the finishing resident does the cases, but that, if there are two finishing residents, 1000 cases per year need to be done "within the total clinical facilities available to the training program."<sup>1</sup> If there are three residents, then 1500 cases need to be done; if four, then 2000 cases; and so forth. Otolaryngology requires that there should be cases "sufficient in number and variety . . ."<sup>1</sup> Plastic surgery has no numbers. Urology requires the cases to be distributed evenly among the residents.

Many other competencies are being neglected. A recently published "Instructional Course Lecture" indicated that orthopaedic surgeons are not good at communicating with patients<sup>4</sup>. Communication skills can be taught and learned. This takes practice and time. This is an aspect of resident education that is for the most part being ignored.

Approximately two-thirds of residents do fellowships. Maybe many do so because they do not yet feel comfort-

able evaluating patients and selecting candidates for surgery. They know that during a fellowship, they will have more experience in an office setting.

There are a number of initiatives that should improve residency education first. Academic orthopaedic surgery organizations should establish a curriculum for at least the basic knowledge base that residents are expected to master during the residency. The current orthopaedic Residency Review Committee requirements regarding faculty and program director qualifications are weak and should be strengthened. Orthopaedic surgery organizations should provide more opportunities for faculty to learn how to be educators. The Residency Review Committee should establish a specific minimum number of new patients that a resident must see and present to a member of the faculty. The Residency Review Committee should establish a minimum number of postoperative patients that a resident needs to see with a faculty member. The program director should be required to document the competency of each resident in a specific list of skills at the end of each year of the residency. We should assure the public that every resident who completes an orthopaedic residency program has certain operative and nonoperative skills. Once competency criteria have been established, the need to specify the number of surgeries performed would become superfluous.

### **The Position of Orthopaedic and Other Surgical Residency Review Committees**

Surgical Residency Review Committees have been gathering information on the operative experience of individual residents for more than forty years, and, during that time, most specialties have required residents to meet quantitative minima in specified categories of procedures in order for them to become eligible for certification. However, until the 1990s, when computer tracking systems became available, those minima were set by Residency Review Committees and/or Boards using professional judgment that was not

necessarily informed by quantitative data analysis.

Since 1999, when the ACGME introduced its Internet-based case log system, Residency Review Committees have been given the opportunity to gather and analyze the patient-care experience of residents much more efficiently and effectively, which has resulted in the establishment of more quantitative minima for residents in most specialties. Currently, eight surgical Residency Review Committees (general surgery, thoracic surgery, plastic surgery, ophthalmology, obstetrics-gynecology, urology, otolaryngology, and orthopaedic surgery) and seven "non-surgical" specialties (allergy and immunology, anesthesiology, dermatology, pediatrics, neurology, pathology, and radiation oncology) require the use of the system as part of the accreditation process. The system is adapted to each specialty, although it utilizes common software to receive, store, and analyze data. Most of the Residency Review Committees focus on the gathering and analysis of patient-care activities that may be categorized by CPT and/or *International Classification of Diseases, Ninth Revision* (ICD-9) codes. These data are then available for analysis at the program and national levels. For example, during the 2003 to 2004 academic year, 3053 orthopaedic surgery residents entered data into the case log system, which permitted the Residency Review Committee to project that a typical resident would perform 1572 procedures (1324 in adults and 248 in children) during the four years of orthopaedic surgery education in an accredited residency. The case log system is not ideal. The system is based on self-reporting. There is variability in resident compliance and in reporting whether the resident is a primary surgeon or a first assistant.

As Residency Review Committees have gained experience with the statistics made readily available by the case log system, six surgical committees (general surgery, urology, thoracic surgery, plastic surgery, ophthalmology, and obstetrics-gynecology) have estab-

lished minimum numbers of procedures that residents must perform in selected areas. For the most part, these minima fall in the eighth or ninth decile of the national statistics for that specialty. In contrast, orthopaedic surgery and otolaryngology have not set minima, preferring to compare the experience of a program's residents with national means, medians, and standard deviations. Following this approach, the Residency Review Committees are not required to change minima as national statistics vary over time. They are, however, able to maintain a reasonable consistency in the evaluation of resident experience from program to program.

As Residency Review Committees have gained experience with the capabilities of the case log system, additional committees are having the system adapted to their use. Next year, the colon and rectal surgery version of the system will come into use, and several other Residency Review Committees are close to requesting an adaptation for their use. In another recent initiative, the ACGME computer staff and the orthopaedic surgery department at Tulane University are developing software that will permit programs (from any specialty) to extract data from local databases and transfer them in batches to the case log system. Finally, as the system becomes generally accepted and user-friendly, certifying boards and Residency Review Committees are working together to design reports that may be used for both accreditation and certification. Five surgical boards (general surgery, thoracic surgery, obstetrics and gynecology, plastic surgery, and otolaryngology) already require residents to submit case log system reports as part of the application process for certification.

Ultimately, many specialties are interested in linking the statistical analysis of resident experience data with faculty evaluations of resident ability and experience. Because the quantitative component of such a system is already in place, several specialties are in the process of developing online faculty evaluation forms that would permit a

more immediate linkage between statistical indicators and faculty assessment of resident competence.

### Conclusion

A rapid response survey was administered after these presentations at the Annual Meeting of the American Orthopaedic Association in Huntington Beach, California, on June 25, 2005. A total of 135 individuals, including thirteen residents (10%), fifty-two faculty members (39%), and seventy program directors and/or chairs (52%), participated in the audience response. When asked what the minimal number of surgical experiences as a surgeon or first assistant for fourteen common orthopaedic procedures during a residency should be, they had the following responses. Fifteen to twenty percent had a constant response that no minimal standards should be set for all fourteen common procedures. The recommended minimal range of operative experiences was one to five below-the-knee amputations; six to twenty-five operations each of nine procedures (shoulder arthroscopy; hemiarthroplasty for hip fracture; carpal tunnel release; lumbar laminectomy; and internal fixation of a femoral shaft fracture, pediatric supracondylar fracture of the humerus, ankle fracture, tibial fracture, and distal radial fracture); and twenty-six to 100 operations each of four procedures (total knee arthroplasty, total hip arthroplasty, knee arthroscopy, and internal fixation of a hip fracture).

Given the experience of Residency Review Committees to date, it is appropriate to conclude that quantitative criteria (whether expressed as absolute minima or standard deviations above or below the means) have been and will become crucial to accreditation decisions. Having quantitative data makes it much easier for Residency Review Committees to be consistent in their evaluation of programs. Furthermore, the setting of minima and/or the publication of national statistics (means and standard deviations) make it easier for programs and residents to under-

stand what is expected of them.

However, neither Residency Review Committees nor certification boards would base their accreditation and certification decisions on quantitative data alone. No certification board would permit an individual to take an examination without the recommendation of a program director, even if the resident has met every quantitative standard. Nor would a Residency Review Committee accredit a residency solely because it is able to provide evidence of a satisfactory number of surgical procedures. In both cases, qualitative evaluation is also required (e.g., a global assessment that the resident is capable of performing surgery independently and competently). The use of quantitative data to develop an overall, qualitative decision improves results, but the decision is not based on numbers alone. Therefore, it seems appropriate to conclude that quantitative minima are now necessary, but still not sufficient, criteria for crucial decisions regarding the competence of surgeons and the quality of residencies and fellowships. Minimal quantitative criteria are just one more tool to address and assess competency.

The Residency Review Committee must strengthen the position of the program director; more clearly separate and define the roles, responsibilities, and relationship of residents and fellows; require (and objectively document) more outpatient and continuity of care criteria; and, with the help of the ACGME, develop curricula and tools to evaluate professionalism, practice-based learning and improvement, interpersonal and communication skills, and systems-based practice, in addition to developing quantitative data for surgical experience.

Documenting residency surgical experience is starting to become a credentialing issue between hospitals and individual surgeons. In the near future, documentation is likely to have a role in applying for initial hospital privileges. Program directors are now being asked to review resident credentialing applica-

tions and to attest to their competence for certain procedures. In the future, a global assessment will not satisfy the certifying medical boards. Furthermore, residents know or will learn that they will need to perform certain common orthopaedic surgical procedures to be credentialed. They will then demand and ensure that they get experience in these procedures to fulfill their initial request for hospital surgical procedures.

Our orthopaedic surgery Residency Review Committee is at a historic point in time. Extrinsic pressures have put the Residency Review Committee in a reactive posture. There have been no substantial changes in the special program requirements pertaining to the education and training of orthopaedic surgeons since 1998! There are many opportunities to be proactive in strengthening education in orthopaedic surgery. Surgical skills provide just one of these opportunities.

The Residency Review Committee must strengthen orthopaedic education by a variety of changes in the special requirements, especially with more objective and quantitative criteria. The Residency Review Committee and the American Board of Orthopaedic Surgery are the only two organizations that can have a direct impact on resident education. The American Orthopaedic Association and the American Academy of Orthopaedic Surgeons have nominating and appointing power and can only influence either by that process or by strong position statements. Furthermore, the American Board of Orthopaedic Surgery and hospitals could bypass the ACGME by requiring certain surgical minima for certification and/or credentialing.

With the public drive toward accountability, medicine is moving or being pushed toward more quantitative data to measure quality. While surgical volume in clinical practice seems to be directly related to outcomes in many surgical specialties, surgical volume during residency has not been studied and the resident is almost always supervised.

Michael A. Simon, MD  
The University of Chicago, 5841 South Maryland Avenue, MC 3079, Chicago, IL 60637

Dempsey S. Springfield, MD  
Mount Sinai School of Medicine, 5 East 98th Street, Box 1188, New York, NY 10029

Steven P. Nestler, PhD  
Accreditation Council for Graduate Medical Education, 515 North State Street, Suite 2000, Chicago, IL 60610

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