Developing the Young Academic Neurosurgeon: A United States and Emory University Perspective

Gerald E. Rodts, Jr., M.D.
President, Congress of Neurological Surgeons
Department of Neurosurgery, Emory University School of Medicine

The American Council for Graduate Medical Education (ACGME) sets the minimum standards for neurosurgery training in the United States. In recent years, these minimum standards have been revised and reorganized into clinical Core Competencies: Patient Care, Medical Knowledge, Practice-based Learning and Improvement, Professionalism, and System-based Practice. Though basic science or clinical research is not a requirement, the ACGME specifies a minimum standard of scholarly activity in neurosurgery training.

At many institutions in the United States, and at Emory University in Atlanta, Georgia, a more formal program has been established to promote the academic development of neurosurgery residents. The goal is to encourage residents to pursue research and publication, teaching, and ultimately a goal in the university setting. Like many institutions, Emory University requires residents to participate in research. At the very beginning of their training, we introduce first-year residents to a committee of research mentors that guide the residents into research laboratories or into clinical research as they mature in the training program. In the middle years of training, residents are required to publish papers (case reports, retrospective studies, prospective studies), and incentives are created to stimulate this activity such as attending national and international meetings. Research efforts are organized by subspecialization, and specific projects and sources of funding are prepared in advance of the each resident's research year. Near completion of the neurosurgery training, guidance and support is given to residents desiring an academic position. This includes instruction in applying for young investigator grant support as well as help in identifying job opportunities. The specific aspects of the Emory program in neurosurgery academic development are reviewed in this paper.

(Received August 4, 2010; accepted September 1, 2010)

Key words: neurosurgery, residency, academic, research, Emory


The primary goal of neurosurgery resident education and training in Japan, the United States, and across the globe is to prepare our trainees to practice proper, skillful, and ethical surgery of the brain, spine and peripheral nerves. The basis of this education is developing a thorough fund of knowledge, necessary decision-making skills, and achieving a level of competence in surgical procedures. In the United States, medical and surgical residency training is evaluated and accredited by the American Council for Graduate Medical Education (ACGME: a private, non-profit corporation). The ACGME has 28 Residency Review Committees (RRC: one for each specialty) made up of volunteer physicians who are appointed by the American Council on Medical Education and other specialty boards and organizations. In this article, the basic components of neurosurgery residency training are reviewed. Though training in basic and clinical laboratory research (including publishing) is not a requirement of the ACGME and Neurosurgery RRC, many universities have developed a formal program to promote the development and advance-

Address for Correspondence: Gerald E. Rodts, Jr., M.D., Professor of Neurosurgery, Emory University School of Medicine, The Emory Spine Center, 59 Executive Park South, Suite 3000, Atlanta, GA 30329

Jpn J Neurosurg VOL. 20 NO.2  2011.2  129

NII-Electronic Library Service
ment of academic neurosurgeons. At Emory University, Department of Neurosurgery, we have developed a system for achieving this goal. This system is also reviewed in this article.

There are 95 neurosurgery programs in the United States training approximately 890 residents. There are around 3,500 board-certified neurosurgeons in practice. The American Board of Neurological Surgery certifies approximately 115 candidates each year. The demand for neurosurgeons has remained stable. Despite the fact that most medical students applying for a neurosurgery residency claim to have a strong interest in academics, the reality is that the majority of U.S. neurosurgery residents go into community (private) practice after training is complete. Some universities are better prepared and equipped to produce academic neurosurgeons. It is understandable why most academic neurosurgeons were themselves trained in centers where there is abundant basic and clinical research activity, and where there is a faculty highly motivated to encourage, challenge, and promote the academic development of a resident in training.

The ACGME sets the minimum standards for clinical and non-clinical training. These standards were vigorously reviewed and revised several years ago. These minimum standards are referred to as the Core Competencies. There are five clinical core competencies, and non-clinical competencies such as education in the socioeconomic of medicine have been added more recently. The five Core Competencies of neurosurgery training are Patient Care, Medical Knowledge, Practice-based Learning and Improvement, Professionalism, and System-based Practice.

The Patient Care Core Competency ensures that a neurosurgery resident-in-training develops the skills to gather important data, order appropriate diagnostic tests, interpret data, and then make proper and reasonable clinical decisions. General medical (e.g. central venous line placement, arterial line placement, etc.) as well as neurosurgical procedures (e.g. ventriculostomy, craniotomy, spinal decompression, spinal fusion, ulnar nerve release, etc.) are supervised and a mentor provides direct instruction and feedback. Residents develop the skills and knowledge to manage patient therapies and work with others to provide patient-focused care.

Medical Knowledge is the second clinical Core Competency for Neurosurgery training. Programs are required to develop a resident’s fund of knowledge and to promote active use of that knowledge to solve medical problems. Regular assessment of knowledge through oral and verbal examinations should take place, as well as structured case discussions. At Emory University, we give short written examinations directly following a didactic session at Grand Rounds each week. Once per year, we administer an oral examination mimicking the format and style of the American Board of Neurological Surgery examination. We also expect residents to study and test on-line using the Self-test. Once per month, a different conference is held in which the residents present clinical cases to a faculty member, who then instructs them in surgical decision-making and rigorously questions them in order to assess their fund of knowledge.

A third clinical Core Competency is called Practice-based Learning and Improvement. Residents are trained to analyze practice performance and carry out needed improvements. They learn to locate and apply scientific evidence to the care of patients. Techniques for critical appraisal of the scientific literature are emphasized, and these techniques are practiced and demonstrated in a journal club once per month (supervised by a faculty member). Residents must become adept in using computer and internet-based resources to support their own learning and to improve patient care. Lastly, residents are taught to facilitate the learning of healthcare professionals in other specialties.

Professionalism is the fourth clinical Core Competency. Residents are taught to demonstrate integrity and honesty and to accept responsibility for their own actions and decisions. With the faculty setting the example, residents learn to act in the best interest of the patient and to demonstrate sensitivity to a patient’s ethnicity, age, and disabilities. In training, they are taught to speak in respectable, understandable language.

The fifth clinical Core Competency is referred to as Systems-based Practice. Neurosurgery residents should
be able to demonstrate awareness of interdependencies in the health care system that affect quality of care. They learn to provide cost-effective care and to avoid an over-use of laboratory and radiographic studies unless truly appropriate. Residents must learn to advocate for quality patient care, and work with hospital management and interdisciplinary teams in the hospital to improve patient care. This can include contributing to pre- or post-op protocol projects or participating in hospital patient care conferences with social workers, nurses, physical therapists, etc.

Non-clinical Core Competencies are currently being developed to answer the need for education about medical socioeconomic issues, legal and liability issues, and other non-clinical issues affecting the practice of neurosurgery within the United States. The ACGME has proposed a new strategy for formal resident assessment called the "360-degree evaluation". Using the 360-degree process, residents are not only evaluated by their faculty in the traditional "top-down" manner, but also using formal written evaluations by everyone "around them" throughout the day such as nurses, hospital administrators, attending physicians in other specialties, physical therapists, etc. Formal ratings of performance are completed annually, and this includes examination of resident record keeping and dictations. Even specific patient medical records are reviewed to explore and assess resident management of patient care. At Emory University, the residents annually take the written examination of the American Board of Neurological Surgery (ABNS) for practice, and more senior residents (usually beginning in the post-graduate year five or six) will take it for credit.

Conversely, the residents fill out written reviews of each faculty member every six months at the end of a clinical rotation. Residents meet as a group with the Program Director every 2–3 months to provide confidential feedback. The Program Director meets individually with each resident at the end of each academic year to go over the results of their formal faculty evaluation.

Though actual basic science research time in a laboratory or in clinical research studies is not required by the ACGME in U.S. residency programs, residents must participate in "scholarly activity". This scholarly activity should include learning about the basic principles of research and how research is conducted, evaluated, explained to patients, and applied to patient care. Neurosurgery programs are required to provide the educational resources to accomplish these minimum requirements.

At Emory University, it is required for neurosurgery residents that they participate in basic science laboratory research or participate in a formal clinical research project. This is true for most academically oriented training programs in the U.S. We look for medical student applicants with a proven history of research and publication. When a recent medical school graduate begins at Emory University as a first-year resident, he/she meets with the Department of Neurosurgery Research Committee to identify potential future areas of interest. Residents then begin clinical training, but they continue to meet once per year with the Research Committee. During mandatory clinical rotations in neurosurgery, residents are expected to write 1 or 2 clinical papers per year. Papers may include case reports, retrospective studies, or prospective studies. If a resident poster or oral abstract is accepted for a meeting (e.g. CNS, AANS, Joint Section), then a complete paper must subsequently be submitted to a peer-reviewed journal within six months. If a resident presents a paper or poster but does not follow up with a formal paper submission, then they are not allowed to travel to another meeting until a paper is completed.

With the guidance and advice of the Research Committee, residents are encouraged to establish a relationship with a mentor with expertise in their area of research interest. The Emory Neurosurgery Program research effort is divided up by subspecialty and includes Spine, Cerebrovascular/endovascular, Neuro-oncology, Functional neurosurgery/epilepsy, Pediatrics, Neuro-intensive care, Nanotechnology, and Neuroregeneration). Residents are provided with a research directory which includes the names, email and office addresses, and telephone numbers of all attending physicians involved in research, post-doctorate researchers, are laboratory staff for each subspecialty.

At Emory University, there is also an extensive history of open collaboration with colleagues at the Georgia Institute of Technology (Georgia Tech). Residents usually
work in laboratories within the Department of Neurosurgery or Neurology or Orthopedics or Radiology, but some residents may choose to work on the campus of Georgia Tech. Joint “think tank” conferences take place 3-4 times per year for interested neuroscience and neurosurgical faculty at the two different universities.

By the 5th year, each resident has selected a Mentor for research in the 6th year (whereas the final 7th years is the Chief Resident clinical rotation). The resident decides between a basic science laboratory tract and a clinical research tract. One year prior to starting the research year, a formal grant application is made for a “R25” grant from the National Institutes of Health (NIH). Other sources of funding that are explored include the AANS Neurosurgery Research and Education Fund (NREF), which includes a 2-year commitment and currently up to $40,000 per year support. Applications may be made for a CNS Resident Research Award or from the American College of Surgeons Research Grant program. The CNS Cushing Fellowship Award, the CNS Wilder Penfield Award, and the CNS Dandy Scholarship are other potential sources of resident research funding. Sometimes, private foundations are pursued for support such as the Dana and Christopher Reeve Foundation for spinal cord research. All applications are coordinated by the Emory Neurosurgery faculty Research Committee and/or by the resident’s selected faculty Mentor.

In the Chief Resident year, those residents interested in pursuing a career in academic neurosurgery make this desire known to the Chairman, Program Director, and appropriate faculty. The faculty take an active role in helping the interested resident find academic job opportunities, and often an Emory faculty member will promote the interested resident by making personal contact with the hiring institution. A Chief Resident going into academics receives further advanced mentoring (prior to graduation) on how to apply for a NIH/NINDS “K Award” for junior faculty investigators.

At Emory University in Atlanta, GA, and at many academically oriented training programs around the U.S., we hope that an organized program (for promoting resident academic development) and personal mentoring, encouragement, and enthusiasm will result in even more residents pursuing careers in academic neurosurgery.