

TEACHING NEUROLOGY TO MEDICAL STUDENTS WHO ARE NOT ENTERING A CAREER IN NEUROLOGY

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I thank the American Academy of Neurology for this recognition. I am truly honored to receive the A.B. Baker Award. I also thank the Baker family for their support of this award. I also thank my colleagues in the Department of Neurology and Carver College of Medicine for supporting my activities in medical student education. I am among the dwindling number of neurologists who had the opportunity to meet Dr. Baker. I was a resident at the University of Iowa under A.L. Sahs, who was one of the four-horsemen of the American Academy of Neurology and a close friend of Dr. Baker. Dr. Sahs was my mentor in my career in stroke and a role model for me to be a teacher.

Academic neurologists are expected to be role models for residents and medical students. In addition, they should demonstrate skills and leadership in clinical service, research and scholarship, and teaching. In the modern era, with the increasing demands for documentation, coding, and rapid service in patient care and the emphasis on funded research, it is hard to maintain excellence in teaching. In particular, the teaching of medical students is becoming more difficult. Still, the most important duty of any academic neurologist remains the education of our future physicians.

We as neurologists and members of the American Academy of Neurology are eager to have as many medical students as possible to pursue careers in our specialty. However, we all recognize that approximately 98% of medical students will have interests in other specialties in medicine. On the other hand, all physicians regardless of their specialty will see patients with a broad spectrum of neurologic symptoms and diseases that happen in people of all ages. Those medical students entering neurology will have extensive training in the recognition and treatment of neurologic disease during residency and the remainder of their career. Yet, physicians in non-neurologic specialties are the first practitioners to see patients with neurologic symptoms. These colleagues often do not have training in neurology in their residencies. Thus, their exposure to neurology during their medical school education becomes crucial. Unfortunately, many medical schools provide little or limited exposure to neurology. During my career, I have become increasingly concerned by the gaps in neurologic education for medical students.

Reasons Medical Students do not enter a Career in Neurology:

Over the years, I have asked medical students about their selections of careers in medicine. There are a number of reasons. For example, students who like children enter pediatrics. Financial incentives lead to other choices. Personal interest in types of diseases and therapies are also reasons for choices. When asked why they are not entering a career in neurology, the two most common answers are the intimidating nature of neurology and brain diseases and the perception that patients with neurologic disease cannot be treated. Neurologists who are teaching medical students need to address both of these issues.

Many medical students are overwhelmed by their experiences in introductory courses in neuroscience. These courses often emphasize large amounts of information that are not relevant to most physicians in practice. For example, is it crucial for a primary care physician to learn the names and functions of the cells in the cerebellar cortex? Is it important for a general surgeon to be taught the functions of the ansa lenticularis? One doubts it. Yet, these nuances are taught and tested in neuroscience courses. Such detail alienates medical students to brain diseases and neurology. Educators in neurology should work closely with their neuroscience colleagues to create introductory courses that are palatable and digestible for medical students. The course must be clinically relevant. The course can be improved by neurology faculty bringing patients or vignettes to the classes. My colleagues and I have become increasingly involved in our introductory neuroscience courses. We have developed a variety of direct participatory activities that have greatly increased student interest.

When I was a medical student, the perception of neurology was that it specialized in awful diseases that could not be treated. For example, as a medical student, I was told by a cynical resident that the treatment of a patient with a stroke was influenced by their ability to swallow. If they could swallow, they were sent home. If they could not

swallow, they were given a feeding tube and sent home. My, how times have changed. Still the perception that neurologists cannot treat patients persists. While I do not emphasize individual therapies in my interactions with medical students because treatments will radically change during their careers, I do highlight the importance of interventions to treat patients with the goals of stabilizing or improving their well-being and avoid the sense of nihilism that surrounds treatment of patients with neurologic disease. The development of treatments of acute ischemic stroke including thrombolytic therapy and endovascular interventions has greatly facilitated the point that neurologists do treat patients and that patients can be helped or cured.

A Clinical-Neuroanatomic Approach

My colleagues and I use an approach that tries to synthesize information taught in our basic science course and to move it to a clinical setting. The first question asked of a student is where in the nervous system the problem is located. The goal is for the student to take a constellation of neurological symptoms and signs and determine a likely localization. The concept is that knowing where the problem is results in a clearer differential diagnosis. I use the analogy of not diagnosing otitis media in a patient with right lower quadrant pain. Similarly, one does not diagnose myasthenia gravis in a patient who has aphasia and right hemiparesis. This serves as a springboard to go through a series of patterns of neurologic disease and the implications as far as localization and potential cause. Rather than a broad differential that includes relatively uncommon neurological diseases, the focus is on relatively common representative diseases. For example, when discussing radiculopathies, the emphasis is on a herniated disc.

Another important concept is the tempo of the disease. Courses are generally classified as acute, subacute, or chronic in nature. The time course for these definitions may vary depending on the location in the nervous system. For example, a stroke may evolve over minutes to a few hours while the symptoms of Guillain-Barré syndrome may progress over a few days. An emphasis on the course is to recognize acute neurological illnesses that would need emergency referral and treatment. These are the patients who need early, accurate diagnosis to avoid death or disability.

Where? What? Why?

It is important to provide students with some basic frame work in diagnosis. There are 3 key questions in the practice of medicine in general and in neurology in particular. These are fundamental for accurate diagnosis, reasonable plan for evaluation, and effective treatment. As stated in the previous section, an anatomic location is the first step. The physician needs to know the answer to the question where. Many neurological disorders are anatomic-specific. The second question is what is the problem? This is the nature of the neurological illness and it is influenced both by the anatomic location and the tempo of the disease. The third question is why did the illness occur? The underlying reason for the neurological problem is related to components of the patient's past medical history. An example would be a 70-year-old man who has aphasia and right hemiparesis. Where? Location is the dominant cerebral hemisphere. What? His symptoms have been present for 3 hours. The time course would be most consistent with stroke. Why? He has a past history of atrial fibrillation; with this history we make the assumption that the stroke is secondary to cardioembolism. There are some limitations to this approach. Some of neurological disorders, such as multiple sclerosis, have symptoms that point to multiple areas of involvement in the nervous system. Other illnesses, such as intoxications, maybe have global findings of neurological dysfunction.

The Importance of the History

When teaching the students, the above exercise is done while the history is being obtained. The presence or absence of symptoms is discussed. In fact, the absence of symptoms may be more important than the symptoms that are present. The core principal of clinical assessment is doing a careful history. Dr. Sahs stated that if you had 30 minutes to be with the patient, a skilled physician would spend 25 minutes taking the history. He also emphasized taking the past medical history before collecting details of the present illness. The concept is that a new illness is likely to be related to the patient's past medical problems. This information helps in selecting additional questions during the remainder of the history. This is a concept that I continue to use when teaching medical students. The goal is for the students to have an impression of possible location of the neurological illness and the differential diagnoses before moving to the examination.

The entire neurological examination is taught to the students. We will also emphasize that while a complete examination should be done on all patients, additional testing of parts of the neurological assessment may be required depending on the patient's history. For example, a more detailed sensory examination will be performed for a patient with a suspected neuropathy than for a patient who has primarily visual complaints. The findings on examination should complement the history. The patterns of neurological impairments, which often are stereotyped, will also point to both the site and type of illness. The students are instructed in the features of the neurological abnormalities that are relatively specific for different parts of the nervous system ranging from disorders of consciousness to primary muscle diseases.

The students are then encouraged to develop a reasonable differential diagnosis. Then, ancillary diagnostic studies can be ordered in a coherent way. The indications for the tests, interpretation of results, and the implications for treatment are then reviewed. Because imaging has become such a key component of evaluation, students are asked to interpret scans and similar studies. Following the establishment of the most likely diagnosis, the faculty and students discuss treatment options.

Students Learn by Doing not Watching

The bright young men and women who are medical students are eager to interact with patients. While medical students are many things, they are not very efficient. This is not surprising given their level of experience. This can be a problem especially in an outpatient clinic setting. The demands on faculty and residents to maintain a high level of productivity means that medical students may be lost. Strategies to involve them in patient assessment other than shadowing need to be developed. This has been a major problem for me. The way for me to address this is for the student to see a return patient while I am seeing another patient. The patient is informed that the medical student is helping me and I will also assess him. The student does a history and then presents the details to me. I will then do additional history with the patient while the student observes my line of questioning. Thereafter, the student and I will do the neurological exam together. I will critique the examination at the time and give the student immediate feedback. In a similar way, it is important for students to gain experience in developing progress notes, writing orders, and creating electronic medical records. This is a challenge that I have had difficulty overcoming. The demands of third party payers, coding personnel, ICD 10, etc hampers the ability of students to participate in writing notes and other components of patient care. This will continue to be a problem for future academic neurologists.

Making Neurology Fun and Relevant

Medical students want to be a member of a team. They want to participate in all aspects of the team's activities. This is particularly true for inpatient rotations. This should be educational and fun. Faculty members should demonstrate joy in their activities. A positive and enthusiastic attending physician spreads similar feelings among the students. The faculty members will serve as a role model for them. In addition, the attitudes and actions of the neurology residents are equally important. Because these physicians are closer in age and experience, medical students relate to them. They should be encouraged to teach the students and to help to have a positive experience. They can observe the students' clinical encounters and critique their clinical notes.

Many neurology textbooks are excellent but are too detailed and overwhelming for medical students. As a result, my colleagues and I developed a syllabus that contains information about a broad spectrum of neurological diseases with a limited number of individual disorders described in more detail. This is supplemented by a series of lectures that are available on our local intranet system. The students are able review the materials as it fits their schedules. The final examination in neurology, which we developed, covers topics in the syllabus and lectures. In addition, the students' performance during the clerkship and their evaluations are used for determination of their grades.

Among our educational initiatives are stroke rounds and neurojeopardy. Stroke rounds involve the participation of faculty, residents, fellows, and students. These case-based sessions are held every weekday and the last for approximately one hour. During the sessions, a medical student presents the case. Then, other students are asked to help localize and diagnose the likely illness. Subsequently, the residents and faculty give their opinions. The case usually involves a stroke. However, besides learning about cerebrovascular disease; students also have the opportunity to learn about the anatomy and function of the brain in a real patient. The format is through asking questions in the Socratic Method. We try to avoid humiliating a student and we take steps to ensure that

all students are involved. In addition, the atmosphere is kept positive with encouragement and jovial exchanges. While such teaching has been criticized, stroke rounds are consistently rated as one of the best educational experiences during the clinical clerkships. In summary, the sessions are both educational and fun. They are also memorable. I have had physicians tell me about their recollections of stroke rounds decades later!

Another educational initiative is the creation of neurojeopardy. This weekly session is loosely modeled on the television program. Six categories of 5 questions that relate to the diagnosis of neurologic diseases are used. Categories can include gait disorders, aphasic syndromes, infectious diseases, movement disorders and tumors. Each question has a point total with the hardest questions having the most points. If I learn the interests of some of the medical students, I will develop questions that give a neurologic spin on their career choice. For example; I will create a category about the facial nerve to pique the interest of a student who is entering otolaryngology. This will make neurology more relevant to him. At the end of the session, students pick two topics for final jeopardy. These topics may range from a neurologic illness to geography, sports, or music. My challenge is to try to make the questions related to neurology. By nature, medical students are competitive and as such, we have teams of students working together. Many medical students have reported to me that many of the questions or topics were tested on the Step 2 examination. The students also rate neurojeopardy as a very positive experience.

Closing Comments

I am grateful to the Academy. It is a pleasure to be recognized for something that one enjoys. This recognition is important to me but still, I find the positive comments that I receive from the students at Iowa even more gratifying. Although I have had success in research, administration, and patient care, the teaching of medical students has been a labor of love. As my career has evolved, I recognized the value of engaging medical students who are not entering careers in Neurology on the importance of our specialty. I hope that you will continue to emphasize the education of these future physicians regardless of their specialty.