The Challenges Facing Neurology, Neurosurgery, and the Neurosciences

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Neurology as a distinct specialty is relatively new in the history of medicine. Beginning with Charcot, who built his neurology on a firm phenomenologic basis, the specialty of neurology was developed rapidly by such outstanding clinicians as Babinski, Duchenne, Erb, Marie, and Hughlings Jackson. In the 19th century, clinical observations increasingly were linked to neuroanatomical substrates. At the turn of the century, neuropathology gained a foothold, and clinical methods were developed further by such luminaries as Ramón y Cajal. Primitive laboratory procedures began to relate spinal fluid and brain electrical changes to human disease. A cadre of superb clinicians emerged, and neurology departments began to appear at medical schools, where residents were taught to interpret signs and symptoms carefully at the bedside. Mentored by superb clinicians, but lacking definitive laboratory and imaging procedures, these young neurologists continued the tradition of a specialty renowned for deductive reasoning. Neurologists were able to predict things other physicians could not, often with startling accuracy. But the specialty was plagued by lack of definitive studies to confirm clinical impressions, and an even more pervasive paucity of treatments for most neurologic conditions which exacted such a heavy human toll. Crude laboratory and radiologic tests, including angiography, were the only tools available. The clinicopathologic conference was in its heyday, and unexpected and startling revelations frequently were made at the autopsy table.

BRAIN RESEARCH ACCELERATES

In the last quarter of the 20th century, things began to change. Imaging began to portray the brain and its diseases, which previously were not visible on radiographs. The genetic basis of many conditions became obvious, and, most important, new treatments were available for an increasing array of diseases. At the close of the century, diagnostic modalities and treatment options were expanding tremendously. The Decade of the Brain focused public attention on the nervous system, and funding for research in neurologic diseases more than doubled as the world began to view brain diseases as a scourge that could be defeated. In this setting, the specialty of neurology was changing. The field had been divided into academic departments responsible for teaching, performing research, and training residents and neurologic practitioners who were responsible for caring for patients in myriad settings. Academic leaders in neurology became increasingly distanced from their clinical colleagues, although both were strongly influenced by financial pressures. Academic leaders who received their salaries from institutions and grant income were slow to recognize the reimbursement considerations faced by practitioners and were even slower to react to them. Although almost all neurologists were expert at reading computed tomographic and magnetic resonance images, in most cases they were prevented from charging for them, the field of imaging having been left to others who could reap financial rewards from the neurologists’ patients. Neurologists and neurosurgeons are to be blamed for this loss of control of portions of their specialties because they had become too busy taking care of patients and did not spend enough time taking care of the business and politics of their specialties. A. B. Baker, founder of the American Academy of Neurology, reportedly stated that he who controls the patient controls the procedure. We did not listen to the sage advice of our predecessors.

HEALTH INSURANCE AND REGULATION

Through the Medicare fee schedule, the federal government determined reimburse-
ment for neurologic evaluation and management codes, as well as for the procedures performed by neurologists. The health insurance companies followed suit, using the Medicare schedules as a template to determine their fee structures. A Harvard study had attempted to place a rationale on the value of evaluation and management codes and procedures for all specialties, but the inequalities and unfairness that triggered the study remained and have persisted until the present day with 2 clear messages: (1) physicians in certain specialties are able to make a lot of money, and (2) procedures are reimbursed at a higher level than evaluation and management codes. These 2 messages have had profound effects on the practice of neurology. Young physicians may choose careers other than neurology, which is perceived as labor-intensive and poorly reimbursed; neurologists increasingly perform procedures; and neurologists spend less time with patients, resulting in patients' most common complaint—"my doctor won't talk to me." Even though evaluation and management code reimbursement is viewed by the overwhelming majority of neurologists as inadequate, the federal government, private insurance companies, regulatory agencies, and hospitals have imposed ever more stringent controls over neurologists' practices. Neurologists view many of these controls as not demonstrated to improve patient care, time-consuming, and expensive, since additional personnel must be hired for the office to be in compliance with safety, coding, regulatory, and billing issues. To add to the burden, recent large jury awards against neurologists in medical malpractice cases, as well as a recent downturn in the economy, have resulted in higher malpractice insurance premiums for practicing neurologists and neurosurgeons, and large numbers have finally decided to leave, or drastically change, their practices. There are fewer neurosurgeons in practice now than 4 years ago largely because of these factors. Neurologists who remain in practice in many cases survive financially primarily by performing procedures. Spending less time with patients, taking histories, and examining patients inevitably means that over time clinical skills, painstakingly developed over a century and a half, are increasingly being eroded.

Neurosurgeons are reimbursed well for placing instruments in patients with spine problems, but unfortunately, many patients need neither the instruments nor the surgery. The biomedical industry has stimulated this use of technology from an interest in monetary gain. The biomedical-industrial complex is driving technological solutions to supposed neurologic problems, but in some cases, such solutions are unnecessary. Unfortunately, this materialistic trend is pervasive in society and is similarly influencing physicians. The end result for medicine can only be negative. The self-sacrificing and charitable attitudes physicians learned are being replaced with self-serving attitudes that are fundamentally foreign to the practice of medicine.

CHANGES IN PRACTICE

When many who are currently leaders in neurology were trained, clinical findings were both fascinating and important. Now the definitive study may be neuroimaging or a laboratory test. Why would a modern neurology resident want to learn how to perform a Jendrassik maneuver when it is easier to order cervical magnetic resonance imaging? As a result of these changes, the most expert clinicians tend to be older people who rely more on what they learn in the office setting or at the bedside. This is how they were trained, and old habits change slowly. Younger neurologists have more faith in technology, neuroimaging, and laboratory procedures and have less time for patients. As time goes by, it will be interesting to see which group has higher patient satisfaction and fewer lawsuits.

THE FUTURE

It is clear that the blistering pace set for the control of neurologic diseases will accelerate on the basis of advances in basic science. The next decade will likely bring further understanding of the biology of important neurologic diseases such as multiple sclerosis, Parkinson disease, Alzheimer disease, amyotrophic lateral sclerosis, muscular dystrophy, and stroke, to name a few, and there likely will be cures. The 21st century will see the greatest advances in the neurosciences in human civilization, particularly in imaging and molecular biology. In imaging, the growth of magnetic resonance technology enables not only visualization of the fine detail of the brain, the spinal cord, and their fiber tracts, as well as peripheral nerve, but also the study of biochemical profiles of these structures. Functional magnetic resonance imaging enables the visualization of sensory, motor, and cognitive skills to reveal the connections among all the fiber tracts. Memory circuits are being mapped out in the temporal lobes.

Magnetic resonance imaging visualization of blood vessels of 500 µm or smaller will mark the end of angiography. With magnets of higher strength, we will see protein structure and the actual molecular activity in cells, revolutionizing medicine and neuroscience.

During the past 10 years, the entire human genome was determined, a discovery that undoubtedly will be one of the greatest scientific achievements in human history. An increasing number of neurologic diseases now can be revealed as genetically caused. The molecular biology of many neurologic diseases once determined will lead to the discovery of targeted chemotherapy for those pathways or actual replacements of defective genes. We see these discoveries in dystonias, Parkinson and Huntington diseases, cerebellar degenerations, and many more diseases. Neurologists will be able to treat the diseases that previously they could only observe. The cellular events involved in traumatic injury to the brain and spinal cord are being determined. The neurointensivist position will become an exciting career as the dynamic minute-to-minute changes in the brain and spinal cord will be monitored and treated.

Similarly, behavioral diseases treated by psychiatrists are being discovered to be genetically based. Fiber tract imaging is demonstrating changes in patients with behavioral problems, and positron emission tomography is revealing synaptic changes that can begin to explain psychiatric diseases. Patients with persisting pain problems may have genetic bases for their pain. The failed back syndrome may be a failed physician syndrome because of an ignorance of the molecular and biochemical influences contributing to the patient's pain problem. All of these molecular and genetic changes are forcing the formerly independent specialties...
of neurology, neurosurgery, and psychiatry to become closer as they work on the same molecular and genetic brain.

NEW ALLIANCES AND TREATMENTS

The rapid revelation of new information will force the development of superspecialization. These superspecialists will have to unite in groups to be able to deal with the entire field of neurology, neurosurgery, and psychiatry. This interdisciplinary cooperation will lead to disease management instead of specialty care. Already interdisciplinary groups of neurologists, neurosurgeons, physiatrists, social workers, and others treat movement disorders and epilepsy. Within the decade, stroke, pain, and numerous neurologic disorders will be treated by these interdisciplinary groups. In academic centers, these groups will include basic translational neuroscientists who will work with clinical specialists and groups to try new discoveries in solving disease problems. Much of this collaboration has already begun. The neurologic field will be one of the most exciting areas in which future physicians and scientists will work. This interdisciplinary relationship will lead to new methods of compensation to correct the inequities perpetrated by a reimbursement system that offers little incentive for good-quality patient care. It makes no sense for a neurosurgeon to make large sums of money removing an epileptic focus whereas the neurologist spends much more time caring for the patient and defining the problem to be surgically treated. Neurologists and neurosurgeons must work as a team in all aspects of disease clinically and financially to produce the best results.

With the discovery through fiber tract imaging that cranial neurosurgical procedures can produce cognitive changes in a brain in which every area will be known to have interconnections with others, neurosurgery will become less invasive. Interventional approaches to aeurysms, arteriovenous malformations, and ischemia percutaneously using arteries and veins as access routes will ensure that many surgical approaches will soon fade into history. Carotid arteries, like coronary arteries, will have stents placed in them using new technology. With the extension of the remarkable targeted molecular therapies that are being reported to treat cancers outside the nervous system, large invasive neurosurgical procedures to remove tumors will fade, and neurosurgery for lesions in the base of the skull will disappear. Technical neurosurgery as we know it today will become of historical interest during this century.

What is ahead for neurologists in the new millennium? There are certainties: Neurologists will continue to be necessary because patients have symptoms that must be interpreted, if only to determine the correct neuroimaging procedure, laboratory tests, or treatment. A general physician or nurse practitioner cannot do that in many instances. In fact, the few studies available suggest that when a neurologist is engaged in a patient’s care, medical costs go down and outcomes are improved. The prognosis and proper treatment are best determined by a neurologist because of neurologic training and experience.

Neurologists, neurosurgeons, and psychiatrists will be working closer in groups managing diseases in a system that pays for disease management and rewards and encourages this interdisciplinary care because its results are superior to specialty care. Changes in reimbursement naturally will follow. Such examples already exist in some large clinical systems in the United States.

There is much discussion at present about ways to change the reimbursement system fundamentally so that core neurology activities are valued and rewarded. Neurologists should be able to make a living doing what they do best and what their patients need most. This change would encourage neurologists to stop trying to gain from the system by pursuing procedures at the expense of more traditional patient care. Efforts are under way to correct this imbalance, and the stakes are high.

Another certainty is that as diagnostic and treatment modalities improve, often by staggeringly huge leaps, the public will have access to these advances almost as quickly as the neurologist through increasingly sophisticated technology and laws governing the release of information on the Internet. The growth of information technology and mining of huge databases of patient information from all over the world in the decades to come will make available to the clinician an expanded range of diagnostic and therapeutic information that a physician can apply to a specific patient. These databases also will contain additional tests to order and treatment options, all based on literature experience. So the quality of neurological practice by the middle of the century will be astounding.

For neurology, neurosurgery, and psychiatry to survive and prosper in this new era, they must return to their roots as the premier clinical specialties. A patient coming to a neurologist’s office with a computer printout of a new treatment has the same concerns as the patient who saw Hughlings Jackson, Babinski, or Wilson: “What’s wrong with me? What will happen to me? How can you help me? What do I do?” The fundamental bases for medicine throughout human history such as the need for compassion and understanding and an intelligent interpretation of all of the findings in the light of the individual asking for help will never change as technology advances. We are neuroscientists. Our professional life will always be fulfilled and justified by answering our patients’ questions and meeting their needs. As A. B. Baker reportedly stated, “Treat the patient, not the disease.” This dictum will endure into the future.

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