Emerging Subspecialties: Neurorehabilitation

Training neurologists to retrain the brain

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WHY NEUROREHABILITATION? If not newly emerging, the subspecialty of neurorehabilitation is definitely burgeoning, and neurology trainees may not be aware of the exciting career opportunities within the field. The contemporary neurology resident is trained in a discipline that has changed dramatically in the last two decades. The modern day neurologist has a slew of treatment options at hand, from r-tPA to multiple immunomodulating medications, and practices with this arsenal of treatments from the emergency room to the outpatient clinic. Despite these advances, many patients still leave the hospital or clinic with debilitating cognitive and sensorimotor impairments and ask what we can do to help them walk or use a hand again or regain enough function to return to their ordinary life activities. Some want advice regarding the prevention of further neurologic deterioration.

The discipline of neurorehabilitation is the field concerned with these reminders of past and present neurologic illness and the improvement of neurologic function. Yet it is not uncommon for many neurology residents to get only a glimpse of this discipline, caught perhaps during a short spinal cord or traumatic brain injury rotation. Beyond the first 72 hours of acute stroke care, most residents will have no interaction with patients to help them swallow, walk, reach and grasp, or manage language and hemineglect disorders. For many residents and practicing neurologists, the team-based approach to therapy characteristic of rehabilitation medicine, and the lack of focus on “localize the lesion” discussions, may seem foreign and fail to inspire a vision of their potential role as a neurorehabilitationist.

But it is precisely neurologists’ background knowledge and interests that make them ideal leaders and partners in the neurorehabilitation team. The neurologist’s in-depth understanding of the anatomy, physiology, mechanisms of in-

jury, and plasticity of the nervous system is an essential component both in offering prognostic guidance to patients and families during rehabilitation and in the development of new and more effective techniques to enhance motor control and cognitive skills. The neurologist’s appreciation of how the web of neuromedical complications and symptomatically targeted medications can affect the nervous system is also an important component in managing the course of rehabilitation and helping move the patient and therapy team toward a set of realizable goals.¹

Beyond this currently available leadership role in neurorehabilitation, the future of the discipline offers young neurologists even more exciting career prospects. From the molecular neurologist to the neurologic ethicist, the “plastic” nervous system is an intriguing target of study. Neurologists with an interest in research are increasingly directing the translation of stem cell neurobiology,² fundamental mechanisms of learning, neuropharmacological manipulations, cortical electromagnetic stimulation,³ robotic therapy,⁴ and brain-computer interfaces⁵ into ways to improve outcomes. The recent introduction of large scale neuroscientifically based therapeutic clinical trials^{6,7} into the field of rehabilitation is advancing the opportunities for evidence-based patient care. Another aspect of great appeal in neurorehabilitation is that it continues to be grounded within general neurology. The principles of neural repair and plasticity share a basic foundation across and beyond the various pathophysiologic etiologies of the original neural injury, so the neurologist trained in neurorehabilitation may contribute to the care of patients with multiple sclerosis, peripheral neuropathy, traumatic brain injury, stroke, or other diseases. A neurologist who can help them identify spared pathways and enable them to practice a skill will give patients hope and better quality of life. As young soldiers return

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from battlefields with the scars of traumatic nervous system injury, or as the aging population suffers cerebrovascular complications in greater numbers, the skills of the neurorehabilitationist will be in even greater demand.

TRAINING OPPORTUNITIES IN NEUROREHABILITATION

A broad range of training paradigms currently fall under the neurorehabilitation umbrella, from the basic science benchtop laboratory to the outpatient clinic. The American Academy of Neurology (AAN) section on Neural Repair and Rehabilitation has drafted a proposed core curriculum for training (<http://www.aan.com/globals/axon/assets/2736.pdf>). Some of the skills that must be learned by the neurorehabilitationist are familiar to neurologists and make them ideal candidates for this role, including understanding the basic science of nervous system plasticity, anticipating the long-term effects of neuromuscular disorders, and managing the medical and social consequences of neurologic injury. However, the neurorehabilitation fellowship is also a chance for the neurologist to learn a new skill set including management of chronic pain, the use of research disability scales, or the completion of formal disability evaluations. Neurorehabilitationists also need to become fluent in the language of occupational, physical, and vocational therapy and to learn how therapists and patients use orthotics or assistive devices, and how these tools fit into the economics of rehabilitation. A set of recommended readings and a certification examination originally established by the American Society of Neurorehabilitation (ASNR) may soon be managed by the United Council for Neurologic Subspecialties. Both the ASNR and the World Federation for Neurorehabilitation sponsor *Neurorehabilitation and Neural Repair*, a bimonthly journal dedicated to the translational clinical sciences of neurorehabilitation. Interested trainees can find listings of current fellowships through the ASNR (<http://www.asnr.com/clientuploads/ASNRFellowshipInformationUPDATE.DOC?PHPSESSID=983c2c30d63c57a482c6725427f5390> days), through the AAN, or through the American Academy of Physical Medicine and Rehabilitation (<http://www.aapmr.org/member/felsearch.htm>).

As with many smaller subspecialties, residents seeking training in neurorehabilitation need to identify those aspects of training they are most interested in to find a compatible fellowship. While some programs concentrate on the topics covered in the AAN proposed curriculum, pre-

paring a fellow for clinical neurorehabilitation practice in about 1 year, others are aimed more toward academic neurorehabilitation, emphasizing a research-based curriculum in areas such as mechanisms of activity-dependent plasticity, functional neuroimaging, transcranial magnetic stimulation, or stem-cell biology, over 2 or more years. Some fellowships may emphasize a disease orientation, such as stroke, brain or spinal cord injury, and multiple sclerosis. Trainees may want to combine general clinical and focused research curricula through one or more fellowships.

CAREER PROSPECTS IN NEUROREHABILITATION

The career prospects for neurorehabilitationists are as varied as the primary interests that lead them to the field. While general rehabilitation is dominated by physiatrists, neurorehabilitation is really a subspecialty that appeals only to a small subgroup of physiatrists. A brief survey of the nationwide job listing service provided by HealthJobs.com, conducted at the time of this writing, revealed eight positions for neurologists with an interest in rehabilitation and one for physiatrists interested in neurology. Many of these positions are academic, reflecting a trend seen in other parts of the world, where neurologists are ushering in a new era in neurorehabilitation.⁸

DISCUSSION Perhaps we can take inspiration from the neurologist who formally introduced rehabilitation techniques to modern medical practice, Dr. Henrich Sebastian Frenkel. Dr. Frenkel, a Swiss neurologist, astutely observed an improvement in the finger-to-nose examination of one of his patients with tabes dorsalis. Upon further questioning, he learned that the patient, having “failed” the examination in a previous visit, had “practiced” so that he would “pass” at his next appointment.⁹ Inspired by his patient, Dr. Frenkel began the organization of a field that would lead within a few years to a department of “ré-éducation fonctionnelle” at La Salpêtrière in Paris. The field flourished among neurologists in Europe, and has now led to 20 to 25 academic neurorehabilitation programs in the United States. Now US neurology trainees can increasingly appreciate that a “functional re-education” of our understanding and treatment of the injured nervous system may benefit our patients, our careers, and our profession.

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