RESIDENT & FELLOW SECTION

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Residency Training: The role of neurocritical care in resident education

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Neurology is traditionally recognized as primarily an outpatient or consultative specialty, usually attracting candidates whose main focus may not necessarily be the management of complex critically ill patients or the performance of invasive procedures. However, the advent of modern mechanical ventilation and, more recently, effective therapies for the treatment of acute ischemic stroke and other neurologic catastrophes is bringing about a paradigm shift, with neurologists increasingly assuming a more aggressive attitude and rapid response to frequently disabling and often fatal pathologies.

Neurocritical care has been around since the dawn of human civilization, and the Edwin Smith Surgical Papyrus already described many conditions considered to be under its scope, including head and spinal injuries, tetanus, and status epilepticus. The outbreaks of paralytic polio in the first half of the 20th century formally marked the first time that neurologists cared for critically ill patients, and the development of the iron lung used in the treatment of polio victims led to improved survival and served as a precursor to modern mechanical ventilation.[1] Walter Dandy with a pioneer vision established in 1932 at the Johns Hopkins Hospital the first dedicated postoperative neurosurgical unit, recognizing the need for special care in sicker neurologic patients.[2] Since those early days, the presence of neurologists in the critical care setting has grown exponentially. Modern neurocritical care is considered to have started with the organization and establishment of dedicated neurocritical care units (NICUs) during the 1980s with the work of Dan Hanley at The Johns Hopkins Hospital, Matthew Fink at Columbia University, Allan Ropper at Massachusetts General Hospital, and Thomas Bleck at University of Virginia at Charlottesville.[3]

There was an urge for improved care of critically ill neurology and neurosurgery patients, with needs not usually recognized and/or addressed in general critical care units. Specialized monitoring and highly trained multidisciplinary teams were also recognized as crucial pieces of this intricate mechanism. During the following decades, the exponential growth of clinical and experimental studies, the development of advanced methods of brain monitoring, and the creation of training centers led to a widespread establishment of these highly specialized units throughout the world.[3]

Caring for patients with neurologic and neurosurgical emergencies can be a challenging prospect that requires a unique set of skills. Many of these disorders rank among the most common causes of death and disability in the adult population and neurologists can expect to be frequently confronted with the care of patients afflicted by neuromuscular diseases (i.e., myasthenia crisis and Guillain-Barré syndrome), hypoxic-ischemic encephalopathy following cardiac arrest (for initiation of induced hypothermia and prognostication), status epilepticus, neurologic complications of medical diseases, meningoencephalitis, increased intracranial pressure, and the ubiquitous cerebrovascular diseases, among others. Moreover, neurologists should also be able to promptly recognize clinical deterioration in a given patient, initiate early interventions that may help limit the extent of neurologic injury, and urgently and efficiently triage patients to the intensive care unit.

Most physicians who lack a background in neurology are not comfortable managing critically ill neurology and neurosurgery patients and usually prefer to seek transfer of care to a facility with a dedicated NICU or rely heavily on their neurology consultants. Furthermore, although most large academic centers in the United States have a dedicated NICU, there remains a significant shortage of neurointensivists (i.e., only about 550 board-certified neurointensivists as of 2011 in the United States according to the United Council for Neurologic Subspecialties), and for the foreseeable future at least, neurology consultants should expect to have a major role in the management of this patient population, particularly during the early period of their disease process.[4] The most recent census of the American Academy of Neurology (AAN)[5] revealed that 37% of AAN members have their practices focused on cerebrovascular diseases, and approximately 10% on critical care. Also, more than half of the 54%

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of the members who consider themselves to be general neurologists work in large groups or hospital centers. We can therefore infer that a significant number of neurologists in the United States are likely consulted to help manage critically ill patients on a frequent basis and ample exposure to neurocritical care during residency training would serve to better prepare general neurologists for this task.

Although neurology consultants have an extremely important role in supporting the care of patients with neurologic diseases or complications in medical and surgical ICUs, neurointensivists have a broader training, including skills with invasive procedures, airway management, imaging analysis, and multimodal monitoring training. A growing body of literature supports that patients with traumatic brain injuries,[6] ischemic strokes,[7] intracerebral hemorrhages,[8] and subarachnoid hemorrhages[9] all have better outcomes and shorter hospital stay when treated by physicians with neurocritical care training. In an effort to disseminate the knowledge of basic neurocritical care competencies, the Neurocritical Care Society developed the Emergency Neurological Life Support course, with the same guiding principles of the Advanced Cardiac Life Support training. The course aims to prepare the provider to promptly recognize and adequately treat the most frequent, disabling, and fatal neurologic conditions, based on current literature evidence.[10]

Clinical rotations for neurology residents in the NICU can be an exciting experience, because they are often able to directly manage high-acuity patients under controlled conditions and adequate supervision. Although the learning curve can be steep at first, the progressive acquisition of knowledge and skills can prepare residents to recognize and promptly react to the most common presentations and complications of a great variety of neurologic emergencies. The Accreditation Council for Graduate Medical Education requires that neurology programs provide "exposure to and understanding of evaluation and management of patients in various settings including an intensive care unit and an emergency department with neurological disorders and for patients requiring acute neurosurgical management."[11] Similarly, the AAN states in the suggested core curriculum for neurology programs that "it is anticipated that experience in managing critically ill patients suffering primary or secondary neurologic dysfunction will occur throughout the three years of residency training, in the intensive care unit, the emergency department and in-patient settings. It would be expected that there are discrete rotations in critical care and supplemented by didactic lectures/seminars by faculty and relevant correlations with other related areas."[12] Nonetheless, the implementation of resident work hour restrictions poses new challenges that may negatively impact the feasibility and/or quantity of critical care exposure for neurology residents during their residency training.

A recently conducted survey supported by the AAN queried program directors of 132 neurology residency programs in the United States about the intensity and quality of the exposure of residents to neurocritical patients. A dedicated NICU was available in 64% of the programs, but only 56% of them offered a dedicated rotation in the NICU. The rotation was mandatory in 91% of the programs with a NICU and lasted an average of 4 weeks. According to this survey, the number of programs having at least 1 resident matching into a neurocritical care fellowship increased from 14% to 35% between 2005 and 2010. The study also identified factors that increased the likelihood of participating in a neurocritical care rotation during residency, such as the availability of a dedicated NICU, the presence of neurology-trained intensivists, availability of a neurocritical care fellowship, and a higher number of neurology residents per class.[13]

The Neurocritical Care Society is committed to promoting education and training in neurocritical care and on its website it provides information about various elective programs in large academic centers available to residents and medical students.[14] Moreover, a rotation in the NICU can be inspiring for many residents, attracting some of them to pursue a fellowship in the field. Neurocritical care is an ever-growing specialty, with exciting research opportunities in many areas of acute brain injury and a high demand for neurointensivists in large private and academic centers.

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