Neurology Training for Psychiatry Residents: Practices, Challenges, and Opportunities

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Received: 30 September 2017 / Accepted: 30 April 2018 / Published online: 18 May 2018
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Historically, neurology, psychiatry, and neuroscience overlapped; it is only recently that disciplinary silos have divided these fields. In the eighteenth and nineteenth century, many significant figures in neurology and psychiatry, including Freud, Charcot, Alzheimer, and Kraepelin, emerged from a shared epistemological background [1]. In the early twentieth century, a period of rapid medical specialization, most physicians in these fields enjoyed board certification in both specialties [2]. However, in the second half of the twentieth century, training pathways for neurology and psychiatry diverged [1]. By the 1980s, there was little emphasis on cross-training between neurology and psychiatry [2].

Over the past three decades, there has been an increase in residency training emphasis on *neuroscience*, “a broad discipline encompassing the study of the nervous system and behavior using cellular and molecular biology, animal models, neuroanatomy, neuroimaging, genetics, neuropsychology, and basic pharmacology (as opposed to clinical pharmacology)” [3]. Since 2006, there has been a boom in neuroscience education with the rapidly developing National Neuroscience Curriculum Initiative [4], but the challenge of clinical application remains [5].

Neuroscience, neuropsychiatry, and neurology are distinct entities [3, 5, 6]. Neuroscience in psychiatry involves understanding psychiatric illness through the lens of neuroscientific knowledge ranging from functional anatomy to genomics; examples include microstructural neurodevelopmental aspects of schizophrenia and the neurobiology of suicide. Neurology and neuropsychiatry are fundamentally clinical. Neurology

refers to the care of patients with disease of the brain, spinal cord, and peripheral nerves. Neuropsychiatry refers to the care of patients with affective, behavioral, and cognitive symptoms in the setting of neurologic disorders such as stroke or epilepsy, as well as to the care of patients with psychiatric illness that have comorbid or iatrogenic neurologic symptoms [5].

Neurology and neuropsychiatry training for psychiatry residents is not yet standardized. In this article, we critically review the current state of neurology and neuropsychiatry training for psychiatric residents: we explicitly consider the goals of such training, identify the gaps in training and the barriers to achieving these goals, and present suggestions for improving the neurology and neuropsychiatry training of psychiatrists.

The State of Neurology Training and Evaluation for Psychiatry Residents

Since 1987, psychiatry trainees have been mandated by the Accreditation Council for Graduate Medical Education (ACGME) and American Board of Psychiatry and Neurology (ABPN) to complete two months of full-time clinical neurology training [7]. The ACGME does not have guidelines for the neurology off-service rotation months with respect to clinical setting or didactic content [6].

There are no formal clinical requirements for neurology or neuropsychiatry beyond the two-month requirement. In a 2011–2012 survey of 226 adult and child psychiatry program directors and associate program directors, the majority of trainees received 1–9 h of neuropsychiatry training in each of the 2nd, 3rd, and 4th years of training. However, there was some confusion about what neuropsychiatry actually entailed [8]. Additionally, 4% of US psychiatry residency programs have a required neuropsychiatry or neurology elective during the 4th year of residency [9].

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Neurology didactics—both during the neurology rotation and throughout residency—vary. In 2013, among a cohort of 57 psychiatry training directors, 54% reported that residents attend neurology didactics along with neurology residents as a part of their rotation experience while 71% reported additional neurology didactics designed for psychiatrists and not associated with the neurology rotation [10]. Additionally, 51% of respondents' programs offered neuroradiology rounds and 34% offered neuroanatomy labs. However, the nature and extent of such discrete didactics—in particular, their overlap with basic or clinical neuroscience—is uncertain. Most programs offering neuropsychiatry didactics do so during the first and fourth years of training [8, 10].

Board Examination and the Psychiatry Resident-In-Training Examination

Neurologic knowledge is evaluated by the ABPN adult psychiatry board examination; 6–8% of the exam is dedicated to neurocognitive/neuropsychiatric topics, 3–5% to neurodevelopmental disorders, and 4–6% to other neurologic disorders [11]. Accordingly, in 2016 neurology made up 15–20% of the Psychiatry Resident-In-Training Examination (PRITE), an in-service exam used by residency programs to evaluate the medical knowledge and board-readiness of residents [12]. Notably, strong performance in the neurology subsection of the PRITE correlates with both board neurology scores and overall board pass rates, but the implications of these findings are unknown [13].

Recommendations, Requirements, and Milestones

A number of professional organizations have issued guidelines for psychiatry resident training in neurology and neuropsychiatry. Requirements for psychiatry training programs are established by the ACGME with input from the ABPN [3]. In addition to clinical requirements, the ACGME is also involved in the evaluation of residency competencies. In the past several years, the ACGME has developed milestones for each specialty to be used to guide residency curricula and evaluation; these are now universal in US residency programs [14]. Milestones are specific to each specialty, but based on six cross-specialty core competencies: medical knowledge, patient care, professionalism, interpersonal communication, practice-based learning, and system-based practice.

The milestones make significant progress in establishing core competencies in neurology and neuropsychiatry. Clinical neuroscience exists as a discrete competency within the medical knowledge domain and emphasizes neuropsychiatric diagnostic tools including imaging and neurophysiology (MK2, 1.1/A, 2.1/A, 3.1/A, 4.1/A) and knowledge of neuropsychiatric disorders (MK2, 2.3/C, 4.3/C). Key elements relevant to neurology and apart from the neuroscience category

include performing a targeted neurological exam (PC1, 2.2/A), understanding the influence of neurological disease on development (MK1, 3.2/B), initiating neurologic workup in psychiatrically ill patients (MK2, 2.3/C), and including neurologic disorders in psychiatric differential diagnosis (MK2, 3.4/C) [7].

In concordance with the dissemination of the milestones, the 2015 ABPN Crucial Issues forum, an annual meeting of educational leaders, addressed neurology training for psychiatry residents. Based on the milestones, training goals established at this forum included neurologic exam skills, diagnosis and initial management of neurologic issues relevant to psychiatry, and recognition of need for neurologic consultation. Plans formulated in response to this forum included further data-gathering regarding practices among training programs and desired skills among practicing psychiatrists [15].

Beyond the ACGME Milestones, the most notable guideline is that produced by the American Neuropsychiatric Association (ANPA). In 2001, the ANPA produced a set of neuropsychiatry training objectives for psychiatry residents. Unlike the ACGME Milestones, the ANPA objectives go into specific detail about skillsets pertaining to specific disorders, or groups of disorders, including traumatic brain injury, post-stroke psychiatric syndromes, and dementia [16].

The Goals of Neurology Education for Psychiatry Residents

Based on review of the literature, the ACGME milestones, and our own experience as trainees and educators, we propose the following as broad goals of neurology education for psychiatry trainees.

Ability to Detect and Triage Neurologic Conditions Common to the Psychiatry Setting

Patients undergoing treatment for psychiatric illness are at elevated risk for neurologic complications due to increased incidence of substance use, neurologic manifestations of psychiatric illness [17], and iatrogenic complications of psychopharmacology [18]. The ability to recognize and triage neurologic problems in the psychiatric setting is requisite for high-quality care.

Psychiatry training directors value trainees developing skills to recognize and treat neurologic issues common to the psychiatric setting. Trainees should be able to perform a tailored, brief neurologic exam and to recognize and triage delirium, unexplained medical symptoms, substance or withdrawal-induced neurologic symptoms, and psychopharmacologic toxicities such as neuroleptic malignant syndrome, serotonin syndrome, extra-pyramidal effects, and anticholinergic toxicity [19]. In addition, trainees

should be able to appropriately and effectively obtain neurologic consultation and to feel comfortable obtaining and utilizing neuroimaging [8].

Diagnosis and Management of Neuropsychiatric Disorders

Program directors consider training in neuropsychiatry to be important [8]. Of particular emphasis are cognitive examination skills, knowledge of neuropsychiatric effects of drugs, and diagnosis and treatment of dementia [8, 20]. Neuropsychiatric differential diagnosis is a particularly important skill. A number of neuropsychiatric conditions may present with predominantly or exclusively psychiatric symptomatology at onset, particularly neurodegenerative, neuroinflammatory, and sleep disorders. As experts in behavioral and affective conditions, psychiatry trainees should develop the skills to deal with psychiatric manifestations of these disorders. Other topics of importance include sleep medicine, cognitive-affective effects of stroke and genetic neurologic disorders, and neuroimaging/neurophysiologic testing for common neuropsychiatric illnesses [8, 20].

Complementing Clinical Neurosciences

With the increasing emphasis on understanding psychiatric disorders through a neuroscientific lens, knowledge of neurologic and neuropsychiatric pathology is vital. From a neuroscientific perspective, clinical distinctions between the medical specialties charged with the care of the brain and mind become increasingly arbitrary [17]. Psychiatric symptoms induced by neurologic disorders provide an important lens to the underlying neurobiology of psychiatric disorders. For example, understanding the role of the glutamatergic system in primary psychotic disorders may be contingent on the study of NMDA-receptor antibody encephalitis. To deemphasize the pathophysiology of these conditions is a missed opportunity to enrich trainees' abilities to conceptualize disturbances in mind and behavior through a clinical neuroscientific framework.

Gaps in Training

Having elucidated the above goals, we identify two primary gaps in current practice. We subsequently discuss barriers to closing these gaps.

Lack of Standardization in Clinical and Didactic Neurology/Neuropsychiatry Training

US psychiatry residents complete at least two months of full-time clinical neurology, generally during the intern year.

However, the neurology experience is not nationally standardized in content or in measurement of educational outcomes [21]. There is significant variability in the setting, intensity, and content of the clinical neurology experience. Residents at one program may complete two months in the neurologic intensive care unit, while residents at another program may have an entirely consultative or outpatient placement. In the authors' experiences, many of the clinical duties assigned on neurology rotations may be service-driven. Furthermore, there are no standardized measurements of the efficacy of clinical neurology training for psychiatry residents with the possible exception of PRITE neurology subsection scores.

Additionally, little data exist on the structure and content of neurology didactics for psychiatry residents. During the neurology rotation, many residents attend didactics targeted towards neurology residents (who attend over the academic year and have different learning needs than psychiatry residents) [10]. While many programs do offer some additional neurology and neuropsychiatry didactics following the intern year, the nature and extent of these didactics is not characterized. Only approximately half of psychiatry training directors feel their program offers sufficient neurology didactics [10].

Formulation of a specific set of neurology skills and knowledge that psychiatry residents should obtain from the neurology component of their training is contingent on a certain degree of consistency in training. The lack of such consistency is a significant gap in neurology training for psychiatry residents.

Lack of Clinical Neurology Training after the Intern Year

Following intern year, most trainees receive minimal additional training in neuropsychiatry or neurology. There is a paucity of academic discourse on the development of such additional training. For instance, what proportion of psychiatric trainees receive a supervised, dedicated neuropsychiatry caseload or rotation is unknown. Many residents receive much of their neuropsychiatry experience adjunctively through rotations in consultation-liaison and geriatric psychiatry, where neurologically ill patients may be common, but neurology/neuropsychiatry faculty less so [22].

There is a lack of operationalized reinforcement of neurology skills and knowledge through clinical and didactic experiences after the intern year. Even those residents completing the clinical neurology rotations with a strong foundation may experience attrition of ability in treating neurologically ill patients over time. Neurology rotations may not equip trainees to adapt and use neurology in a psychiatric setting. Additional training may be necessary to utilize the foundational skills of the intern-year neurology experience appropriately in the psychiatric setting.

Barriers to Improving Neurology Skills Among Psychiatry Residents

The etiology of neurology training gaps is understudied and multifactorial; we propose a number of possible barriers to closing these training gaps.

Loss of Comfort with Neurology Skills: Neurophobia

The dearth of follow-up neurology training after the intern year may be paradoxically impacted by low resident confidence. Neurophobia is a well-described lack of comfort with clinical neurology among non-neurology physicians and trainees. Among non-neurologists, neurology is persistently regarded as difficult and frightening [23–26]. Additionally, among medical students, lack of longitudinal, repeated exposure to neurology knowledge and skills is associated with discomfort with clinical neurology [25]. Interestingly, there are no data on neurophobia among psychiatrists and psychiatry trainees.

Likely owing to the lack of neurology training later in residency, there is some evidence that psychiatry residents lose comfort with neurology and neuropsychiatry skills over the course of residency. The authors' own experiences corroborate this. Such losses of comfort may or may not coincide with deterioration in clinical knowledge; among a cohort of residents at one program, comfort with diagnosis and treatment of common neurologic conditions decreased progressively following the intern year despite PRITE neurology subsection scores increasing [2]. It is unclear whether the discrepancy between self-assessed skill and PRITE scores reflects a discrepancy between increasing didactic knowledge and worsening clinical skill, or whether it reflects a discrepancy between actual and assessed neurology competency.

While data on the practice effects of lowered neurology comfort do not exist, loss of comfort in neurology skills may be both an effect and a cause of lack of neurology training later in residency. We suspect that trainees who feel anxious about neurology skills are less likely to put these skills into action in the clinical settings. They may also be less likely to proactively seek further training, particularly if seeking such training is atypical within the culture of a given residency. Indeed, lack of confidence may prompt “knee-jerk” neurologic referral or consultation that precludes trainees from using differential diagnostic and examination skills. This is especially true given the related barrier of normative de-emphasis of physical and neurologic examination in psychiatry.

Limited Utilization of Physical/Neurological Exam Skills

A physical and neurologic exam are theoretically part of the psychiatric intake for patients in most settings, but such

examinations are cursory. In a prospective study of 60 patients admitted to an inpatient psychiatry facility, only 57.6% had a comprehensive neurologic examination completed, and in 10% of the patients, the nervous system was described as “grossly intact” [18]. In the outpatient setting where senior residents spend the majority of their time, the rates of comprehensive physical and neurologic exam are under 10% [27]. No published data exist on the use of neurologic exam skills in the consultation setting. While these data are extremely limited in scope, the authors' experiences are concordant with the findings; thorough neurologic examination may not be a culturally promoted element of psychiatric evaluation. Additionally, attitudes about the utility of neurologic examination skills may also be inflected by increasing emphasis on neurodiagnostic testing over exam skills, even in the neurological setting. Minimal use of physical examination skills in psychiatry may contribute to attrition of skills or comfort with neurology.

Blurring of Biological Psychiatry, Neuroscience, Neuropsychiatry, and Neurology

Ironically, the increasing importance of neuroscience may blur competencies between fields, potentially eclipsing didactic training in clinical neurology and neuropsychiatry. While there is clear overlap between neuroscience and neurology, clinical skills such as examination and management of neurologically ill patients remain discrete from basic neuroscience. Guidelines and data on neuroscience training, including ACGME milestones, tend to subsume neurology [7].

Survey data of psychiatry residency training directors from 2014 suggest that only approximately 20% understand the difference between general psychiatry and neuropsychiatry [8]. Interestingly, similar data from 1995 showed a limited but more robust understanding of neuropsychiatry as an entity; at that time, 66% of psychiatry program directors reported a clear understanding of neuropsychiatry and 89% felt neuropsychiatry fell under the auspices of psychiatry, although only 40% identified their program as providing specific training in neuropsychiatry [28]. While no data exist regarding the change between 1995 and 2014, one possible explanatory model is that the framework of clinical and basic neurosciences has become more complex as neuroscience and neuropsychiatry have become less analogous. The confluence of increasing emphasis on neuroscience and of confusion about the purview of neuropsychiatry may be factors in the relative paucity of clinical neuropsychiatry training for advanced residents. Programs with robust neuroscience curricula may not be cognizant of the need for separate neuropsychiatry and neurology training.

Limited Neuropsychiatry Teaching Faculty

In addition to possible cultural barriers to developing and maintaining neurologic and physical exam skills among advanced psychiatric trainees, there is also a lack of educators in neuropsychiatry and neurology in psychiatry. In 2014, 39% of training directors reported that lack of neuropsychiatry faculty was a significant or severe barrier to providing neuropsychiatric training and supervision [8]. This is consistent with earlier data that almost half of residency training directors could not identify neuropsychiatry faculty within their program. As a result, many programs use neurology and psychiatry faculty to teach neuropsychiatric topics (27% of programs and 39% of programs, respectively), but it is unclear whether this ultimately translates to sufficient supervision and exposure to clinical neuropsychiatry training [5].

Strategies for Improvement

Strategies for improving the neurology training experience of psychiatry residents run the gamut from broad, overarching changes such as creating more standardized requirements for the clinical neurology rotation to more institutionally specific, low-resource interventions, such as interdisciplinary case conferences.

Improvement of Clinical Neurology Experience: Richer and (Maybe) Longer

Ideally, the clinical neurology rotation should establish skills in neurologic triage and neuropsychiatric diagnosis and management. There are a number of ways to improve the clinical neurology experience of psychiatry trainees.

Program directors largely feel that outpatient and consultation settings are best for psychiatry trainees [20]. Exposing psychiatry residents to neuropsychiatric pathology as part of their rotation provides opportunities for self-directed learning, exercising neuropsychiatry diagnostic and management skills, and interacting with consulting neuropsychiatrists. Such efforts may be integrated into routine workflow and case assignment.

In the outpatient setting, clinical experiences must extend beyond passive observation by involving residents in the examination of patients under supervision [20]. Outpatient rotations with emphasis on neuropsychiatry and/or with co-located/coordinated/integrated psychiatric care may be especially instructive.

Extension of the neurology training time to three to four months may allow more flexibility in balancing service needs with education [2, 3]. Clinical opportunities may include allowing psychiatry trainees to serve as “neurology liaisons”

to psychiatric services by fielding neurology consults on psychiatry patients, high-yield subspecialty clinic experiences such as memory disorder and sleep, and opportunities to longitudinally follow neuropsychiatric patients across settings.

Longitudinal Neuropsychiatric Supervision

The vast majority of the clinical neurology experience for psychiatry residents occurs in the intern year [2, 3]. Didactic neurology experience is concentrated in the first and fourth years [10]. Few programs have neuropsychiatry rotations [28]. Where available, a longitudinal neuropsychiatry clinic experience gives residents the opportunity to hone their skills by following and managing a cohort of patients with neuropsychiatric disorders or psychiatric complications of neurologic disease [22]. However, given the structural challenges in coordinating such a clinical experience, alternative means for ensuring adequate neuropsychiatry exposure and supervision may be necessary.

Patients with cognitive complaints or comorbid neurologic disorders are common enough in the psychiatric setting that supervision can take the form of regular neuropsychiatry case conferences. Arranging several neuropsychiatry clinical teaching workshops over the course of an academic year in partnership with neurology may also provide valuable hands-on experience [8].

Collaborative Clinical and Didactic Teaching

Clinical and/or didactic collaboration with neurology promotes sharing knowledge and skills among trainees in both disciplines. Neurology-psychiatry case conferences have a number of benefits: their inclusivity may promote faculty buy-in from both departments, they foster a culture of cross-talk, and they empower residents to develop skills in utilizing consultants.

Joint neurology-psychiatry didactic experiences range in intensity. One program describes a community-of-practice seminar on development and neuropsychiatry for trainees in neurology, psychiatry, education, and development [29]. Similarly, a third-year resident neural systems-based neuroscience course at another program utilizes neurology and psychiatry expertise to integrate neuroscience teaching with neuropsychiatric disorders [30]. Joining with neurology to create a neuropsychiatry didactic program in which residents take ownership for peer teaching/learning through resident-led or flipped classrooms may increase interdisciplinary interaction and provide bidirectional teaching.

Clinically, one program’s neuropsychiatry and behavioral neurology consult service allows trainees to work in a setting in which neurology, psychiatry, and neuropsychology formally join together to formulate diagnoses and treatments for complex neuropsychiatric patients [17]. At another program,

trainees rotate on a neurobehavioral team consisting of behavioral neurologists, consult/liaison psychiatrists, neuroradiologists, and neuropsychologists [31]. This rotation correlated with improvement in subsection scores in behavioral neurology among neurology trainees, although such data were lacking for psychiatry trainees [31]. Although unavailable at many programs, neuropsychiatry and neurology elective experiences allow interested residents to improve their skills and explore opportunities for further training [28].

Targeted Didactics: Teaching Neurology for Psychiatrists

Many psychiatry residents participate in neurology resident didactics while on the neurology rotation. Such didactics may not meet the learning needs of psychiatry residents. Creating didactics aimed at psychiatry residents is a high-value, but potentially high-resource intervention.

One program dedicates a full didactic week to neuroradiology for psychiatrists [32]. This curriculum was designed specifically to teach first year psychiatry residents about the use of neuroimaging, both for diagnosis of neuropsychiatric disease and as a tool to learn pertinent neuroanatomy [32].

Targeted neurology didactics do not have to be so resource intensive. Programs can collaborate with neurology departments to have senior trainees teach brief targeted didactics [10]. At one of the authors' institutions, chief residents in neurology and psychiatry provide didactic instruction for in-service exam preparation across departments.

New educational technologies such as e-learning (education utilizing electronic media) provide opportunities to improve teaching. E-learning can take many pedagogical and structural forms, but is often guided by empiric and theoretical data from fields such as education and cognitive psychology. E-learning has been used successfully in neurology education, with some data suggesting that learners perceive live neurology lectures as less useful than online resources [23, 24]. Additionally, neuroscience education has increasingly used e-learning, as evidenced by the National Neuroscience Curriculum Initiative. E-teaching neurology may facilitate standardization of neurology education among psychiatric trainees, allow for high-yield and psychiatry-specific content, and overcome the barrier of insufficient faculty time to repeatedly offer such didactics.

In conclusion, neurology and neuropsychiatry are required aspects of psychiatric training. Clinical neurology skills are important for the detection and management of neurologic issues in primary psychiatric patients and for caring for the large population of patients who exist on a clinical spectrum between neurology and psychiatry. As such, psychiatry residents receive more mandated neurology training than any other specialty. However, despite the guidance of the ACGME milestones and the ongoing work of the ABPN in improving

neurology training for psychiatry residents, such training remains poorly standardized and difficult to evaluate. Clinical neurology experiences vary widely in setting and focus. Ongoing neurology and neuropsychiatry training may be unavailable to trainees. Such lack of exposure may result in a loss of skills and confidence over residency. A number of possibilities exist for improving neurology and neuropsychiatry skills among psychiatry trainees. These include improved standardization and measurement of the full-time clinical neurology experience, longitudinal neuropsychiatry experience, and collaborative didactic and clinical experiences working alongside neurologists and neuropsychiatrists.

Compliance with Ethical Standards

Disclosures There are no conflicts of interest.

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