DRAFT

Core Curriculum for Training in Behavioral Neurology & Neuropsychiatry

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Background

As a medical subspecialty, Behavioral Neurology & Neuropsychiatry encompasses clinical and pathological aspects of neural processes associated with cognitive functions, emotional states, and social behavior. The seminal work of late 19th and early 20th neuroscientists such as Griesenger, Broca, Wernicke, Harlow, Charcot, Freud, Alzheimer, and Pick laid the foundation for modern neuropsychiatry and behavioral neurology as an integrated discipline (1-4). Although neurology and psychiatry evolved into distinct medical specialties during the 20th century, Behavioral Neurology & Neuropsychiatry have grown in parallel with common roots in cognitive neuroscience (5-7). Advances in functional brain imaging techniques, electrophysiological methods, and experimental psychology over the last two decades have nurtured remarkable growth in clinical neuroscience. These tools and approaches contribute to a core knowledge base and inform a clinical skill set for both neuropsychiatry and behavioral neurology.

Behavioral neurologists and neuropsychiatrists regard the relationship between brain and behavior as inexorable (3,4,8,9). Reciprocal interactions between psychological factors and neuropsychiatric illness are appreciated, yet both are fundamentally understood in terms of brain function and dysfunction (3,4,8-11). Clinically, the behavioral neurologist/neuropsychiatrist elicits and constructs a comprehensive patient history that emphasizes neurodevelopmental and environmental influences on cognitive, emotional, behavioral, and elementary neurological functioning. Systematic clinical assessment also requires the use and interpretation of standardized, validated, and reliable metrics of cognitive, emotional, behavioral, and elementary neurological functions. The use and interpretation of neuroimaging, electrophysiologic, and other laboratory measures that inform diagnosis and/or treatment planning is emphasized. Interpreting clinical signs, symptoms, and syndromes as reflecting neural processes supercedes conventional (ie, DSM-based) psychiatric diagnoses. The historical dichotomization of clinical conditions into strict "psychiatric" or "neurological" types is rejected in favor of a more integrative perspective. Consequently, the clinical and scientific purview of Behavioral Neurology & Neuropsychiatry is therefore broad, including at least:

1) *Focal neurobehavioral syndromes*
   - eg, aphasias, apraxias, agnosias, aprosodias, apathy, executive dysfunction, orbitofrontal syndrome, etc.
2) *Major neuropsychiatric syndromes*
   - eg, delirium, the dementias, and the major primary psychiatric disorders, including those with atypical or refractory presentations
3) *Neurologic conditions with cognitive, emotional, behavioral features*
   - eg, dementias, movement disorders, stroke, epilepsy, multiple sclerosis, traumatic brain injury, etc.
4) *Comorbid neuropsychiatric and neurologic conditions*

- eg, Down's syndrome and Alzheimer's disease, obsessive-compulsive disorder and Tourette's syndrome, Huntington's disease and alcohol abuse, etc.

Given the breadth of the clinical problems addressed by behavioral neurologists and neuropsychiatrists, expertise in pharmacological, psychosocial, behavioral, and environmental interventions, alone or in combination, is required of such clinicians in order to meet the needs of patients with these conditions and their families. This comprehensive approach to clinical assessment and treatment synthesizes key aspects of the traditionally separate clinical methods used in the practice of neurology or psychiatry alone; it is this synthesis that distinguishes the clinical paradigm of Behavioral Neurology & Neuropsychiatry as unique among other medical specialties in the clinical neurosciences.

Jointly recognizing the essential similarities between Behavioral Neurology & Neuropsychiatry, the American Neuropsychiatric Association (ANPA) and the Society for Behavioral and Cognitive Neurology (SBCN) concur that the body of knowledge pertaining to the phenomenology, pathophysiology, diagnosis, and treatment of cognitive, emotional, and behavioral disturbances in relation to brain dysfunction is common to both Behavioral Neurology & Neuropsychiatry. These historically separate but parallel subdisciplines can therefore be merged into a single subspecialty area of medicine that herein will be referred to as Behavioral Neurology & Neuropsychiatry.

Expertise and clinical competence in Behavioral Neurology & Neuropsychiatry requires the development of a combination of knowledge and skills that are beyond the scope of those required for the practice of either general neurology or general psychiatry alone. The additional knowledge base and skill set of the behavioral neurologist/neuropsychiatrist builds on the foundation established by primary training in either neurology or psychiatry and adds to that additional and specialized training in the evaluation, differential diagnosis, prognosis, pharmacological treatment, psychosocial management, and neurorehabilitation of persons with complex neuropsychiatric and neurobehavioral conditions (2-4,7-9,12-17). Because the body of knowledge and the clinical skills circumscribed by Behavioral Neurology & Neuropsychiatry are additive to those of general psychiatry and general neurology, and also distinct from the other subdisciplines of either of these medical specialties, training specific to Behavioral Neurology & Neuropsychiatry is required to achieve competence to practice in this area of medicine.

Goals and Objectives for Training in Behavioral Neurology & Neuropsychiatry

Training programs in Behavioral Neurology & Neuropsychiatry throughout the United States and Canada foster the development of practitioners in this area. The ANPA promulgated standards for fellowship training in this area (19) that have been used by such programs, as they exist presently, to standardize fellowship training. The ANPA Standards for Fellowship Training (19) stipulate that Fellows in Neuropsychiatry may enter training at either the 4^{th} or 5^{th} post-graduate year of training, but require those beginning in the 4^{th} year of post-graduate training to complete two years of fellowship training. Fellows in Neuropsychiatry will in most cases undertake such training following primary training in general psychiatry and Fellows in Behavioral Neurology will in most cases undertake such training following primary training in general neurology or pediatric neurology. However, these routes to specialty training are not invariable, and it is possible that training in either type of fellowship program may follow primary training in neurology, psychiatry, or both. As such, this core curriculum is predicated on the availability of a supervisory structure that involves program direction from an American Board of Psychiatry and Neurology (ABPN) certified psychiatrist or neurologist with expertise in neuropsychiatry and/or behavioral neurology. Mastery of the core curriculum may also require additional supervision from a neurologist or psychiatrist whose specialty background is complementary to that of the program director. The goals and objectives for training in Behavioral Neurology & Neuropsychiatry include:

1. Develop clinical expertise in care of patients with brain dysfunction including understanding of diagnostic skills, neurologic and mental status examinations, cognitive testing, electrophysiological testing, neuroimaging, differential diagnosis, crisis intervention, application of time-limited psychotherapy, and referral for rehabilitative therapies.

2. Gaining broad knowledge in the field through extensive exposure to the core literature in neuropsychiatry, neuropsychology, and behavioral neurology. Neuroanatomy and neurochemistry of cognition, emotion, and behavior must be emphasized.

3. Understanding the principles and practice of neuropsychopharmacology, with special emphasis on psychostimulants and other catecholaminergically active agents, cholinesterase inhibitors, NMDA receptor antagonists, anticonvulsants, atypical antipsychotics, antidepressants, and emerging neuropharmacologic agents, as well as the interactions of such agents with other medications on central nervous system function.

4. Participating in a structured educational curriculum that complements clinical and self-study experiences, usually consisting of rounds, case conferences, individual supervision, didactic lectures, and other courses or seminars relevant to training in Behavioral Neurology & Neuropsychiatry.

5. Developing an understanding of research methodology in Behavioral Neurology & Neuropsychiatry.

It is not the objective of this document to specify the manner in which these educational goals and objectives are met in an individual training program or the methods by which competence in Behavioral Neurology & Neuropsychiatry are achieved or evaluated. The curriculum (ie, the educational content in this field of study) and the methods of training (ie, clinical experience, didactic experience, independent study) are interconnected but separate elements of an educational program. Consequently, this document offers only an outline of the core curricular content that training programs in Behavioral Neurology & Neuropsychiatry are expected to include. Programs may differ in the emphases placed on the various elements of the training curriculum described herein. A complementary set of training objectives developed for use in residency programs are offered elsewhere (7), and may be of service to both fellowship and/or residency training directors as they design their specific training programs.

The methods by which this knowledge and performance skills are taught during the course of training are considered separately from the core curricular content and are described in the document entitled "Behavioral Neurology & Neuropsychiatry Program Requirements."

Core Curriculum for Training in Behavioral Neurology & Neuropsychiatry

For the purposes of this core curriculum, the field of Behavioral Neurology & Neuropsychiatry is defined as "a medical specialty committed to better understanding links between neuroscience and behavior, and to the care of individuals with neurologically based behavioral disturbances" (18). Recognizing the need to make clear the educational content that these programs are expected provide to trainees in Behavioral Neurology & Neuropsychiatry, the SBCN and the ANPA partnered to develop this core curriculum for training in the unified medical subspecialty of Behavioral Neurology & Neuropsychiatry. These organizations drew upon work in this area undertaken previously by the Section on Behavioral Neurology of the American Academy of Neurology and the Curriculum Task Force of ANPA to identify potential curricular content for training in Behavioral Neurology & Neuropsychiatry. This included reviewing the Accreditation Council on Graduate Medical Education (ACGME) program requirements for training in psychiatry (20) and neurology (21); reviewing and comparing potential curricular content with that of other established neurological and psychiatric subspecialties, including Addiction Psychiatry, Clinical Neurophysiology, Forensic Psychiatry, Geriatric Psychiatry, and Neurodevelopmental Disabilities as specified by the American Board of Psychiatry and Neurology (ABPN)(22); reviewing and comparing potential curricular content with the Standards for Training in Consultation-Liaison Psychiatry (recently

approved and renamed by the ABPN as the subspecialty Psychosomatic Medicine) as specified by the Academy of Psychosomatic Medicine (23); integrating the proposed core curriculum with the current Standards for Fellowship Training in Neuropsychiatry as specified by the ANPA (19); and reviewing content in current textbooks in Behavioral Neurology & Neuropsychiatry (3,4,7,8,9,12-17,24-31).

Core Curricular Content

The core curriculum for Behavioral Neurology & Neuropsychiatry is composed of four primary content areas:

I) Structural and Functional Neuroanatomy

II) Neurobehavioral and Neuropsychiatric Assessment

III) Treatments

IV) Neurobehavioral and Neuropsychiatric Syndromes

These content areas collectively reflect the breadth and diversity of the field. *Clinical training in Behavioral Neurology & Neuropsychiatry must emphasize the principles of clinical assessment and treatment.* Accordingly, training programs should emphasize mastery of the first three of these core curricular content areas regardless of the specific clinical focus (eg, dementias, stroke, traumatic brain injury, etc.) of those programs. Fellows in Behavioral Neurology & Neuropsychiatry are expected to both complement and supplement their "bedside-learning" of the field through guided self-directed learning activities (ie, reading relevant textbooks and peer-reviewed articles) and didactic experiences (ie, seminars, case conferences, Grand Rounds, local or national conferences, etc.) related to the fourth core curricular content area (Neurobehavioral and Neuropsychiatric Syndromes).

I. Structural and Functional Neuroanatomy

A. The Fellow in Behavioral Neurology & Neuropsychiatry will develop expertise in:

1. The structural and functional organization of: the cerebral cortex and its major divisions; white matter tracts; limbic and paralimbic structures; anatomic and functional basal ganglia; diencephalon; the mesencephalon, metencephalon, and myelencephalon; and the cerebrovascular and ventricular systems.
2. The structural and functional organization of cortico-cortical and cortical-subcortical circuits.
3. Structural and functional cerebral hemispheric specialization, particularly as regards localization and lateralization of cognitive, emotional, behavioral, and sensorimotor functions.
4. Neuroanatomy, metabolism, and functional significance of the major neurotransmitter systems, local circuit and modulatory neurotransmitters, neuropeptides, neurohormones, and other endogenous neuroactive substances in the central nervous system.

B. The Fellow in Behavioral Neurology & Neuropsychiatry will develop expertise in the structural and functional bases of cognition, emotion, and behavior, including:

1. Cognition
   a. Arousal
   b. Perception
   c. Attention
   d. Language
   e. Memory
   f. Praxis

g. Recognition
h. Visuospatial function
i. Executive function

2. Emotion
   a. Mood
   b. Affect
   c. Anxiety
   d. Anger

3. Behavior
   a. Motivation
   b. Comportment
   c. Personality

II. Neuropsychiatric Assessment

The Fellow in Behavioral Neurology & Neuropsychiatry will be provided with education and experience in the areas of clinical assessment listed below. Note that area **C** is an exception to this and is most appropriately regarded as area in which acquisition of advanced knowledge, and not necessarily performance skills, is an appropriate goal of fellowship training.

A. Neurological Examination

1. Elemental neurological function
   a. Cranial nerves
   b. Motor
   c. Sensory
   d. Coordination
   e. Gait
   f. Reflexes, including primitive reflexes (“frontal release signs”)
2. Neurological “soft-signs” and the use and interpretation of standardized scales pertaining thereto.
3. The use of neurological examination rating scales and the interpretation of such data.

B. Mental Status Examination

1. Assessment of General Mental Status
   a. Appearance and behavior
   b. Speech
   c. Thought process
   d. Thought content
   e. Emotion
   f. Comportment
   g. Personality
2. Assessment of Cognition
   a. Arousal
   b. Attention
   c. Language

d. Memory
e. Praxis
f. Recognition
g. Visuospatial function
h. Executive function

3. Adjusting mental status examination content and process in a manner sensitive to the patient's abilities or impairments in order to facilitate useful description of findings in patients who are unable to cooperate with any or all parts of a formal cognitive examination.
4. Interpreting mental status examination findings with respect to structural and functional neuroanatomic correlates.
5. Developing differential diagnosis based on mental status examination findings and their integration with findings from the neurological examination.
6. Indications for, administration of, and interpretation of standardized neuropsychiatric rating scales that supplement the neuropsychiatric history and mental status examination.

C. Neuropsychological Assessment

1. The content, sensitivity, and specificity of neuropsychological testing, including:
   a. Fixed assessment batteries.
   b. Flexible batteries.
   c. Projective testing.
   d. Personality assessment tools.
2. The influence of age, education, cultural background, fatigue, drugs, sensory impairment, and primary psychiatric illnesses on test performance.
3. The role of and indications for neuropsychological testing in the evaluation and treatment planning related to neurobehavioral and neuropsychiatric disorders.
4. The relationship between neuropsychological test results and bedside or office-based screening mental status examinations.
5. The anatomic and disease correlates of neuropsychological test abnormalities.

D. Neuroimaging

1. Understanding the principles and applications of structural and functional imaging of the brain, including the generally accepted clinical indications for such studies.
2. The correlation between neuroimaging findings and clinical examination (neurological and/or mental status) findings in persons with neurobehavioral or neuropsychiatric syndromes.

*** Note:** The types of available neuroimaging methods and also their generally accepted clinical indications are likely change over time. This element of the Core Curriculum may require revision as such changes occur.

E. Electrophysiologic Testing

1. Understanding the principles and applications of electrophysiologic recordings of the central nervous system.
2. The correlation between electrophysiologic findings and clinical examination (neurological and/or mental status) findings in persons with neurobehavioral or neuropsychiatric syndromes.

*** Note:** The types of electrophysiology testing methods available as well as their generally accepted clinical indications are likely to change over time. This element of the Core Curriculum may require revision as such changes occur.

F. Laboratory Studies

1. Indications for serum and urine studies relevant to the evaluation of patients with neuropsychiatric and neurobehavioral conditions.
2. Indications for and interpretation of results from cerebrospinal fluid examination relevant to the evaluation of patients with neuropsychiatric and neurobehavioral conditions.

G. Integration and Presentation of Findings

1. Integration of collateral historical information into the clinical assessment.
2. Development of a neurobehavioral and neuropsychiatric differential diagnosis.
3. Formulation of a neurobehavioral or neuropsychiatric diagnosis based on findings from the clinical assessment.
4. Development of treatment plan for the neurobehavioral or neuropsychiatric condition.
5. Presentation, both verbally and in writing, of clinical impressions and recommendations derived from the comprehensive clinic assessment to:
   a. The patient and his or her family
   b. Other health care professionals
   c. Officers of the court
   d. Other private or public agencies providing services to the patient.

III. Treatments

The Fellow in Behavioral Neurology & Neuropsychiatry will demonstrate knowledge about and clinical competency in the prescription and/or monitoring of somatic therapies, psychosocial interventions, crisis intervention, and basic neurorehabilitation, as specified below:

A. Somatic Therapies

1. Therapeutic uses, benefits, side effects, and risks associated with psychotropic and neuropharmacologic agents commonly used in the care of patients with neurobehavioral and neuropsychiatric disorders.
2. Drug-drug interactions related to these and other medications commonly used in the care of patients with neurobehavioral and neuropsychiatric disorders.
3. Knowledge of the indications and contraindications for the use of electroconvulsive therapy and neurosurgical procedures (ie, ablative procedures, deep brain stimulators, vagus nerve stimulators, etc.) in the treatment of patients with neurobehavioral and neuropsychiatric disorders.

B. Psychosocial Interventions

1. Knowledge of and indications for psychosocial interventions used in the care of patients with neurobehavioral and neuropsychiatric disorders, including:

a. Supportive therapy, family therapy, other psychotherapeutic interventions relevant to the care of persons with neuropsychiatric and neurobehavioral disorders
b. Patient and family education
c. Environmental interventions
d. Behavioral management strategies
e. Use of and referral to community resources

2. Fellows should demonstrate the ability to work in a "split therapy" model when needed; this refers to a model of treatment in which the fellow is providing medical management and another clinician is providing specific psychosocial interventions (eg, psychotherapy, behavioral management, etc.).

IV. Neurobehavioral and Neuropsychiatric Syndromes

Fellows in Behavioral Neurology & Neuropsychiatry are expected to develop in-depth knowledge regarding the neuropsychiatric and neurobehavioral consequences of many neurological and psychiatric conditions. All fellows are expected to bring to subspecialty training the level of knowledge and clinical competence required by the ACGME-RRC in Neurology or Psychiatry for completion of and board-eligibility in the area of their pre-fellowship training (ie, neurology, psychiatry, or both). However, *since training in Behavioral Neurology & Neuropsychiatry may follow primary training in either neurology or psychiatry, it is not expected that the fellows will develop the same fund of knowledge or clinical competency in the management of the primary neurological or psychiatric disorders listed herein as that obtained by primary specialty training. Instead, it is expected that the fellow will develop sufficient knowledge regarding these conditions such that he or she can competently evaluate and manage their neurobehavioral and neuropsychiatric manifestations.*

Given the limited duration of training in Behavioral Neurology & Neuropsychiatry, some fellows may have little direct experience evaluating and caring for patients with some of these problems during the period of fellowship training. The elements of the Core Curriculum described in sections I-III (above) are designed to ensure that Fellows develop the knowledge base and clinical skills required to understand, evaluate, and treat patients with neurobehavioral and neuropsychiatric problems through mastery the principles of Behavioral Neurology & Neuropsychiatry. In the service of preparing Fellows to provide care for persons neurobehavioral and neuropsychiatric problems arising in the context of the broad range of conditions in which such problems develop, Fellows are expected to both complement and supplement "bedside-learning" through guided self-directed learning activities and/or didactic experiences. Guided self-directed learning activities may include reading relevant textbooks, peer-reviewed articles, or other materials recommended by training program faculty. Didactic experiences may include seminars or other course work provided by the training program itself or by other programs either within or affiliated with the institution in which the fellowship training occurs. Additionally, Fellows should be encouraged to attend local or national conferences relevant to this aspect of training in Behavioral Neurology & Neuropsychiatry.

Through these means, it is expected that the fellow will develop an advanced level of knowledge regarding the neurobehavioral and neuropsychiatric aspects, epidemiology, neurogenetics, putative neurological substrates, and typical neuropathological features of the conditions listed below, where such are known.

I. Focal neurobehavioral syndromes, including disorders of:

1. Arousal (e.g., coma, persistent vegetative state, minimally conscious state, etc.)
2. Perception (e.g., illusions, hallucinations, sensory impairments)

3. Attention (e.g., delirium, confusion, neglect/visuospatial disturbances)
4. Language (e.g., the aphasias)
5. Memory (e.g., the amnesias)
6. Praxis (e.g., the apraxias)
7. Recognition (e.g., the agnosias)
8. Executive function (e.g., dysexecutive syndrome)
9. Comportment and social behavior (e.g., disinibition, *witzelsucht*, paroxysmal irritability and aggression [or "organic aggressive syndrome"], Klüver-Bucy syndrome, etc.; see also impulse-control disorders, below)
10. Motivation (e.g., apathy, abulia, akinetic mutism)

II. Major Neuropsychiatric Syndromes

1. Attention-deficit and disruptive behavior disorders
2. Learning, communication, and motor skill disorders
3. Dyslexia
4. Developmental disabilities, including mental retardation
5. Autism and pervasive developmental disorder
6. Age-related cognitive impairment
7. Amnestic disorders (e.g., alcohol amnestic disorder [or Korsakoff's psychosis], transient global amnesia, posttraumatic amnesia, psychogenic amnesia)
8. Cortical, subcortical, white matter, and mixed dementias
9. Substance abuse and dependence
10. Disorders of mood (e.g., major depressive disorder, bipolar disorder, etc.)
11. Disorders of affect (e.g., pathological laughing and crying, affective lability, essential crying, euphoria, placidity, etc.)
12. Anxiety disorders (e.g., panic disorder, post-traumatic stress disorder, generalized anxiety disorder, obsessive-compulsive disorder)
13. Psychotic disorders (e.g., schizophrenia, schizoaffective disorder, delusional disorders)
14. Personality disorders and personality change due to neurological/medical conditions
15. Impulse control disorders (e.g., intermittent explosive disorder, aggression/rage due to neurological/medical conditions, hypersexuality, self-injurious behavior, etc.)
16. Somatoform disorders (e.g., somatization, conversion disorder, etc.)
17. Factitious disorders
18. Malingering
19. Sexual disorders
20. Sleep disorders (see also *Supplementary Curricular Content*, below)
21. Tic disorders, including Gilles de la Tourette's syndrome

III. Neurologic conditions with cognitive, emotional, behavioral features

1. Neurodegenerative disorders (e.g., Alzheimer's disease, frontotemporal dementia, diffuse Lewy body disease, Parkinson's disease, Huntington's disease, etc.)

2. Stroke and other cerebrovascular diseases (e.g., transient ischemic attack [TIA], reversible ischemic neurologic impairment [RIND], vascular dementias, intracranial hemorrhage, aneurysms, hypoxic-ischemic encephalopathy)
3. Epilepsy (e.g., primary and/or secondary generalized and/or partial seizures, Gastaut-Geschwind interictal personality syndrome, non-epileptic seizures)
4. Multiple sclerosis
5. Traumatic brain injury
6. Hydrocephalus (including normal pressure hydocephalus)
7. Primary and secondary brain tumors
8. Central nervous system infections (e.g., HIV, neurosyphilis, Lyme disease, herpes encephalitis, prion encephalopathies)
9. Neuroendocrine disorders (e.g., hypo- and hyperthyroidism, diabetes mellitus, etc.)
10. Toxic exposures/ingestions
11. Metabolic disorders, including solid organ failure and transplantation and inborn errors of metabolism (e.g., adrenoleukodystrophy, phenylketonuria, etc.)
12. Movement disorders (e.g., Parkinson's disease, Huntington's disease, Wilson's disease, acute and tardive movement disorders, psychogenic [conversion] movement disorders)
13. Headache (e.g., tension-type, migraines, cluster, etc.)
14. Acute and chronic pain
15. Collagen-vascular diseases, including systemic lupus erythematosus

Supplementary Curricular Content

Training programs may elect to facilitate the Fellow's development of special expertise and/or clinical competence in additional areas in Behavioral Neurology & Neuropsychiatry. Emphasis on these supplementary areas should not detract from the emphasis needed to master all of the elements of the Core Curriculum. Possible supplementary curricular content may include:

1. Sleep Disorders and Polysomnography
2. Geriatric Behavioral Neurology & Neuropsychiatry
3. Pediatric Behavioral Neurology & Neuropsychiatry
4. Neurorehabilitation, including Cognitive Rehabilitation
5. Neurogenetics
6. Neuropsychiatry of Substance Abuse
7. Forensic Behavioral Neurology & Neuropsychiatry
8. Crisis Intervention in Behavioral Neurology & Neuropsychiatry
9. Clinical or Research Neurophysiology (including electrodiagnostic and neuromagnetic assessment techniques)
10. Clinical or Research Neuroimaging (including advanced structural and functional imaging techniques)
11. Neuropharmacology
12. Transcranial Magnetic Stimulation and Electroconvulsive Therapy
13. Neuropathology
14. Epidemiology, Public Health, Public Policy, and/or Public Advocacy

15. Administration
16. Education

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