



Review Article

An International Curriculum for Neuropsychiatry and Behavioural Neurology



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ABSTRACT

With major advances in neuroscience in the last three decades, there is an emphasis on understanding disturbances in thought, behaviour and emotion in terms of their neuroscientific underpinnings. While psychiatry and neurology, both of which deal with brain diseases, have a historical standing as distinct disciplines, there has been an increasing need to have a combined neuropsychiatric approach to deal with many conditions and disorders. Additionally, there is a body of disorders and conditions that warrants the skills sets and knowledge bases of both disciplines. This is the territory covered by the subspecialty of Neuropsychiatry from a 'mental' health perspective and Behavioural Neurology from a 'brain' health perspective. This paper elaborates the neuropsychiatric approach to dealing with brain diseases, but also argues for the delineation of a neuropsychiatric territory. In the process, it describes a curriculum for the training of a neuropsychiatrist or a behavioural neurologist who is competent in providing a unified approach to the diagnosis and management of this set of conditions and disorders. The paper describes in some detail the objectives of training in neuropsychiatry and the key competencies that should be achieved in such higher training after a foundational training in psychiatry and neurology. While aiming for an internationally relevant training program, the paper acknowledges the local and regional differences in training expertise and requirements. It provides a common framework of training for both Neuropsychiatry and Behavioural Neurology, while accepting the differences in skills and emphasis that basic training in psychiatry or neurology will bring to the subspecialty training. The future of Neuropsychiatry (or Behavioural Neurology) as a discipline will be influenced by the successful adoption of such a unified training curriculum.

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Un currículo internacional para neuropsiquiatría y neurología conductual

R E S U M E N

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Neuropsiquiatría
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neuropsiquiátrico

Los grandes avances en las neurociencias en las últimas 3 décadas han hecho hincapié en la comprensión de las perturbaciones en el pensamiento, el comportamiento y las emociones. Mientras que la psiquiatría y la neurología se ocupan de enfermedades del cerebro, recientemente ha habido una creciente necesidad de tener un enfoque neuropsiquiátrico combinado para tratar muchos trastornos. Además, hay múltiples condiciones en las que confluyen habilidades y bases de conocimiento de ambas disciplinas. Este es el territorio cubierto por la subespecialidad de Neuropsiquiatría desde una perspectiva de salud «mental» y la Neurología Conductual desde una perspectiva de salud «cerebral». Este artículo elabora el enfoque neuropsiquiátrico para tratar las enfermedades cerebrales, pero también discute los límites del territorio neuropsiquiátrico. En este proceso, se describe un currículo para la formación de un neuropsiquiatra o un neurólogo conductual competente para proveer un abordaje integral en términos diagnósticos y terapéuticos. El documento describe con cierto detalle los objetivos de la formación en neuropsiquiatría y las competencias clave que se debe alcanzar en dicha formación superior, después de una formación inicial en psiquiatría y neurología. Al mismo tiempo que aspira a un programa de formación internacionalmente pertinente, el documento reconoce las diferencias locales y regionales en materia de conocimientos y requisitos de formación. Proporciona un marco común de formación tanto para la Neuropsiquiatría como para la Neurología Conductual, aceptando las diferencias en habilidades y el énfasis que la formación básica en psiquiatría o neurología traerá a la formación de la subespecialidad. El futuro de la Neuropsiquiatría (o Neurología Conductual) como disciplina estará influido por la instauración exitosa de un currículo de capacitación unificado.

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Introduction

Neuropsychiatry (NP) involves the application of neuroscientific principles to the study of disturbances in thought, behaviour and emotion. Its broader definition encompasses a wide territory that includes all of psychiatry and much of neurology. This in fact was the conceptualisation of NP in the early throes of its development in the 19th century.¹ Historical developments, however, led to the emergence of psychiatry and neurology as two distinct disciplines with a wide and sometimes unbridgeable gulf between them. NP thereby came to define itself as a border discipline, valiantly attempting to bridge the gulf between two disciplines, both studying the same organ but with different tools and biases.²

The development of psychiatry and neurology as distinct disciplines was for more than historical reasons. The disciplines require different, albeit complementary, sets of skills, training experiences and baskets of knowledge. Psychiatry prides itself in its rich phenomenological descriptions, nuanced observation of behaviour, highly sophisticated interviewing skills, interpersonal sensitivity, ability to deal with ambiguity, and the seamless synthesis of the biological with the psychological. Only an exclusive training in psychiatry can deliver competence of all this. Indeed, an ability to use an interview both for diagnosis and treatment, and to achieve both objectives concurrently, is a skill only years of psychiatric training and practice can deliver. Neurology lays claim to its unabashed empiricism, rigorous clinical examination skills and its pure

objectivity, again requiring considerable exposure and training in the traditional subject matter. These differences seem sufficient to ensure that the two disciplines are unlikely to be subsumed under one super discipline of NP, even though new developments in neuroscience are likely to blur their boundaries forever more.

How then can NP, if it defines itself as a border-zone discipline, survive and thrive? Are the fortunes of the border-zone not dependent upon the vagaries of the two disciplines that it joins (or separates)? The approach we recommend is to chart neuropsychiatric “territory” and define the neuropsychiatric “approach”. The latter combines the skills required of the two disciplines into a unique set, which along with expertise in neuropsychology, neuroimaging and neurophysiology makes a neuropsychiatrist well equipped to traverse the neuropsychiatric territory.³ Training in NP thereby relies on a curriculum that clearly defines the territory to be covered and the unique skills that a neuropsychiatrist must develop. This paper attempts to describe both.

The curriculum of NP must take into consideration the somewhat different emphasis that behavioural neurology (BN) brings. For most purposes, the two sub-disciplines of NP and BN differentiate themselves by approach rather than substance, as the subject matter is very similar, if not identical. Since NP stems out of psychiatry and BN from neurology, the proponents bring different biases and propensities to the subject matter. The United Council for Neurologic Subsidiaries (UCNS) of the USA has a common core curriculum for BN and NP (<http://www.ucns>).

org/go/subspecialty/behavioral/certification), a position that we support, although textbooks of BN⁴ (e.g., Marsel Mesulam, 2000) do not necessarily take this position. This paper describes the curriculum of NP, and identifies areas of particular importance to BN so that it can be readily adapted to the latter. It also recommends a period of apprenticeship in both psychiatry and neurology, crowned by training specifically in NP or BN.

Currently, there are few training programs worldwide that are exclusive to NP and lead to a specific NP specialist accreditation. In most countries, trainees who gain experience in NP do so within general adult psychiatry, old age psychiatry, child psychiatry or forensic psychiatry, thereby covering only part of the subject matter and a dilute version of the neuropsychiatric approach. This is true even for countries in which a number of NP specialist positions exist. Some countries, in particular the USA, have provision for dual training in neurology and psychiatry, with certification in both disciplines. While this approach meets some of the requirements of training in NP, it is important to appreciate that this may not be enough for competence in NP, as training separately in the two disciplines could skirt the core business of NP, and a period of training in NP *per se* is essential. We recommend this to be a period of two years, considering the wide range of experiences necessary for a neuropsychiatrist.

Overarching Goals of a Training Program

The overall objective of a NP training program is to produce a specialist who is competent in the diagnosis and management of a range of neuropsychiatric disorders, and is able to function as a consultant to other specialists, often working in psychiatry or neurology. This requires a sound knowledge base of neuroscience, in relation to neuroanatomy, neurophysiology, neurochemistry and neuropharmacology, as well as the basic subject matter of psychiatry and neurology. This is then complemented by developed expertise in the use of specialised neuropsychiatric investigations, which include neuroimaging (both structural and functional), neurophysiology (in particular, electroencephalography) and neuropsychology. The neuropsychiatrist must be an expert diagnostician, and should attempt to master the biological treatments of psychiatry and the common therapeutics of neurology, but without ignoring the principles of psychotherapeutic and rehabilitative approaches. Since neuroscience is a rapidly expanding discipline, a neuropsychiatrist must combine academic pursuit with clinical work. This would enable them not only to be able to critically evaluate research evidence, but to actively pursue the advancement of knowledge. Neuropsychiatrists are also expected to be good teachers and mentors to ensure that the discipline can grow into the future.

Neuropsychiatry Training: Its Overall Structure

Training in NP assumes a good basic training in psychiatry and neurology. The structure of the program therefore requires an initial period of training in both specialties. In most cases, this requires three years of training in psychiatry and one year

in neurology, although this could be reversed if the primary affiliation is with neurology and BN the notional area of specialisation. This would be followed by a period of training, generally for two years, in NP, as an advanced trainee or a Fellow. Some training programs have provision for only one year of NP training. As the curriculum below will suggest, this is inadequate to cover the subject matter and the diversity of clinical experience required.

The setting of the training is important. Basic training in psychiatry and neurology can occur in training programs for these specialties without any additional requirements, although being cognisant of the long-term objectives is an advantage. Advanced training in NP itself should occur in a tertiary training centre. Such a centre will generally be in a University-affiliated hospital, with access to advanced neuroimaging and neurophysiology. The NP Training Centre would ideally be staffed by 2 or more neuropsychiatrists and 1 or more clinical neuropsychologists. It is advantageous to have a behavioural neurologist on the staff as well. In addition, the training centre should have a close working relationship with general psychiatric, clinical neurology and neurosurgical services. In addition to clinical excellence, the training centre should have an active research program, and training in research should be embedded in the training experience at the Centre.⁵

This paper goes into some detail on the content of the training program, with the appreciation that each training centre will offer its unique experience, and not all elements of the curriculum can be adapted to every program. Of course, every program would adequately address the core training requirements in the assessment, diagnosis and treatment of common neuropsychiatric disorders from a broad perspective. The usual style is that of an apprenticeship, admixed with some didactic work. Since NP training comprises the 5th and 6th years of specialist training, the trainee is expected to assume much clinical responsibility.

The training is usually in the apprenticeship style, with some didactic work. There is generally a continuous evaluation process, based on a few formal assessments and/or a series of informal assessments by the supervisors. A project based on original research or systematic reviews should form part of this training to prepare the trainee for a life-long period of education and professional enhancement. In a rapidly advancing field, this lifelong commitment is critical, and preparation for this should begin in the early years of training. It is important that all this occurs in a setting of the highest ethical standards of conduct in clinical practice and scholarly work. The training will generally include clinical experience in a range of settings that include memory clinics, movement disorder clinics, and tertiary consultation in the general hospital and epilepsy services amongst others, such that clinical expertise of the training will extend to the range of disorders included in the curriculum below. In the USA, for instance, 32 accredited Fellowship programs across the country offer a structured 2-year clinical and research experience following a prescribed curriculum. Individual programs require accreditation by the United Council for Neurologic Subspecialties to ensure standardised delivery of clinical teaching and supervision.

The NP trainee will be expected to undertake a research project, especially in the second year of training. This could be in the form of a systematic review or, preferably, original research, with the aim of a peer reviewed publication upon completion.

It is important to pay due attention to the evaluation process. In the United States, a certification has been developed based on an evaluation process prior to a Fellowship of the Board being awarded. Many other countries, such as Australia, do not have a certification for NP. In such cases, trainee evaluation is usually a continuous process that relies on the supervisor's oversight, use of log books and documentation of milestones.

Neuropsychiatry Training: Specific Objectives

The objectives of a training program should span a broad range as the training not only builds a sound knowledge base and develops diagnostic and treatment, skills; it also fosters an attitude of care and respect, and an interest, if not passion, for advocacy for better treatment for sufferers of neuropsychiatric disorders. The objectives can be summarised as follows:

1. Developing a sound knowledge base

The corpus of knowledge on which NP is based is growing rapidly, especially with the major advances in neuroscience. The trainee should be equipped with a sound grasp of the fundamentals and a reasonable knowledge of important factual information in each of the following areas:

1a. Basic Neuroscience

The objectives can be summarised as follows: a) Knowledge of the structure and organisation of the brain at both macroscopic and microscopic levels; NP is particularly interested in the limbic system and the frontal lobe, and the cognitive substrates of cognition and emotion; b) there is increasing interest in neuronal networks or 'circuits' in the understanding of brain-behaviour relationships, with the modern neuropsychiatrist being also recognised as a 'circuit psychiatrist';⁶ for instance, there are circuits for positive and negative valence within the amygdala with different connections, plasticity mechanisms and behavioural correlates;⁷ c) the neurochemistry of the brain is another important area, as it forms the basis of neuropsychopharmacology; since many neuropsychiatric disorders are developmental or relate to ageing, brain development and change across the lifespan are important areas of study; d) the NP trainee should also learn the basic tenets of neurophysiology to better disorders such as epilepsy and the encephalopathies, and use diagnostic techniques such as electroencephalography (EEG); e) the same applies to the principles of neuroimaging, both structural and functional, with an emphasis on magnetic resonance imaging (MRI) and positron emission tomography (PET), and f) there are also major implications for NP in the growing knowledge relating to genetics and epigenetics; trainees may choose to follow a standard textbook of neuroscience as the basis of knowledge acquisition.^{8,9}

1b. Applied Neuroscience

The NP must learn about the neuroscientific underpinnings of the investigations used and the treatments applied to the patients.

1. Knowledge of neurophysiology translates into the understanding of EEG and event-related potentials (ERPs), both essential diagnostic techniques in NP.¹⁰
2. Since neuroimaging is central to a neuropsychiatric work-up, good knowledge of brain structure and function, and their relationships must be supplemented with the basics of neuroimaging, especially magnetic resonance and positron emission tomography. Neuropsychiatrists use all modalities of imaging, such as structural imaging using CT and MRI, and functional imaging using fMRI, PET, SPECT, quantitative EEG and magnetoencephalography (MEG).¹¹
3. Brain stimulation (or neuromodulation) is a growing field within NP, and the trainee should familiarise with the principles of electroconvulsive treatment (ECT), transcranial magnetic stimulation (TMS), transcranial direct current stimulation (tDCS), vagus nerve stimulation (VNS) and deep brain stimulation (DBS).^{12,13}
4. Other technological developments in applied neuroscience are occurring rapidly, including computerised testing, computerised cognitive training, neurofeedback, brain-computer interface and virtual reality. Since neuropsychiatry is at the forefront of physical treatments for mental disorders, it behoves the neuropsychiatrist to keep abreast of these developments. Notable examples include the use of ketamine in depression,¹⁴ and the focus on targeting inflammatory and neuroimmune pathways in psychosis and mood disorders.¹⁵

1c. Neuropsychiatric Disorders

A reference has been made above to the neuropsychiatric 'territory'. While it is impossible to completely delineate this, some disorders that comprise it include: neurocognitive disorders including the dementias (Alzheimer's disease, vascular dementia, front-temporal dementia, dementia with Lewy bodies, other) and predementia syndromes (e.g. mild cognitive impairment); delirium and related syndromes; disorders of arousal (coma, persistent vegetative state, catatonia), seizure disorders especially in relation to their psychiatric and behavioural aspects and nonepileptic seizures; movement disorders, especially drug-induced movement disorders (tardive dyskinesia, akathisia, parkinsonian side effects, neuroleptic malignant syndrome), psychiatric aspects of movement disorders such as Parkinson's disease, Huntington disease, and dystonia; psychogenic movement disorders; psychiatric aspects of traumatic brain injury; secondary psychiatric disorders, i.e. psychosis, depression, mania, and anxiety disorders secondary to 'organic' brain disease; substance-related psychiatric disorders; attentional disorders (adult ADHD and related syndromes); tic disorders, including Tourette's; neurodevelopmental disorders and psychiatric aspects of sleep disorders.^{16,17}

By the completion of training, neuropsychiatry trainees should be competent in assessing and treating most of the above disorders, including their atypical presentations such as psychosis, 'pseudodementia', 'masked' depression,

'conversion' disorders and behavioural disorders. They should be knowledgeable about the aetiopathogenesis and epidemiology of these disorders. In management, they should be able to interpret medical, psychological and neurodiagnostic investigations; use psychopharmacology¹⁸ and ECT with some confidence; be familiar with other physical treatments (in particular novel brain stimulation therapies such as rTMS, tDCS, VNS, DBS);¹⁹ knowledgeable about the application of psychotherapies, including supportive, cognitive-behavioural, group and family therapies as they relate to neuropsychiatric patients; and be familiar with rehabilitation programs, management in forensic settings, and strategies that meet the needs of carers including the role of self-help groups, including Alzheimer's Association, Tourette Syndrome Association, and other consumer organisations. The neuropsychiatrist should understand the influence of specific factors on the diagnosis, treatment and care of neuropsychiatric disorders, including age, intellectual capacity including handicap, medical illness and disability, gender, culture, spiritual beliefs, socio-economic status, psychiatric comorbidity, polypharmacy, and support factors.

1d. Neuropsychology and Cognitive Neuroscience

While neuropsychology is a discipline in itself, a neuropsychiatrist should be well versed in the principles of neuropsychology, be able to perform competent cognitive assessments at the bedside and in the clinic, and liaise with the neuropsychologist in the team competently and assuredly.²⁰ Cognitive neuroscience is a related discipline which studies the biological principles underlying cognition and includes cognitive psychology, computational modelling and behavioural genetics²¹ with increasing impact on neuropsychiatric practice.

1e. The Brain Mind Relationship

A neuropsychiatrist confronts issues related to the mind-brain debate on a regular basis, with duality of the brain (body) and mind being embedded in popular culture. Understanding of this and other neurophilosophical issues is important to equip the neuropsychiatrist to bridge the gulf between psychiatry and neurology.²² Being at the forefront of neuroscientific developments, the neuropsychiatrist also must have considered views on neuroethical debates surrounding brain stimulation and the augmented self, authenticity and alienation of self-experience.²³

1f. Medicine in Relation to Neuropsychiatry

By the completion of training, neuropsychiatry trainees should be knowledgeable about medical and surgical conditions in general, and particularly those that relate to psychiatric practice, such as neurology, neurosurgery, geriatrics, and rehabilitation medicine. The neuropsychiatrist is also called upon to function in the liaison-consultation role for neurology, neurosurgery and geriatrics, among other disciplines.

1g. Medicolegal Context

Aspects important for NP include the mental health and guardianship legislation, including its local application,

testamentary capacity, enduring power of attorney, informed consent, assessment of older offenders and fitness to plead.²⁴

1h. Prevention and Health Promotion in Neuropsychiatry

The importance of primary prevention and health promotion cannot be over-emphasised, and many late-life neuropsychiatric disorders are important candidates for this. In fact, a life span perspective needs to be taken to achieve effective primary prevention, and involvement of the neuropsychiatrist should extend beyond the clinic in this regard.

1i. Service Issues

The delivery of neuropsychiatric services encounters economic, geographical, ethical and political constraints which the neuropsychiatrist must expertly navigate to be able to be an effective advocate for the patients.

1j. Professional responsibility

A trainee should be knowledgeable about the principles of medical ethics, the development of professional attitudes and mechanisms for the development and maintenance of clinical competence, acknowledging the need for professional and public accountability.

1k. Research Methods

A neuropsychiatrist is also a researcher who is familiar with the principles of the scientific method and is able to evaluate developments in neuropsychiatric research. This can be achieved through seminars, journal clubs, targeted courses and personal study.

2. Developing Core Neuropsychiatric Skills

2a. Assessment of Neuropsychiatric Patients

The assessment skills required of a neuropsychiatrist are a combination of psychiatric and neurologic skills, and include: good psychiatric interviewing; performing a competent neurological assessment;²⁵ using cognitive tests at the bedside and in the clinic competently; appropriately referring people for neuropsychological assessments and utilising neuropsychological reports in the patient work-up; using neuroimaging and neurophysiological investigations adeptly and liaising with expert neuroradiologists, nuclear physicians neurophysiologists and neuropathologists when appropriate. The NP trainee should be able to conduct the assessment and both hospital and community settings, and be able to take sociocultural and familial factors into consideration in understanding behaviour. The trainee should also learn to assess functional capacity in various settings.

2b. Management of Neuropsychiatric Patients

The trainee should gain adequate experience in the management of common neuropsychiatric conditions (1c above) in various hospital, outpatient and community settings. This involves the use of both physical and psychological therapies,²⁶ although the expertise should be particularly manifest in the use of physical treatments. Neuropsychiatric treatment should be holistic, taking biological, psychological and social factors into consideration, and not be exclusively physical.

2c. Medico-legal Assessments

The neuropsychiatrist is frequently called upon to perform assessments for testamentary capacity, guardianship, enduring power of attorney, competency and informed consent. In addition, assessments for brain injury in relation to trauma may be necessary, and the requirements of a medicolegal setting must be taken into account.²⁷ Experience in writing reports for the court is an important neuropsychiatric skill to be developed.

2d. Prevention and Health Promotion

With the increasing emphasis on health promotion and illness prevention, neuropsychiatry should incorporate primary prevention as an integral part of the treatment offered. This will include lifestyle factors, physical exercise, cognitive training, nutrition, control of vascular risk factors, prevention of brain trauma and control of substance use.

2e. Neurorehabilitation

With the recognition that the brain is exceedingly plastic under certain circumstances, the emphasis on rehabilitation in neuropsychiatric disorders has grown. Neuropsychiatry should pay due attention to this, with the recognition that neurorehabilitation has emerged as a separate discipline in itself.²⁸

2f. Research Project

A neuropsychiatrist is also a researcher, and a trainee should go through the entire research cycle: literature review, development of a research plan, an ethics approval process, data collection, analysis and preparation of a dissertation or paper for publication. This is best begun in the first year and completed in the second. If original research is impractical, a systematic review may be an alternative. The trainee should aim for a first author publication in a peer reviewed journal by the end of their training.

3. Developing an Attitude of Care and Advocacy

The services available for neuropsychiatric disorders do not often match the great disability in the sufferers and burden on their careers and supporters that these disorders produce.²⁹ Neuropsychiatrists must recognise their role as physicians and healers, putting the patients' health foremost, and becoming advocates for their healthcare needs in the health system and society in general.³⁰

4. Evaluation and Certification

Evaluation is an important component of any training program, and varying strategies have been applied by NP training programs. In Australia, in line with the current competency based training system in place for trainees in other sub-disciplines of psychiatry, a series of formative assessments to evaluate the acquisition of key competencies in neuropsychiatry has been proposed. In other jurisdictions, methods of assessment should comprise a combination of validated self-assessment, observed interviews by a supervisor, case presentations, maintenance of a clinical log book, and some formal review of progress. We recommend a continuous

process of assessments through the period of the training, with the supervisors having primary oversight, rather than exclusive reliance on an exit examination. If Board certification is an objective, some form of end of training assessment is recommended, with appropriate procedures for evaluation and redress.

Neuropsychiatric Training: Key Competencies

Based on the above objectives, some key competencies for a neuropsychiatric trainee have been described. There is a set of clinical skills that form the core basis of neuropsychiatric practice. These skills are quite general and apply to all aspects of neuropsychiatry. A number of specific modules are then described, and 2 modules are described in detail. A trainee should be expected to develop good competency in the core skills as well as in the most salient specific modules. However, not all modules will be mastered to an equal degree, and the time spent in any particular module may be influenced by the setting and the facilities available. A basic level of competence is expected in each module in a 2-year training program. Training programs should endeavour to achieve this by bringing in resources from without if they do not exist within in program, or by collaborating with other programs in exchanges so as to share expertise and be able to provide the full range of training experience.

1. Core Skills Module

1.1. Knowledge base in Neuroscience

- Knowledge of brain structure at the macroscopic and microscopic levels, in particular the knowledge of neuronal networks, the limbic system, the neuroanatomical substrates of memory and the frontal executive system.
- A knowledge of CNS structure-function correlations.
- Knowledge of neurochemistry, especially neurotransmitter and receptor function.
- The biochemical basis of neuropsychopharmacology.
- The basic principles of neurophysiology.
- The basic principles of neuroimaging, structural and functional.
- The basic principles of genetics and immunology as they apply to the CNS.
- The basic principles of neuropsychology and cognitive neuroscience.
- A basic grasp of issues related to the mind-brain debate, the biology of consciousness and other neurophilosophical issues.
- Research methods and biostatistics.

1.2. Clinical Skills in Neuropsychiatry

- Undertake clinical assessment of patients with neuropsychiatric problems.
 - Take a neuropsychiatric history.
 - Perform a neuropsychiatric assessment.
 - Perform a cognitive examination (simple and extended). A neuropsychiatrist should develop competency not only in conducting an extended cognitive assessment at the

bedside or in the clinic, but also in interpreting results of such an examination in order to determine whether the patient is suffering from a dementing illness, a confusional state or a specific cognitive deficit. Part of the skill would involve placing the results of the examination in the context of the patient's educational and social background and pre-morbid level of functioning.

- Perform a neurological examination.
- Construct a neuropsychiatric differential diagnosis.
- Undertake and plan the investigation of a patient with neuropsychiatric problems.
 - Understand the need for relevant medical investigations, including relevant haematological, metabolic, bacteriological, virological, immunological and toxicological investigations of relevance to NP. Develop the knowledge to interpret the results and pursue further investigations as needed.
 - Competence in key neuropsychiatric investigations including the use of neurophysiology such as EEG, ERPs, nerve conduction studies and telemetry, cerebrospinal fluid examination, nerve, muscle and brain biopsy, sleep study, and other such investigations as required.
 - Indications for, and interpretations of, the various forms of brain imaging, both structural and functional, including MRI, CT, SPECT, PET, etc. The trainee should have sufficient familiarity with these techniques to be able to describe them to a patient and their family/carer and to be able to interpret the results. The trainee should know when such investigations are likely to alter management or treatment decisions and should have some understanding of their theoretical importance. The trainee should have sufficient first-hand knowledge of CT and MRI brain scans to be able to detect salient abnormalities and critically assess an expert neuroradiological report.
 - Neuropsychological assessment: the trainee should be competent on conducting an extended cognitive assessment in the clinic and at the bedside, and also appropriately liaise with a clinical neuropsychologist when formal assessments are warranted.
- Prescribe and oversee treatment to patients with neuropsychiatric disorders.
 - The trainee will be familiar with the biological, psychological and social aspects of intervention and will be able to combine them judiciously for the benefit of the patient.
 - The trainee should have sufficient skills to explain the mode of action, benefits and side effects of these treatments to fellow health professionals, patients and their families; be familiar with the principles of treatment of major neurological disorders and be familiar with neuropsychiatric complications of such treatment.
 - The neuropsychiatrist should also be aware of the neurological manifestations and complications of psychiatric treatment and advise patients and professionals on evaluating the importance of these and in minimising their occurrence and severity. She/he must be familiar with potential drug interactions between psychiatric and neurological medications and other treatments. This will include the awareness of the risks associated with

prescribing psychotropic drugs to patients with neurological and neurosurgical diseases and have a working knowledge of non-pharmacological treatments in neurological and neuropsychiatric disorders.

- The trainee will have competence in the assessment for and the administration of electro-convulsive therapy (ECT) in its current form. The trainee should have some understanding of the newer physical treatments such as transcranial magnetic stimulation (TMS), vagus nerve stimulation (VNS), deep brain stimulation (DBS), and other physical treatments.
- She/he should also acquire knowledge of the principles of neuro-rehabilitation and familiarity with the concepts of disability and handicap. The trainee should be able to assess the need for physical or cognitive rehabilitation and be able to liaise with a rehabilitation service to meet the needs of the patient.
- To diagnose and treat patients with medically unexplained neurological symptoms. The neuropsychiatrist is frequently called upon to diagnose and treat patients with neurological symptoms that do not have an identifiable physiological cause, such as in conversion, dissociation and factitious disorders. She/he should be able to work with colleagues in other disciplines to determine which further tests and investigations are necessary or not as the case may and to competently handle such cases. NP training should include competence in understanding the possible social, cultural and family influences on unexplained neurological symptoms.
- Working with other disciplines. The trainee should be able to grasp the principles behind cognitive behavioural treatments for NP patients and be able to plan and oversee such treatments carried out by another professional such as a trained nurse or clinical psychologist. She/he should be aware of the relationship between NP and allied psychiatric subspecialties such as old age, child and learning disability psychiatry, and which sub-discipline patients might most appropriately be served by.

1.3. Critical Thinking in Neuropsychiatry—Research and Scholarship

A specialist training in NP will equip the trainee to think critically in the field, assess empirical evidence and evaluate published and unpublished claims. This skill can be developed by means of journal clubs, attendance at research meetings, research presentations, short-term courses, etc. It is expected that the trainee will undertake a research project. This should ideally involve all the steps in an empirical project (background review, design of study, applying for ethics clearance, data gathering and analysis, and report preparation). However, it may take the form of a critical review of a current topic, or a case series. The trainee will produce a report of a publishable standard, as judged by the supervisors, and will be encouraged to publish in a peer-reviewed journal. The research report is a mandatory component of the training to be completed by the end of year 2 of the training.

2. Specific Modules

A number of specific modules have been identified for both clinical experience and knowledge base. A trainee is expected to be exposed to typical cases from each of the modules. While each training program will differ in relation to the depth of exposure in each of the modules, the total lack of exposure in any module should not be accepted, and the trainee should have the opportunity to visit another centre to fill a gap in the training. Details for each of these modules have been previously described, but an example is given of the salient content of one module only.

Specific Modules

- Disorders of arousal (e.g., coma, persistent vegetative state, minimally conscious state, etc.).
 - Disorders of attention (e.g., delirium, confusion, neglect/visuospatial disturbances).
 - Neurocognitive disorders — dementia in the elderly (Alzheimer's, vascular, DLB, FTD, PDD, Huntington's, CJD, mixed, other), early-onset dementia, mild neurocognitive disorder (including neurodegenerative disorders, infectious disorders, e.g. HIV, traumatic brain injury, substance-related); focal cognitive disorders (amnesia, aphasia, apraxia, abulia, disinhibition, impulse control disorders, Kliver Bucy syndrome, etc.).
 - Cerebrovascular disease and neuropsychiatric disorders (neurocognitive disorders, depression, other).
 - Seizure disorders, epileptic and nonepileptic (psychiatric aspects).
 - Movement disorders — drug-induced (tardive dyskinesia, akathisia, parkinsonism, neuroleptic malignant syndrome), psychiatric aspects of other movement disorders (Parkinson's disease, idiopathic dystonia, etc.), tic disorders.
 - Traumatic brain injury and its psychiatric consequences.
 - Secondary psychiatric disorders, i.e. psychosis, depression, mania, anxiety disorders and obsessive compulsive symptoms and disorder secondary to 'organic' brain disease.
 - Substance-related psychiatric disorders — alcohol, drugs of abuse, etc.
 - Psychiatric aspects of immunological disorders, including autoimmune encephalitis and chronic fatigue syndrome.
 - ADHD and behavioural disorders.
 - Sleep disorders, neuropsychiatric aspects.
 - General Hospital Liaison Neuropsychiatry.
 - Developmental Neuropsychiatry (learning disorders, developmental disability including intellectual handicap, pervasive developmental disorders and related syndromes).
 - Neuropsychiatric rehabilitation.
 - Forensic neuropsychiatry.
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- Module (example): Seizure disorders, neuropsychiatric aspects**
- ### Specific competencies
- Undertake a clinical assessment of patients with suspected epilepsy.
 - Take a seizure history.
 - Take a neuropsychiatric history focusing on eliciting impact of seizure disorder on the patient.
 - Take a history from an informant.
 - Perform a neurological examination on patients with suspected epilepsy.
 - Construct a formulation with differential diagnoses for the seizure type and syndrome, along with discussion of aetiology.
 - Assess patients suspected of having non epileptic seizures (NEAD).
 - Be familiar with the main features differentiating epilepsy and NEAD.
 - Be familiar with the co-existence of epilepsy and NEAD.
 - Be familiar with the management of NEAD.
 - Undertake investigation of patients with suspected epilepsy.
 - Be familiar with EEG recording and interpretation (including the limitations) in people with epilepsy.
 - Be familiar with the indications for and interpretation of structural and functional neuroimaging in people with epilepsy.
 - Prescribe treatment to patients with coexisting neurological disorder.
 - Be familiar with social and psychological interventions for the treatment of epilepsy including relaxation techniques and other behavioral methods of controlling/inhibiting seizures.
 - Be familiar with the principles of the medical treatment of the different seizure and syndrome types.
 - Be familiar with potential drug interactions between psychiatric medications and anticonvulsants.
 - Be aware of the risks associated with prescribing psychotropic agents to patients with epilepsy.
 - Be familiar with the surgical treatment of epilepsy including vagal nerve stimulation.
 - Assess and manage special patient groups with epilepsy.
 - Be familiar with the difficulties in assessing and managing seizure disorders in children and adolescents with epilepsy, including issues around puberty.
 - Be familiar with the difficulties in assessing and managing seizure disorders in women with epilepsy, including catamenial epilepsy, contraception, pregnancy, teratogenicity, polycystic ovarian syndrome, menopause.
 - Be familiar with the difficulties in assessing and managing seizure disorders in older age patients, including cognition and issues regarding concomitant physical illnesses and medication.
 - Be familiar with the difficulties in assessing and managing seizure disorders in patients with learning disability including aetiology, difficulty eliciting a history, cognitive and treatment issues.
 - Assess and manage psychiatric co-morbidity in people with epilepsy: pre-ictal, ictal, post-ictal, interictal and iatrogenic.
 - Be familiar with the diagnosis and management of depression in people with epilepsy including the risk of suicide.
 - Be familiar with the diagnosis and management of anxiety/panic attacks in people with epilepsy, including the

difficulties in differentiating between panic attacks and ictal panic.

- Be familiar with the diagnosis and management of psychosis (post-ictal psychosis, chronic interictal psychosis and forced normalisation) in people with epilepsy.
- Be familiar with the diagnosis and management of cognitive dysfunction in people with epilepsy, resulting from seizures and anticonvulsant medication, including the role of neuropsychological assessments.
- Be familiar with the diagnosis and management of sexual dysfunction in people with epilepsy.
- Be familiar with the diagnosis and management of disorders of impulse control (anger/irritability, drug/alcohol problems) in people with epilepsy.
- Be familiar with quality of life issues in people with epilepsy, such as stigma, locus of control, employment/relationship difficulties.
- Be aware of the issues involved in the medico-legal aspects of epilepsy.
- Be aware of the driving license implications of having epilepsy.
 - Be familiar with the concept of automatisms when used as a defence in court.
 - Liaison with Epilepsy Surgery Program.

In centres affiliated with Epilepsy Surgery programs, the trainee should become familiar with the psychiatric issues involved in the assessment of candidates for epilepsy surgery, and be able to provide pre-operative consultations and post-operative follow-up to such patients.

Behavioural Neurology

The Society for Behavioral and Cognitive Neurology (SBCN) of the United States defines Behavioural Neurology (BN) as having a focus on the “clinical and pathological aspects of neural processes associated with mental activity, subsuming cognitive functions, emotional states, and social behaviour” (<http://the-sbcn.org/1733.cfm>), thus emphasising the close alignment in content and curricula between NP and BN. The reliance on advances in functional neuroimaging, electrophysiological methods and cognitive neuroscience to advance the field of BN further underscores the commonalities between the two subspecialties. It was in recognition of this shared interest that the SBCN in discussions with the American Neuropsychiatric Association (ANPA) proposed a joint accreditation for BN and NP to the American Academy of Neurology (AAN) in 2003, having this approved as a joint subspecialty a year later. Given the relatively smaller size of ANPA membership at the time, this combined effort provided the respective governing bodies with the opportunity to combine forces in favour of better defined accreditation and certification requirements. The new subspecialty of ‘BN and NP’ was defined as a “medical specialty committed to better understanding links between neuroscience and behaviour, and to the care of individuals with neurologically based behavioral disturbances”.³¹ This definition reiterates much of what we have said above about NP itself and there is much overlap in the curricular content. The distinction therefore lies in the approach of the trainee in NP who comes

from a background of apprenticeship in Psychiatry having developed skills in the detailed observation and phenomenological description of the nuances of behaviour disturbances. A clear distinction in the curricula of NP and BN is therefore not possible, with the variations being determined by differences in emphasis, setting and prior training strengths and weaknesses.

Neuropsychiatry for the General Psychiatrist

With the recent push to reconfigure psychiatric disorders on the basis of underlying neuroscientific principles,³² the importance of neuroscience in contemporary psychiatry cannot be over-emphasised. Basic neuroscience and the principles of NP should therefore be part of any psychiatric training program.³³ The knowledge base to rely upon is no different from that discussed above, except that the depth and breadth will necessarily be limited in a general psychiatry context. It is important that all psychiatry training programs aim to achieve this training goal. Neuropsychiatrists, as teachers and academics, have a central role to play in imparting this knowledge and training.

Conflicts of interest

The authors have no conflicts of interest to declare.

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