



The Royal Australasian
College of Physicians

Neurology

Advanced Training Curriculum

Paediatrics & Child Health Division



AUSTRALIAN & NEW ZEALAND
ASSOCIATION OF NEUROLOGISTS



The Royal Australasian
College of Physicians

Physician Readiness for Expert Practice (PREP) Training Program

Paediatric Neurology Advanced Training Curriculum

TO BE USED IN CONJUNCTION WITH:

Basic Training Curriculum – Paediatrics & Child Health
Professional Qualities Curriculum

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Fellows and RACP staff have contributed to the development of this curriculum document.

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The process was managed by the Curriculum Development Unit within the College's Education Services, which designed the document, drafted the content material, organised and facilitated writing workshops, developed resource materials, and formatted the final document.

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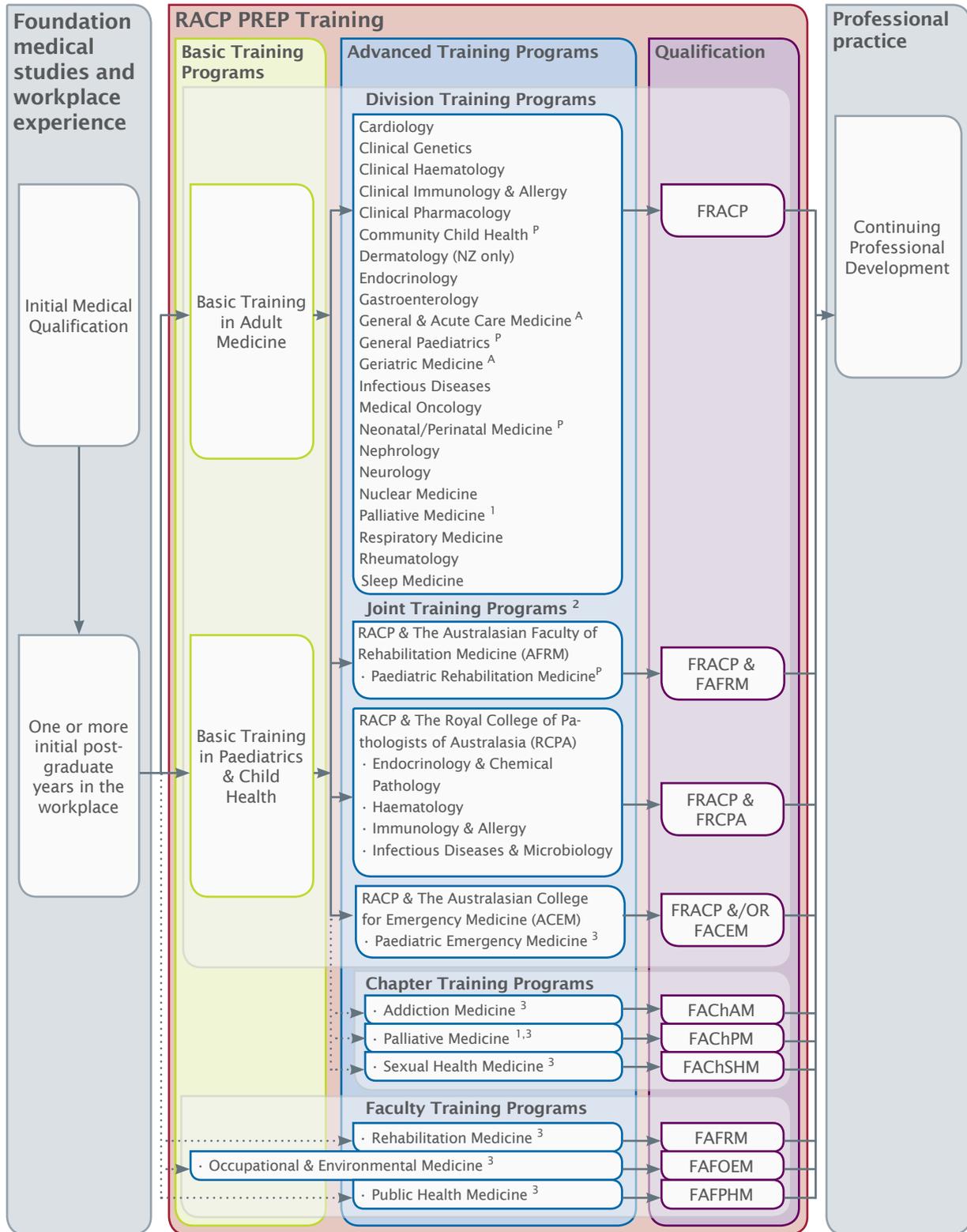
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Please note: No Domains, Themes or Learning Objectives have been updated for this edition; design changes ONLY.

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RACP FELLOWSHIP TRAINING PATHWAYS AND THE CONTINUUM OF LEARNING



^P Trainees must complete Basic Training in Paediatrics & Child Health to enter this program.

^A Trainees must complete Basic Training in Adult Medicine to enter this program.

¹ Trainees who have entered Advanced Training in Palliative Medicine via a RACP Basic Training Program will be awarded FRACP upon completion and may subsequently be awarded FACHPM. Trainees who have NOT entered Advanced Training in Palliative Medicine via a RACP Basic Training Program will only be awarded FACHPM upon completion.

² The Child & Adolescent Psychiatry Joint Training Program with the Royal Australian and New Zealand College of Psychiatrists (RANZCP) is currently under review by the RACP and RANZCP and closed to new entrants at present.

³ Alternative entry requirements exist for these training programs; please see the corresponding PREP Program Requirements Handbook for further information.

NB1: This diagram only depicts training programs that lead to Fellowship. Please see the RACP website for additional RACP training programs.

NB2: For further information on any of the above listed training programs, please see the corresponding PREP Program Requirements Handbook.

OVERVIEW OF THE SPECIALTY

The practice of paediatric neurology involves the diagnosis and treatment of children with diseases affecting the central, peripheral and autonomic nervous systems, and muscle. A paediatric neurologist is a skilled clinician, who reaches a diagnosis by taking a detailed history and performing thorough neurological and developmental examinations, supplemented by the rational use of tests. A paediatric neurologist needs to have a detailed knowledge of normal paediatric development and a broad understanding of paediatric medicine. Paediatric neurologists are expected to be skilled in the methodology and interpretation of electroencephalography (EEG), electromyography (EMG) and nerve conduction studies. Paediatric neurologists also need well-developed skills in the interpretation of paediatric neuro-imaging.

A paediatric neurologist must be aware of the evidence that supports his/her management decisions. Many neurological conditions are chronic and disabling, and the paediatric neurologist may need to treat psychological, cognitive and behavioural complications, liaise with other medical and allied health professionals, and be involved in rehabilitation. At the other extreme, some neurological conditions are untreatable, and the neurologist must be able to provide a prognosis to the patient and their carers, and be able to manage end-of-life issues. Good interpersonal and counselling skills are a critical component of paediatric neurology.

There are a number of future challenges for paediatric neurologists. Knowledge of genetic medicine is becoming increasingly important, as the genetic causes for more neurological diseases are being identified. The rapid progress of gene discovery is likely to permit the diagnosis of more diseases in children with neurological disorders – as such, knowledge and understanding of genetics will become increasingly important. Advances in areas such as imaging, epilepsy surgery, stroke, neuro-immunology, neuromuscular disorders and the treatment of previous incurable genetic diseases mean that the management of children with neurological disease will become increasingly demanding.

CURRICULUM OVERVIEW

Paediatric Neurology Advanced Training Curriculum

This Curriculum outlines the broad concepts, learning objectives, theoretical knowledge, clinical skills, attitudes and behaviours required and commonly utilised by paediatric neurologists in Australia and New Zealand. It emphasises the skills required of a paediatric neurologist, particularly in diagnosis and management. The common neurological problems are outlined, along with examples of the common conditions with which the trainee must be familiar.

In putting together this curriculum, a problem-based approach has been followed in order to achieve simplicity. However it is recognised that many important conditions do not fit well within this framework. Trainees are directed to Appendix 1, which lists several such disorders that the curriculum writing group feel deserve additional attention.

The purpose of Advanced Training is for trainees to build on the cognitive and practical skills acquired during Basic Training. At the completion of Advanced Training in Paediatric Neurology, trainees should be competent to provide, at consultant level, unsupervised comprehensive medical care in paediatric neurology.

Attaining competency in all aspects of this curriculum is expected to take a minimum of three years of training. It is expected that all teaching, learning and assessment associated with the Paediatric Neurology Advanced Training Curriculum will be undertaken within the context of the paediatrician's everyday clinical practice, and will accommodate discipline-specific contexts and practices as required. As such, it will need to be implemented within the reality of current workplace and workforce issues, and the needs of health service provision.

There may be learning objectives that overlap with, or closely relate to, other domains; however, to avoid repetition, these have been assigned to only one area. In practice, however, it is anticipated that within the teaching/learning environment, the progression of each objective would be explored.

NB: The curriculum should always be read in conjunction with the relevant training handbook, available on the College website.

Professional Qualities Curriculum

The Professional Qualities Curriculum (PQC) outlines the range of concepts and specific learning objectives required by, and used by, all physicians and paediatricians, regardless of their specialty or area of expertise. It spans both the Basic Training and Advanced Training programs, and is also utilised as a key component of the Continuing Professional Development (CPD) Program.

Together with the various Basic Training and Advanced Training curricula, the PQC integrates and fully encompasses the diagnostic, clinical, and educative aspects of the paediatrician's daily practice.

Each of the concepts and objectives contained in the PQC will be taught, learnt and assessed in the context of everyday clinical practice. Therefore, it is important that they be aligned with, and fully integrated into, the learning objectives of the Paediatric Neurology Advanced Training Curriculum.

EXPECTED OUTCOMES OF TRAINING

Graduates from this training program will be equipped to function effectively in the current and emerging professional, medical and societal contexts. At the completion of Advanced Training in Paediatric Neurology, as defined by this curriculum, it is expected that a new Fellow will have acquired the theoretical knowledge and developed the clinical skills necessary for competent neurology practice.

It is expected that a new Fellow will be able to:

- demonstrate a sound knowledge of neuroanatomy
- describe all common, rare and emergency neurological conditions
- take a neurological history and carry out a detailed neurological examination
- identify and apply the clinical skills of diagnosis and management
- effectively communicate with patients, their carers, and other professionals
- apply the rational use of investigations in patients with neurological problems
- interpret clinical neurophysiology tests
- explain the roles of rehabilitation medicine, neurosurgery, intensive care, neuropsychiatry and palliative care
- demonstrate the inherent skills required of a consultant physician, particularly self-motivated learning, teaching and an understanding of research principles.

CURRICULUM THEMES AND LEARNING OBJECTIVES

Each of the College's training curricula has been developed using a common format, thereby ensuring a degree of consistency in approach across the spectrum of training.

Domains

Domains are the broad fields that group common or related areas of learning.

Themes

Themes identify and link more specific aspects of learning into logical or related groups.

Learning Objectives

Learning objectives outline the specific learning requirements. They provide a focus for identifying and detailing the required knowledge, skills and attitudes. They also provide a context for specifying assessment standards and criteria, as well as providing a context for identifying a range of teaching and learning strategies.

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DOMAIN 1	CLINICAL APPROACH
Theme 1.1	History taking
Learning objective 1.1.1	Elicit a comprehensive history from a patient and their primary carers

A large part of the practice of neurology involves interaction with patients and their families to obtain a clear history. Often, the diagnosis is determined by the history rather than examination. A neurologist must be able to clarify the nature of a patient's presenting problem, which then leads to hypothesis generation and the formation of a differential diagnosis. The detail required will vary according to the circumstances – in general, when seeing a patient for the first time, a comprehensive history should be taken.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the clinical presentations of various neurological diseases and their benign mimics
- plan both open and directed questions to obtain relevant data
- determine the history of the presenting problem incorporating the developmental stage of a child, including:
 - symptom onset
 - duration and course of the condition
 - associated symptoms
- obtain further details from other sources, e.g. paediatrician, teachers, other family members, home video etc.
- elicit the key features of the history:
 - neurological
 - prenatal and perinatal
 - developmental milestones
 - growth
 - behavioural
 - sleep
 - family
 - psychosocial and general medicine history, including immunisation
- include the child/adolescent in the process of information gathering
- recognise socio-cultural differences, and use qualified interpreter services when required
- utilise strategies to deal with conflict and grief
- recognise the signs of child abuse and domestic violence
- use basic counselling skills and display empathy and respect
- use the data obtained to:
 - plan investigations
 - identify a patient's neurological problem
 - form a differential diagnosis.

DOMAIN 1	CLINICAL APPROACH
Theme 1.2	Neurological examination
Learning objective 1.2.1	Conduct a detailed neurological examination

Neurologists have the ability to perform a detailed examination, a skill underpinned by a comprehensive knowledge of neuroanatomy. The examination is used to test hypotheses generated when taking the history, and helps guide further investigations. A neurologist must be competent in the examination of cognition/mental state, cranial nerves, limbs and gait, as well the general medical physical examination. A neurologist must also adapt the examination to the requirements of the situation. A paediatric neurologist must also bring special skills to the assessment of the different stages of normal neurodevelopment. These include a greater emphasis on observation, establishing trust, and examination through game-play.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the anatomy and physiology of the nervous system
- outline the normal neurodevelopmental changes from premature neonate to adulthood
- take a professional and ethical approach to patient examination
- explain the different approaches required for a neonate/infant/child/adolescent
- identify the methods of examination suitable to a patient's neurodevelopmental stage, to assess:
 - cognition/mental state
 - cranial nerves
 - motor function
 - reflexes
 - coordination and gait
 - sensory function
- adapt examination methods depending on the behavioural and cognitive state of the child
- form a differential diagnosis
- recognise signs of non-accidental injury.

DOMAIN 1	CLINICAL APPROACH
Theme 1.3	Diagnosis and management
Learning objective 1.3.1	Formulate a diagnosis, differential diagnosis and management plan
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • synthesise the key information obtained from history, examination and investigations to formulate a diagnosis and differential diagnosis • utilise educational resources such as textbooks, journals, online sites and colleagues in diagnosis • describe to the child and family the potential negative impacts of investigations involving neuroimaging and genetic testing • review significant investigations such as magnetic resonance imaging (MRI) and nuclear medicine electrophysiology • revise a diagnosis when new information becomes available • formulate an immediate and longer-term management plan, ensuring that treatments are up to date • adhere to published principles or medically accepted guidelines when off-label prescribing • collaborate and participate in multidisciplinary teams • outline additional patient resources, including allied health, social work, NGOs, etc. • refer to other neurologists or specialist physicians, including general paediatricians, when appropriate. 	

DOMAIN 1	CLINICAL APPROACH
Theme 1.4	Presentation and communication skills
Learning objective 1.4.1	Present and discuss a patient's history, examination findings, investigation results and management plan
<p><i>Adequate communication is an essential skill. A paediatric neurologist must be able to succinctly summarise a patient's key clinical and investigation findings, reach a diagnosis and management plan, and present this in verbal and written form.</i></p> <p><i>A paediatric neurologist must be able to work as a member of a multidisciplinary team, respecting the roles of the other members of the team, and must communicate effectively with patients and their families, whilst taking appropriate regard for confidentiality.</i></p>	
<p>Knowledge and skills</p>	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • describe principles of effective communication • outline confidentiality issues and requirements • present the following patient information verbally, and in written form: <ul style="list-style-type: none"> • key clinical findings • investigation findings • diagnosis • management plan • document the clinical findings and management plan in written form • explain and discuss a diagnosis, prognosis and management plan with patients and their parents/caregivers • verbally present pertinent literature reviews to an audience of peers • contribute as a member of a multidisciplinary team. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.1	Problems presenting in the neonatal period
Learning objective 2.1.1	Assess, diagnose and manage problems presenting in the neonatal period

Common neonatal neurological disorders include:

- hypoxic ischaemic encephalopathy
- disorders of prematurity
- neonatal seizures
- hypotonia
- stroke
- congenital and neonatal infections
- cerebral malformations and dysmorphic syndromes
- prenatal disorders and maternal diseases
- inborn errors of metabolism.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the neurodevelopmental features and examination findings of normal preterm and term infants
- develop a differential diagnosis, investigation and management plan for neonatal seizures
- describe the pathophysiology, clinical correlates and prognosis of neonatal encephalopathy, including hypoxic ischaemic encephalopathy and periventricular leukomalacia
- assess and develop a differential diagnosis for hypotonia in the newborn period
- evaluate and manage perinatal stroke
- recognise and form an investigation and management plan for developmental malformations and/or dysmorphic syndromes identified in the newborn period
- outline the impact of maternal disorders and prenatal neurologic diagnoses on the fetus
- recognise and investigate disorders of metabolism in the newborn period.

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.2	Malformations of the head, brain and spine
Learning objective 2.2.1	Assess, diagnose and manage patients with malformations of the head, brain and spine

Common malformation disorders include:

- microcephaly
- macrocephaly
- plagiocephaly
- congenital brain malformations
- hydrocephalus
- spina bifida and other malformations of spinal cord development.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the embryology of brain and spinal cord development
- outline the mechanisms of cerebrospinal fluid (CSF) formation and flow pathway
- describe the common patterns of brain malformation
- describe the clinical features and presentations of the common forms of brain malformation
- outline the common causes of an abnormally sized or shaped head
- identify the common causes of raised intracranial pressure
- recognise the presentations and complications of spinal cord malformations
- form a differential diagnosis based on history, examination and investigations
- discuss the prognosis, implications and the management of these disorders with patients and parents.

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.3	Developmental delay
Learning objective 2.3.1	Assess, diagnose and manage patients presenting with developmental delay

Common causes of developmental delay include:

- genetic or syndromic causes, e.g. chromosomal abnormalities, neurocutaneous syndromes
- structural brain abnormalities, e.g. cerebral malformations, acquired perinatal or post natal vascular or traumatic causes
- infection including HIV and cytomegalovirus (CMV)
- toxins
- metabolic disorders
- pervasive development disorders and autism.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- define normal development ranges for the following:
 - fine motor
 - gross motor
 - social
 - speech and language
- describe the causes of developmental delay, and define them in terms of the area affected, e.g. specific or global
- recognise infants, children and young people with neurological deficits
- assess all relevant maternal and child history pertaining to all aspects of development of an infant, child or young person
- outline the range of developmental assessment tools for infants, children and young people with developmental delay/disabilities
- describe the longitudinal aspects of/assessment intervals for infants, children and young people with developmental delay/disabilities
- interpret results from psychological and developmental assessment tools for infants, children and young people
- describe the role of allied health in assessment of infants, children and young people with developmental delay/disabilities
- summarise the history and findings of an infant, child or young person, and communicate this information clearly to other professionals.

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.4	Developmental/cognitive regression
Learning objective 2.4.1	Assess, diagnose and manage patients presenting with developmental/cognitive regression

Causes of developmental regression include:

- neurodegenerative disorders, e.g. Huntington’s disease, ataxia telangiectasia, subacute sclerosing panencephalitis (SSPE)
- metabolic disorders, e.g. storage disorders, amino acid and organic acidurias, mitochondrial cytopathies, lipofuscinoses, glycosylation disorders
- autism
- epileptic encephalopathies.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the presentation of neurodegenerative disorders at different ages
- determine whether other organs are involved, from history and examination
- determine whether the clinical features are referable only to the central nervous system, or if the peripheral nervous system is involved
- identify treatable causes of developmental regression, e.g. vitamin B12 deficiency, creatine deficiency, coeliac disease
- define disorders causing developmental regression in terms of anatomical location, e.g. grey matter, white matter
- perform investigations bearing the above in mind.

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.5	Altered states of consciousness
Learning objective 2.5.1	Assess, diagnose and manage children presenting with altered states of consciousness

Common causes of disorders of consciousness include:

- infection: meningitis, encephalitis (infective, vasculitic, autoimmune)
- inflammation: autoimmune, demyelinating
- epilepsy: postictal, non-convulsive status, epileptic encephalopathy
- structural causes: raised intracranial pressure, stroke, space occupying lesion (SOL)
- metabolic and toxic issues secondary to systemic disease, including prescribed and illicit drugs, hypoglycaemia, hepatic and renal failure
- trauma, including non-accidental injury
- migraine and migraine equivalent.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the common causes of altered states of consciousness
- assess a patient's level of consciousness using the Glasgow Coma Score, and identify its limitations in childhood
- recognise the signs and symptoms of critically raised intracranial pressure
- describe the implications and management of raised intracranial pressure
- explain the mechanisms of decreased consciousness, including:
 - inflammatory/infectious causes
 - epileptic causes
 - structural causes
 - metabolic and toxic causes
- form a differential diagnosis based on history, examination and investigations
- describe the diagnosis and management approaches for patients with altered states of consciousness
- prioritise aspects of management for patients with altered states of consciousness.

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.6	Sleep disorders
Learning objective 2.6.1	Assess, diagnose and manage children presenting with neurological causes of sleep disorders
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • assess sleep disorders, including insomnia, night terrors, parasomnias and excessive daytime sleepiness • identify the appropriate investigations, and describe the utility of sleep studies • differentiate sleep disorders from related neurological presentations, e.g. frontal lobe epilepsy and parasomnias, night terrors. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.7	Headache
Learning objective 2.7.1	Assess, diagnose and manage patients presenting with headache
Common types of headache include:	
<ul style="list-style-type: none"> • migraine • tension-type headache • chronic daily headache • headache due to raised intracranial pressure • tumour. 	
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • explain headache syndromes • explain the principles of the rational use of investigations for headache • recognise migraine, migraine equivalents and migraine variants, e.g. vomiting • recognise and treat rare headache syndromes • identify secondary headache from underlying causes such as raised intracranial pressure, vasculitis, space occupying lesions or benign intracranial hypertension • recognise tumours presenting without headache • form a differential diagnosis based on history, examination and investigations • explain management strategies for the common types of headache, such as the rational use of medications and non-pharmaceutical interventions, including psychological and relaxation therapies such as massage, biofeedback, yoga etc. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.8	Seizures
Learning objective 2.8.1	Assess, diagnose and manage patients presenting with seizures

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- distinguish between epileptic and non-epileptic events, including non-epileptic seizures and syncope
- evaluate a patient with a possible seizure
- form a differential diagnosis based on history, examination and investigations
- describe epilepsy classifications
- formulate a plan to investigate the underlying aetiology of epilepsy
- use EEG, brain imaging and video monitoring
- describe age-related presentations in epileptic symptoms
- discuss with the patient and their carers the prognosis, its implications, and management strategies for dealing with epilepsy
- identify appropriate potential candidates for evaluation for epilepsy surgery
- describe to the patient and their carers the investigations that may be performed as part of a pre-surgical evaluation
- outline management strategies, including anticonvulsant use, diet, epilepsy surgery and vagal nerve stimulator.

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.9	Paroxysmal non-epileptic attacks
Learning objective 2.9.1	Assess, diagnose and manage patients presenting with paroxysmal non-epileptic attacks
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> describe the range of paroxysmal non-epileptic attacks presenting in childhood, including: <ul style="list-style-type: none"> tics hyperekplexia benign paroxysmal vertigo paroxysmal dyskinesia stereotypies benign neonatal sleep myoclonus syncopal attacks, including vasovagal and reflex anoxic breath holding describe the paroxysmal non-epileptic attacks presenting at different ages describe key features of non-epileptic paroxysmal attacks elicitable on history or examination describe the role of home video and other investigations for paroxysmal non-epileptic attacks manage diagnostic uncertainty and counselling in relation to risk management. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.10	Disorders of special senses
Learning objective 2.10.1	Assess, diagnose and manage patients presenting with sensory disorders

Common sensory disorders include:

- visual disorders:
 - acute visual loss, e.g. optic neuritis, ischaemia
 - chronic visual loss, e.g. retinopathy of prematurity (ROP)
 - diplopia, e.g. myasthenia gravis
 - positive visual symptoms, e.g. migraine
- auditory disorders:
 - acoustic neuroma
 - congenital deafness.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- identify the anatomy of the visual, auditory and vestibular pathways, and localise a lesion
- explain the common causes of visual disturbance and eye movement abnormalities
- assess causes of visual disturbance, including non-organic presentations
- describe the indications for investigations
- form a differential diagnosis and management plan for patients with visual problems
- form a differential diagnosis and management plan for patients with hearing loss or vertigo.

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.11	Gait and balance
Learning Objective 2.11.1	Assess, diagnose and manage patients presenting with gait and balance disorders
Common causes of gait and balance disorders involve:	
<ul style="list-style-type: none"> the cerebrum, including the patterns of cerebral palsy the basal ganglia, e.g. cerebral palsy, metabolic conditions the cerebellar, e.g. drugs and toxins, degenerative including inherited disease, demyelination vestibular pathways, peripheral and central proprioception disorders, e.g. spinal cord and peripheral nerve diseases, including vitamin B12 deficiency. 	
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> identify the neurological systems involved in gait and balance explain the common causes of gait and balance disorders describe the importance of the time-course and the associated clinical features in reaching a diagnosis localise the lesion based on history, examination and investigations form a differential diagnosis and management plan based on history, examination and investigations. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.12	Movement disorders
Learning objective 2.12.1	Assess, diagnose and manage patients presenting with movement disorders
Common causes of movement disorders include:	
<ul style="list-style-type: none"> hyperkinetic causes, e.g. chorea, myoclonus, dystonia, tics hypokinetic causes tremor, e.g. essential tremor. 	
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> identify the anatomy and physiology of the motor system explain the various causes of hyperkinetic causes, hypokinetic disorders and tremors categorise the nature of a movement disorder evaluate the type of disorder, its localisation, time-course and associated clinical features form a differential diagnosis and management plan based on history, examination and investigations. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.13	Stroke syndromes
Learning objective 2.13.1	Assess, diagnose and manage patients presenting with stroke
Common stroke syndromes include:	
<ul style="list-style-type: none"> transient ischemic attack (TIA) arterial ischaemic stroke venous sinus thrombosis subarachnoid haemorrhage intracranial haemorrhage stroke mimics, e.g. migraine. 	
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> describe vascular anatomy and stroke syndromes describe risk factors and comorbidities in stroke explain causes of stroke in children, e.g. non-atherosclerotic arteriopathies, congenital heart disease describe the clinical features and classification of stroke syndromes describe the indications for investigations form a differential diagnosis based on history, examination and investigations discuss with patients the prognosis, implications, and management strategies for stroke, e.g. acute management, rehabilitation, secondary prevention and impact on the family. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.14	Weakness
Learning objective 2.14.1	Assess, diagnose and manage patients presenting with weakness
Common causes of weakness involve:	
<ul style="list-style-type: none"> • the brain, e.g. stroke • the spinal cord, e.g. demyelination • anterior horn cells, e.g. spinal muscular atrophy • peripheral nerves, e.g. Guillain–Barré syndrome • neuromuscular junctions, e.g. myasthenia gravis • muscle, e.g. Duchenne muscular dystrophy. 	
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • identify the anatomy and physiology of the motor system • describe the common neurological causes of weakness • describe the clinical features and presentations of the common causes of weakness • localise the site of a lesion • assess patients based on lesion localisation, time-course and associated clinical features • form a differential diagnosis and management plan based on history, examination and investigations. 	

DOMAIN 2	PRESENTING PROBLEMS
Theme 2.15	Neurometabolic disorders
Learning objective 2.15.1	Describe the principles of, and indications for neurometabolic assessment

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the neurologic presentations of common metabolic disorders in childhood and the differential diagnoses for these presentations, including:
 - encephalopathy
 - developmental regression
 - muscle weakness
 - intellectual deterioration
 - seizures
 - paroxysmal dyskinesia
 - stereotypies
- describe the presentations, investigations and treatment of common neurodegenerative conditions in childhood, including metabolic, neurotransmitter and mitochondrial disorders
- describe a structured approach to metabolic investigations in childhood, i.e. identifying features such as age at presentation, ethnicity, clinical features, examination findings and imaging or EEG features (e.g. distinguishing white matter vs. grey matter disorders)
- review the results of common metabolic investigations, e.g. plasma amino acids, urine organic acids, etc., and where abnormal, review in conjunction with a metabolic physician
- outline the range of treatable neurometabolic disorders, their clinical presentations and their treatments, e.g. Wilson's disease, pyridoxine dependent seizures, etc.
- describe the metabolic disorders that may be amenable to bone marrow transplantation or enzyme replacement therapy
- discuss the genetic implications of common neurometabolic conditions.

DOMAIN 3	INVESTIGATIONS
Theme 3.1	Neuroimaging
Learning objective 3.1.1	Select appropriate neuroimaging techniques and interpret the results of tests
Neuroimaging investigations include:	
<ul style="list-style-type: none"> • cranial ultrasound • computed tomography (CT) and computed tomographic angiography (CTA) • magnetic resonance imaging (MRI), magnetic resonance angiography (MRA), magnetic resonance venogram (MRV), magnetic resonance spectroscopy (MRS) • vascular imaging • catheter angiography • functional neuroimaging, including single photon emission computed tomography (SPECT), positron emission tomography (PET) and functional magnetic resonance imaging (fMRI). 	
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • identify brain anatomy and pathology • describe and identify normal anatomy in neuroimaging (CT, MR), including vascular anatomy and pathology • explain the rational use of neuroimaging, including: <ul style="list-style-type: none"> • the appropriate selection of tests • the sequences used • the limitations of the test • possible complications of the procedure • outline the considerations of performing neuroimaging, including radiation risks and technical difficulties • review the results of neuroimaging, and synthesise the findings with the radiologist's report. 	

DOMAIN 3	INVESTIGATIONS
Theme 3.2	Clinical neurophysiology
Learning objective 3.2.1	Perform and interpret neurophysiology tests

Clinical neurophysiology investigations include:

- electromyography (EMG)
- nerve conduction studies (NCS)
- electroencephalography (EEG)
- evoked potentials
- vestibular function tests.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- discuss the rational use of clinical neurophysiology tests, including:
 - indications
 - limitations
 - complications
- interpret and report EMG and NCS results, including:
 - describing the physiological basis of EMG and NCS potentials and waveforms
 - describing the technology used for EMG and NCS recording
 - interpreting EMG and NCS reports
- interpret and report EEG and evoked potentials results, including:
 - describing the physiological basis of EEG potentials and waveforms
 - describing the technology used for EEG recording
 - observing EEG electrode placement and recording
 - identifying examples of normal and abnormal EEG waveforms
 - recognising typical EEG patterns for age dependent childhood epilepsy syndromes, e.g. hypsarrhythmia, centroparietal and perisylvian tangential dipoles and 3 Hz spike wave
 - describing the role and limitations of EEG in clinical neurology
 - reporting EEG studies and interpret findings in clinical context
 - correctly localising focal epileptiform discharges and slow wave activity
- interpret results of clinical neurophysiology tests and synthesise these findings with other clinical data in the management of patients with neurological conditions.

DOMAIN 3	INVESTIGATIONS
Theme 3.2	Clinical neurophysiology
Learning objective 3.2.1	Perform and interpret neurophysiology tests
Minimum practical performance requirements	
<ul style="list-style-type: none"> observe nerve conduction and EMG studies 	see below
<ul style="list-style-type: none"> perform nerve conduction and EMG studies under supervision 	highly recommended
<ul style="list-style-type: none"> report the results of EEGs under supervision 	a logbook must be kept of a minimum of 300 studies, which must be reported during training
<ul style="list-style-type: none"> attend EEG, EMG and NCS reporting sessions 	3½ hours per week during core training
<ul style="list-style-type: none"> attend the ANZAN EEG course 	mandatory
<ul style="list-style-type: none"> attend the ANZAN EMG course 	highly recommended
NOTE: Trainees meeting these objectives will have completed Level 1 Training in Clinical Neurophysiology. See related document “ <i>Training in Clinical Neurophysiology</i> ” for further information.	

DOMAIN 3	INVESTIGATIONS
Theme 3.3	Cerebrospinal fluid (CSF)
Learning objective 3.3.1	Perform a lumbar puncture (LP) and interpret the results
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> describe the indications, contraindications, limitations and complications of LP describe the performance of LP and management of complications, to: <ul style="list-style-type: none"> enable informed consent for the procedure manage post-LP symptoms perform a LP interpret CSF results, including: <ul style="list-style-type: none"> opening pressure standard tests: cell counts, protein, glucose special tests: oligoclonal bands, glucose ratio, amino acids, neurotransmitters, PCR for viruses, CSF cytology interpret and apply the CSF results to clinical practice. 	

DOMAIN 3	INVESTIGATIONS
Theme 3.4	Neuropathology
Learning objective 3.4.1	Interpret the results of neuropathology tests
Neuropathology investigations include:	
<ul style="list-style-type: none"> • nerve biopsy • muscle biopsy • brain biopsy. 	
Knowledge and skills	
By the completion of Advanced Training, a new Fellow should be able to:	
<ul style="list-style-type: none"> • describe the principles of nerve, muscle and brain biopsy • discuss the rational use of neuropathology tests, including: <ul style="list-style-type: none"> • indications • limitations • complications • interpret the results of nerve, muscle and brain biopsies, and apply the results to clinical practice. 	
Minimum practical performance requirements	
• attend neuropathology sessions	highly recommended
• attend the ANZAN neuropathology course	highly recommended

DOMAIN 3	INVESTIGATIONS
Theme 3.5	Neuropsychology
Learning objective 3.5.1	Describe the principles of, and indications for, neuropsychological assessment
Knowledge and skills	
By the completion of Advanced Training, a new Fellow should be able to:	
<ul style="list-style-type: none"> • describe the role of the neuropsychologist • describe the principles of neuropsychological assessment • identify the domains tested in a neuropsychological assessment • describe common tests used in a neuropsychological assessment • describe the indications for neuropsychological assessment. 	

DOMAIN 3	INVESTIGATIONS
Theme 3.6	Neurogenetics
Learning objective 3.6.1	Describe the principles of, and indications for, genetic testing
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • describe the utility of genetic testing in neurological diagnosis, even in asymptomatic individuals • describe the role of clinical genetics services • identify the available resources for information in this rapidly changing area • discuss the importance of pre-test counselling • describe the ethical considerations related to the consent of children • refer to a clinical genetics service where required • consider the utility in distinguishing syndromes associated with intellectual disability, in terms of: <ul style="list-style-type: none"> • planning • treatment • aetiology and/or mechanism • recognise the clinical features of common neurogenetic syndromes, including neurofibromatosis and tuberous sclerosis. • recognise the clinical features of common non-genetic syndromes, including Sturge-Weber syndrome and fetal alcohol syndrome disorder (FAS)/(FASD) • outline classifications of genetic syndromes • correlate with behavioural phenotypes (and recognition) • acknowledge individual differences within and between syndromes, including developmental trajectories • explain why multiple phenotypes may have the same genotype, e.g. 22q11.2. 	

DOMAIN 4	MANAGEMENT
Theme 4.1	Therapeutics in neurology
Learning objective 4.1.1	Select and use appropriate therapeutics for the management of neurological diseases

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the principles of rational use of therapeutics, including:
 - monitoring of levels
 - basic pharmacokinetics, metabolism and drug interactions
 - the potential role of pharmacogenomics
- identify common classes of neurological medications, including their:
 - indications
 - usage principles
 - monitoring requirements
 - common adverse effects
 - significant drug interactions
- describe the basic principles of safe and rational drug use
- describe usage principles and indications for specific drugs used in the management of chronic neurological diseases, including:
 - epilepsy
 - immune disorders and immune suppression
 - pain modification
 - stroke and vascular disease
 - movement disorders
 - headache
- identify devices commonly used in the management of neurological diseases, e.g. stimulators
- outline the purpose and importance of therapeutic trials, e.g. multicentre trials in neuro-oncology.

DOMAIN 4	MANAGEMENT
Theme 4.2	Neurological emergencies
Learning objective 4.2.1	Diagnose and manage neurological emergencies
Neurological emergencies include:	
<ul style="list-style-type: none"> • status epilepticus • acute stroke • coma/altered conscious state • rapid onset weakness, e.g. Guillain–Barré syndrome, myasthenia gravis • spinal cord syndromes • meningoen­cephalitis • encephalopathy • traumatic brain injury, e.g. non-accidental injury. 	
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • describe the rapid clinical assessment of a patient with a neurological emergency • discuss the rational and appropriate use of investigations to diagnose and manage neurological emergencies • describe the management of the specific neurological emergencies listed, including the: <ul style="list-style-type: none"> • clinical approach • role of investigations • therapeutic and management options • describe the role of an intensive care unit and identify when to refer. 	

DOMAIN 4	MANAGEMENT
Theme 4.3	Neurorehabilitation
Learning objective 4.3.1	Describe principles of recovery from neurological illness and formulate a prognosis

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- discuss the principles of recovery from neurological illness and/or injury, including the natural history and neuronal plasticity
- formulate a prognosis, based on understanding of natural history and clinical assessment of markers of recovery in an acute setting
- describe the principles of neurorehabilitation, including:
 - indications for referral
 - goals
 - techniques
 - realistic outcomes
- describe the roles and indications for referral to allied health professionals involved in rehabilitation
- describe the indications for referral to orthopaedic and/or general surgeons in children with neurological disease
- contribute as a member of a multidisciplinary team.

DOMAIN 4	MANAGEMENT
Theme 4.4	Neurological manifestations of psychological disease
Learning objective 4.4.1	Recognise psychological illness in patients and identify indications for appropriate referral

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the clinical presentations of patients with psychological illness
- discuss the manifestation of psychiatric illness as somatic complaints, e.g. weakness due to conversion disorder, non-epileptic seizures
- investigate and manage patients with psychological illness
- discuss the psychological aspects of illnesses and their management, e.g. depression, anxiety, psychosis, conversion
- describe the roles of child psychiatrists and child psychologists
- describe the indications for referral to psychology services.

DOMAIN 4	MANAGEMENT
Theme 4.5	Neurosurgery and interventional radiology
Learning objective 4.5.1	Describe the indications for, and complications of, common neurosurgical and vascular surgery procedures

Common surgical procedures in neurology include:

- brain tumour surgery
- spinal surgery
- CSF shunting, CSF diversion procedures and neuroendoscopy
- craniectomy and other procedures for the treatment of cranial malformations
- emergency surgical procedures for the management of trauma, e.g. evacuation of intracranial haematoma
- neurovascular surgery, e.g. aneurysm clipping (and coiling), surgical procedures for the treatment of Moya-Moya
- epilepsy surgery.

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- describe the indications for referral to a neurosurgeon and/or interventional radiologist
- describe common neurosurgical and interventional radiology procedures
- describe the potential complications of neurosurgical and interventional radiology procedures
- collaborate with neurosurgeons and interventional radiologists.

DOMAIN 4	MANAGEMENT
Theme 4.6	Adolescent neurological disease
Learning objective 4.6.1	Manage the effects of neurological disease in adolescents

Knowledge and skills

By the completion of Advanced Training, a new Fellow should be able to:

- recognise and diagnose neurological conditions presenting in adolescence
- describe principles of normal adolescent development, and anticipate the impact of chronic illness
- respect patients' privacy and autonomy
- elicit the history of the psychosocial health of the patient, including drugs and alcohol
- identify mental health issues and refer appropriately
- assess and manage problems of patients' adherence to management
- manage an adolescent with a complex chronic illness, in a multidisciplinary team.

DOMAIN 4	MANAGEMENT
Theme 4.7	Transition to adult care
Learning objectives 4.7.1	Manage the effects of patient transfer from paediatric to adult care
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • encourage a process for adolescents to learn the skills of independence and self-management from their early teens, and provide adequate planning for the transition to adult care • communicate with adolescents and their caregivers regarding the transition to adult care • describe the components of a successful transition process • support young adults and caregivers during the transition process • identify any local services available, and advocate for the provision of services within the paediatric and adult sector to facilitate the development of transition services. 	

DOMAIN 4	MANAGEMENT
Theme 4.8	Lifestyle implications of neurological disease
Learning objective 4.8.1	Address and manage the lifestyle implications of neurological disease
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • identify state/national driving regulations for neurological conditions, and provide guidance in relation to an individual's fitness to drive • assess a patient's capacity and competence to make informed decisions regarding their treatment options • describe the medical and legal implications of a patient's ability to make informed decisions • provide support with respect to education • identify community services for children with a disability or other chronic neurological condition • describe the effects of chronic illness on families. 	

DOMAIN 4	MANAGEMENT
Theme 4.9	Issues at the end of life
Learning objective 4.9.1	Treat and manage patients with progressive conditions
Knowledge and skills	
<p>By the completion of Advanced Training, a new Fellow should be able to:</p> <ul style="list-style-type: none"> • discuss the limitations of treatment in patients with progressive conditions • consult with the patient and/or caregivers to determine a management plan that prevents suffering at the end of life • manage the needs of patients at the end of life, including pain, anxiety, dyspnoea, hydration and nutrition • describe the principles of palliative care, and the indications for referral to a palliative care service • work collaboratively with palliative care teams • access and apply current legislation • describe the principles of clinical ethics • identify different cultural aspects of death and dying • explain the criteria and assessment of brain death. 	

Appendix

During their period of Advanced Training, paediatric neurology trainees should address all domains, themes and learning objectives as detailed in this curriculum. In addition, trainees should familiarise themselves with the following disorders:

- Central nervous system (CNS) tumours
- CNS inflammatory conditions
 - acute disseminated encephalomyelitis (ADEM)
 - chronic inflammatory demyelinating polyneuropathy (CIDP)
 - Guillain–Barré syndrome (GBS)
- CNS infections
- Neurometabolic conditions
- Neurocutaneous syndromes
- Neurological manifestations of non-accidental injury