Learning about Neurological Disorders (2015)

Recommendations for UK Medical Undergraduate Education
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# Summary

1. Medical students should learn about neurological disorders because they are common and can have important consequences for patients. These disorders (whether of brain, spinal cord, peripheral nervous system or muscle) account for up to one in eight consultations in general practice, one in five emergency medical hospital admissions and a high proportion of disability (particularly severe and progressive disability) in the population. Functional neurological symptoms (i.e. symptoms not caused by disease) are extremely common, accounting for up to a third of all neurological consultations, and we include these patients within the term “neurological disorders”. Neurological disorders are relevant not only to neurology and neurosurgery but also anaesthetics and intensive care, child health, emergency and trauma medicine, internal medicine, general practice, psychiatry and rehabilitation.

2. The ABN recommends that students should have sufficient understanding of basic neurosciences to support learning about neurological disorders and the principles of their diagnosis and management.

3. We recommend that students should seize the full range of opportunities presented in a medical curriculum to learn about neurological disorders. In general all students should have core learning opportunities for 4-5 whole time equivalent weeks in a neurospecialty setting. A multidisciplinary approach to learning should be encouraged and learning should be broadly linked to patient experiences, clinically relevant events and opportunities guided by neurologically trained staff.

4. We recommend that the new graduate doctor should have the knowledge and skills to:

   - obtain, interpret and present an accurate history relating to people with neurological symptoms
   - recognise what symptoms and signs may indicate neurological disorders
   - carry out, interpret and present an appropriate neurological examination (including that of the unconscious patient)
• formulate a differential diagnosis
• implement appropriate monitoring, observation and early treatment in emergency situations
• explain the nature of and indications (and contraindications) for common investigations of neurological disorders and the significance of results
• explain the roles of other medical and paramedical specialties as part of the multidisciplinary team in the management of neurological disorders

5. We recommend that the new graduate doctor should be able to demonstrate relevant knowledge of:
• basic undergraduate neurosciences to support understanding of clinical practice and to provide opportunities to expand learning and research
• common symptoms indicative of neurological disorders
• common and/or important neurological disorders and their management
• common emergency neurological problems and their management
• common investigations and their role in neurological disorders
• principles underlying the management of neurological disability including an understanding of the relationship between impairments, activity limitations and participation, and quality of life

6. We recommend that each medical school has an implementation strategy for learning about and assessing neurological disorders with a neurospecialty clinical lead to highlight and coordinate local learning opportunities in collaboration with other specialties and basic neuroscience disciplines.
2 Introduction

In 1994 the Association of British Neurologists set out its views on undergraduate medical education and neurology.¹ This document was revised in 2006.² The central message was the need for undergraduate curricula to focus strictly on material directly relevant to newly qualified doctors as recommended by the General Medical Council and to adjust the balance of basic neuroscience to better serve clinical need. The impetus for further revision springs from awareness of the wide range of doctors who still lack knowledge and skills in clinical neurosciences, an awareness that students and trainees often lack confidence in this area, and recent audits which have identified poor aspects of acute neurological care.³ ⁴

In this document we use the term ”Neurological disorders” but we emphasise the importance of an inclusive approach rather than a specialty based understanding of these disorders. Doctors in many specialties apart from the neurospecialties (neurology, paediatric neurology, neurosurgery, neurophysiology, neurorehabilitation, neuropathology and psychiatry) have to diagnose and manage people with neurological disorders on a daily basis.

Several issues dictate the importance of effective learning about neurological disorders as a core undergraduate activity.

1. Neurological symptoms are extremely common and account for about one in eight consultations in general practice and about 20% of acute medical emergency admissions. The prevalence of neurological disability in the community is high (about 2%) and often severe and/or progressive.⁵ The last two decades have seen major expansions in understanding of the genetics, structure, function and reparative capacity of the nervous system. Evidence-based treatments for neurological disorders have proliferated (e.g. stroke, subarachnoid haemorrhage, traumatic brain and spinal injury, epilepsy, multiple

sclerosis, Parkinson’s disease, dementia and neuromuscular diseases). Some of these conditions and/or their treatments carry risks (e.g. stroke and thrombolysis) so competence in acute neurological assessment is vital for safe care. There is also a substantial evidence base for the role of rehabilitation, best exemplified by the contribution of stroke and spinal injury units.

2. Surveys of UK\textsuperscript{6} \textsuperscript{7} undergraduate medical schools have showed wide variation in the provision of clinical neurospecialty time provided to students, ranging from none to about 6 weeks: this compares to recommendations from Europe\textsuperscript{8} of 5 weeks and the US\textsuperscript{9} of 4 weeks. Medical students and junior doctors have reported a range of difficulties in acquiring relevant knowledge and skills.\textsuperscript{10} \textsuperscript{11} \textsuperscript{12} \textsuperscript{13} There are probably several causes for the latter including curriculum overload, increasing pressure on student and teacher time and impediments to student access to patients with neurological disorders. Whilst there is an increasing body of evidence relating to educational interventions in neurology, so far the evidence base for changes in patient outcomes as a result is more limited.\textsuperscript{14}

3. Postgraduate training is in a further process of transformation with the proposals of Shape of Training (2014)\textsuperscript{15}. All students will require sufficient background knowledge and clinical skills in neurological

\textsuperscript{11} Ridgeway L et al. Preventing neurophobia in medical students, and so future doctors. Practical Neurology 2007;7:116-123.
\textsuperscript{13} Pakpoor et al. National survey of UK medical students on the perception of neurology. BMC Medical Education 2014;14:225 http://www.biomedcentral.com/1472-6920/14/225
\textsuperscript{15} Greenaway D et al. Shape of Training : securing the future of excellent patient care http://www.shapeoftraining.co.uk/
disorders to be able to develop as a “generalist”, with a special emphasis on managing older patients with their concomitant high prevalence of brain disorders and multiple comorbidities or dealing with medical emergencies involving neurological disorders. However neither the GMC document “Tomorrow’s Doctors”\textsuperscript{16} nor the Foundation Programme Curriculum\textsuperscript{17} provide explicit guidance on coverage and assessment of neurological disorders.

This document, like its 2006 predecessor, reaffirms and modifies core learning objectives (combining essential neurology, neurosurgery and neuro-rehabilitation). The philosophy remains:

- to highlight common and important disorders of the nervous system
- to emphasise that sufficient knowledge and understanding of the basic neurosciences are fundamental to understanding disorders of the nervous system, to life-long learning and to research into improving outcomes for patients
- to emphasise opportunities for learning about clinical and basic neuroscience in greater depth beyond core material for some students
- to leave the details of how the curriculum should be delivered to individual medical schools, guided and evaluated by the GMC
- to leave aside generic issues of medical education except where they have special reference to neurological disorders

We recognise the important links and overlaps between the clinical specialties of Psychological Medicine/Psychiatry and Neurology in relation to both scientific understanding and clinical issues (including Learning Disability) but do not attempt in this document to write a unitary curriculum. Likewise, a neurodevelopmental assessment can be paramount when assessing a child but is beyond the scope of this document, which is primarily targeted at learning about adult neurological disorders.


\textsuperscript{17} Foundation Programme \url{http://www.foundationprogramme.nhs.uk/pages/home/curriculum-and-assessment/curriculum2012} (accessed July 30th 2014)
3 Principles behind Core Curriculum

The curriculum should allow the development of knowledge and skills that a newly qualified doctor needs on entry to the Foundation Programme. However, learning about neurological disorders may stimulate a deeper academic interest for some students who may wish to extend understanding through intercalated degree programmes and student selected learning components (SSCs) in basic or clinical neuroscience departments.

Students can learn about neurological disorders through a wide range of opportunities throughout the curriculum and not just in a series of specified “blocks” or weeks devoted to “Neuroscience”. Thus people with neurological disorders are likely to be seen in general practice attachments, a range of hospital based attachments (Internal Medicine, Paediatrics, Old age Medicine, Psychiatry, A&E etc.) as well as experienced through specific neuroscience attachments, SSCs, project work and lectures. Every effort should be made to ensure that learning opportunities are progressive through the curriculum and at a level that the student can assimilate. Learning must be clinically focused, relevant and patient-based, avoiding the pitfalls of an excessively detailed approach to neuro-anatomy and the neurological examination; by contrast, the vitality of the ability to take a history cannot be overemphasized. The joint engagement of curricula organisers from clinical neurospecialties, other specialties that treat neurological disorders and basic neurosciences is integral to this endeavour.

The curriculum must emphasise the central role of patients and their journeys with neurological disorders, as well as the roles of family, social environment and medical and health professionals. In addition, the curriculum should be informed by an understanding of the public health and epidemiological aspects of neurological disorders with emphasis on the common and/or important conditions.

The curriculum should assume the principles laid out in the GMC document “Tomorrow’s Doctors” and “Principles of Good Medical Education and Training”.\(^\text{18}\) We have linked the key learning outcomes to relevant paragraph numbers in “Tomorrow’s Doctors” (GMC 2009) under Outcomes 1 and 2: these refer to the level required of the newly graduating doctor and

thus refer to “the graduate”. We have, where available, considered related recommendations for UK undergraduates from specialties with significant interest in neurological disorders in particular Geriatric Medicine\textsuperscript{19}, Psychiatry\textsuperscript{20} Ophthalmology\textsuperscript{21} and Rehabilitation Medicine.\textsuperscript{22} Recommendations for head, neck, spine and neuroanatomy\textsuperscript{23} are referred to in "Tomorrow’s Doctors (related documents)”. In respect of the core neurological examination we also took particular note of papers by Gelb et al\textsuperscript{7} and Moore & Chalk\textsuperscript{24}.

\textsuperscript{19} Recommended Curriculum in Geriatric Medicine for Medical Undergraduates 2013. British Geriatric Society Education and Training Committee. \url{http://www.bgs.org.uk/index.php/medicalstudents/top/959-undergraduatecurriculum8} (accessed 29/7/14)
\textsuperscript{20} Royal College of Psychiatry Core Curriculum 2011. \url{http://www.rcpsych.ac.uk/workinpsychiatry/faculties/academic/undergraduateteaching/curriculum.aspx} (accessed 30/7/14)
\textsuperscript{21} Royal College of Ophthalmologists. \url{http://www.rcophth.ac.uk/page.asp?section=321&sectionTitle=Undergraduate+Ophthalmology} (accessed 12/5/14)
\textsuperscript{22} British Soc of Rehab Med – Undergraduate Medical Education in Rehabilitation pub June 2006
4 Five Parts of the Core Curriculum

This section sets out suggested learning outcomes under the following headings:

- Scientific basis
- Clinical skills and understanding
- Core clinical knowledge
- Investigation and management
- Neurological disability

4.1 Scientific basis

Scientific background knowledge should be integrated with clinically relevant situations, centred around patients and viewed as a means to understand the diagnosis and management of neurological disorders. The dynamic changes in the nervous system and its susceptibility to injury throughout life indicate that processes of development and ageing should be included.

*Learning outcomes (Tomorrow’s Doctors (TD) para 8)*

The graduate should be able to:

- Describe the essential anatomy and functions of the brain with particular reference to consciousness, language and other cognitive functions, behaviour and mood, vision and hearing, breathing and swallowing, movement, sensation, autonomic control and pain
- Describe the processes and pathways which lead to voluntary muscle movement starting in the motor cortex including the corticobulbar and corticospinal pathways (upper motor neurone), the lower motor neurone, neuromuscular junction and muscle: the role of extrapyramidal systems including basal ganglia and cerebellum: the
control of posture and reflex movement

- Describe the structure and function of the spinal cord with particular reference to movement, sensation and autonomic control (including sphincters, blood pressure and sexual function)

- Describe the cranial nerves, major nerve roots and main peripheral nerves (including major muscle innervations, dermatomal and sensory nerve distributions)

- Describe clinically relevant features of the skull and the vertebral column with particular attention to the anatomical relations of the cranial nerves, spinal cord and nerve roots to bony and soft tissue structures

- Explain the anatomical and physiological principles underlying the blood supply to and drainage from the brain and spinal cord

- Explain the broad pharmacological principles as applied to the brain and peripheral nervous system

- Explain the principles regulating intracranial pressure, cerebrospinal fluid formation and its constituents, circulatory pathways and reabsorption

- Describe the clinically relevant aspects of neural development and ageing processes

- Describe the broad processes – pathological, physiological, genetic, metabolic, immunological – which result in disordered neural function

- Describe the relevant public health issues and epidemiology

4.2 Clinical skills and understanding

Learning outcomes (TD paras 8, 13, 19)

The graduate should be able to:

- Obtain, record and communicate (in writing and verbally) an accurate history; explain why it may indicate a neurological disorder; and recognise when to extend and amplify it appropriately by additional history from a witness or carer, for example in the context of loss of consciousness, confusional states, cognitive or behavioural
impairment, or language barriers

- Elicit questions from patients relating to their understanding of their condition and treatment options. Students should also recognise the concept of capacity, which is often highly relevant in neurological disorders.

- Perform, record, interpret and communicate (in writing and verbally) a basic neurological examination relevant to the clinical problem as identified from the history (see appendix).

- Use the history (especially the distribution of symptoms and their time course) and examination findings to suggest an anatomical or system localisation for a neurological problem and a relevant differential diagnosis.

- Recommend appropriate initial investigations and relevant observations, monitoring and early treatment in certain emergency situations.

- Be able to interpret basic neurological investigations in the light of the clinical findings to refine the diagnosis.

- Explain the implications of diagnosing a neurological disorder for patients and their families particularly in the context of progressive and/or degenerative disorders.

- Explain the importance of effective and empathetic communication of the diagnosis, the implications for the individuals within their social framework and relevant ethical considerations, especially those relating to consent and management.

### 4.3 Core clinical knowledge

This is described under overlapping headings.

A. *Major symptoms relevant to neurological disorders*

*Learning outcomes  (TD 8-19)*

The graduate should be able to evaluate through history and examination a patient presenting with:

- Headache
• Transient loss of consciousness/awareness
• Dizziness & vertigo (overlap with ENT)
• Weakness
• Gait disturbance including falls, unsteadiness and disorders of movement
• Altered sensation & pain
• Acute onset focal symptoms
• Coma and brain death (overlap with Anaesthetics & ITU)
• Disordered cognition (including delirium), mood and behaviour (overlap with Psychiatry)
• Visual problems including sudden and gradual loss of vision and double vision (overlap with Ophthalmology)
• Speech problems
• Breathing and swallowing problems (overlap with Respiratory & GI Med)
• Incontinence (overlap with Urology)
• Delayed developmental milestones (overlap with Child Health and Psychiatry – Learning Disability)

B. Common and/or important conditions

Learning outcomes  (TD 8-19)

The graduate should be able to describe and apply basic principles of diagnosis, investigation, management and (where appropriate) prevention in:

• The primary headache syndromes (e.g. migraine, tension type headaches) and important secondary headache syndromes (e.g. subarachnoid haemorrhage)
• Epilepsy (including status epilepticus)
• Cerebrovascular disease including stroke, transient ischaemic attack and subarachnoid haemorrhage
• Raised intracranial pressure and hydrocephalus
• Syncope, coma, brain death
• Traumatic brain and head injury (including common complications)
• Dementia
• Infections of the nervous system
• Tumours of the nervous system
• Parkinsonism and movement disorders
• Multiple sclerosis
• Spinal cord and root dysfunction (including spinal cord compression)
• Peripheral neuropathies (including Guillain-Barré syndrome & common mononeuropathies)
• Neuromuscular disorders (including motor neurone disease, myasthenia gravis and myopathy)
• Functional disorders (i.e. neurological symptoms which are not explained by disease, sometimes referred to as conversion, psychogenic, non-organic or somatic symptoms)

C. Emergency neurology

Learning outcomes (TD 13-19)

The graduate should be able to explain and undertake an initial assessment (including differential diagnosis, early investigation, management, monitoring and referral) of the following conditions:

• Sudden loss of consciousness and coma
• Acute stroke
• Traumatic brain and head injury
• Epileptic seizures
• Acute confusional state (delirium)
• Acute new headache
• Suspected spinal cord and cauda equina compression
• Acute generalised weakness (e.g. Guillain Barré syndrome)

4.4 Investigation and management

A. Investigation

Learning outcomes (TD 14, 18, 19)

In respect of the investigations listed below the graduate should be able to:

• recognise the need for the investigation and any contraindications
• know who undertakes the investigation and how it is requested
• recognise their limits in explaining the procedure to the patient, and obtaining informed consent
• be able to act appropriately on reports and results

Relevant neurological investigations

• Blood/urine investigations especially in emergency neurology (4.3.c)
• CT and MR imaging of the nervous system
• Lumbar puncture

The graduate should also be able to explain the roles and principles of the following investigations and how they are performed:

• Electroencephalography (EEG)
• Electromyography and nerve conduction studies
• Genetic (DNA) investigations
• Angiography (non-invasive and invasive)
• Brain, muscle or nerve biopsy

B. Observation and ongoing monitoring

Learning outcomes (TD 14, 16)

The graduate should be able to explain the importance of observing change
in the status of patients with disorders of the nervous system particularly in relation to coma, confusional state or weakness.

The graduate should be able to:

- Evaluate and report a patient’s Glasgow Coma Scale score
- Carry out routine neurological and general observations
- Perform a basic respiratory (including spirometry and blood gases) and swallowing evaluation in the paralysed/weak patient
- Explain the role of medical, nursing staff and allied health professionals
- Explain the role of specific environments (e.g. ITU) to support this care
- Consider the issues of communication involved in relation to breaking neurological bad news, ethical issues in neurology and end-of-life care (e.g. motor neurone disease, persistent vegetative state)

B. Treatment

Many neurological disorders have specific treatments and all such disorders need to be managed

Learning outcomes (TD 8-19)

The graduate should be able to:

- Explain the principles of treatment for common specific pharmacological interventions (e.g. migraine, epilepsy, meningitis, stroke)
- Explain the principles of treatment for specific neurosurgical or radiological interventions (e.g. for intracranial mass or aneurysm)
- Explain the principles of treatment for supportive treatments including management of ventilation, nutrition/feeding, bladder & bowel, circulation and skin management in the unconscious or paralysed patient
- Describe the contribution of nurses, dieticians, speech & language therapists, physiotherapists and occupational therapists in the acute care of the unconscious or disabled patient
4.5 Neurological disability

Learning outcomes (TD 8-19)

The graduate should be able to:

- Explain how neurological disorders contribute to impairments, limitation of activities and restriction of participation in the community including:
  1. the contribution of neurodevelopmental and learning disorders
  2. the impact of injury and acquired neurological disease (including the vegetative state) especially in younger age groups
  3. the impact of stroke and dementia especially in the older population

- Explain the role of measurement and of common assessment tools (e.g. Barthel index, quality of life indices) in evaluating and monitoring impairment, activity and participation in neurological disorders

- Explain the importance of a team-based approach (including social services) to people with long term neurological disorders whether the result of a single event (e.g. stroke, head injury, Guillain-Barré syndrome) or of progressive disease (e.g. dementia, Parkinson’s disease, multiple sclerosis, motor neurone disease or muscular dystrophy).

- Explain the role of rehabilitation in the management of the patient following an acute neurological disorder (e.g. stroke or head injury) or in the maintenance of ability in chronic neurological disease (e.g. multiple sclerosis)
5 Opportunities and Implementation

Opportunities

- A medical curriculum presents many opportunities to learn about neurological disorders and to interact with people who have these disorders. Close liaison between preclinical and clinical teachers is needed in organising curricula to maximise opportunities and to make students aware of them.

- Whether a problem-based learning or more traditional approach is used, people with neurological disorders may be encountered by students as hospital inpatients, on stroke or rehabilitation units, as outpatients, in day units, in A&E or ITU, in GP surgeries, on home visits, at clinical demonstrations or on elective attachments. All present opportunities for learning especially when guidance from neurologically trained staff is available.

- In keeping with these principles a broad range of medical and non-medical disciplines can contribute to learning opportunities for students through various components of the curriculum provided that there are agreed aims and objectives. Apart from non clinical neuroscientists these include neurologists, neurosurgeons, neuropathologists, neurophysiologists, neuroradiologists, and health care professionals in acute medicine, ophthalmology, ENT, A&E, rehabilitation, elderly care and general internal medicine, child health, psychiatry and primary care. We emphasise the central importance of neurologists in teaching about neurological disorders.

- Students can be greatly assisted by a clinical attachment within a neurospecialty, particularly to enhance history taking and clinical examination skills. In keeping with US and European recommendations\(^6\,7\), the ABN recommend a minimum period of 4-5 weeks full time equivalent for all clinical undergraduates.

- The student should be encouraged to use and collate these experiences as part of a portfolio of knowledge and experience.

Implementation

- Learning to take a neurological history and carry out a neurological
examination must be supervised by competent, neurologically trained doctors.

• Total curricular provision and opportunities should reflect the importance of neurological disorders as reflected by the facts that up to one in eight GP consultations, 20% of acute medical emergency admissions and a high proportion of community disability will have a neurological cause.

• Medical Schools and the NHS should work together to integrate a relevant and achievable learning and assessment process for neurological disorders and make appropriate crosslinks with other relevant disciplines. Identification of a specific clinical lead with expertise in neurological disorders (academic staff or NHS with appropriate honorary academic appointment) in the planning process is essential.

• Where medical schools have two courses such as a traditional five year course and a graduate entry programme, we suggest that the syllabus and learning objectives are as similar as possible even if the learning and assessment methods differ.

Assessment

The assessment of core knowledge and skills related to neurological disorders should be integral to all curricula. Students should be guided to undertake self-evaluation of their knowledge and skills as part of their own reflective development plan. Given the prevalence of neurological disorders in medical practice, all students should anticipate formative and summative evaluations of their neuroscience knowledge and clinical skills during their training.

Skills’ assessments should concentrate on students’ ability to take and report a history, elicit and report appropriate signs, draw conclusions and understand aspects of early management of common and important disorders. Knowledge-based assessment has an important role in confirming the core knowledge, stimulating learning and in making explicit the standards expected and required for safe clinical practice.
Appendix

Core clinical examination of the nervous system for medical undergraduates

The neurological examination needs to be focussed and will be dictated by the history, the clinical urgency and setting. The primary purpose is to identify the likely location and cause of the problem (where is and what is the lesion?).

Learning Outcomes (TD 8, 13,14)
The graduate should be able to:

• evaluate a patient under the headings 1-8 below
• make concise, accurate verbal and written reports of the findings
• interpret abnormalities found appropriately in the context of the history

1. Level of consciousness
Eye opening, verbalisation and motor elements of the Glasgow Coma Scale – role of GCS: respiratory function and pupil responses (see also below)

2. Higher function
General observation when taking history. Orientation, attention, memory, language function, visuospatial orientation, ability to recognise objects and people and perform movements, mood and behaviour (awareness of recognised standard scales used).

Note: some people have significant learning disabilities which may make evaluation more difficult (overlap with Psychiatry) and neurodevelopmental evaluation is an important aspect in the assessment of neonates, infants and children (overlap with Child Health).

3. Coverings of the nervous system
The face (including eyes, orbits, nose, ears & mouth), head and neck (e.g. head size and shape, evidence of trauma, scars, shunts, arteritis, shingles): requirement to make safe and refer before examination where spinal trauma possible: features of meningism, spinal deformity and spinal tenderness

4. Gait

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General observation when sitting, standing and walking. Identification of hemiparetic, parkinsonian and ataxic gaits: obvious abnormalities of posture and tone, abnormal movements. Romberg’s test

5. Cranial nerves (CRN)

6. Motor system

7. Sensory system
   Light touch & pin prick sensation (distribution of a sensory abnormality in relation to nerve, root, spinal level), proprioception, vibration sense: awareness of inattention and neglect

8 Autonomic system
   Awareness of postural control of blood pressure – lying & standing blood pressure: and awareness of impaired bladder, bowel and sexual function in spinal, cauda equina and peripheral nerve lesions
This report is a revision of the 2006 version compiled on behalf of the Association of British Neurologists Council by the Training & Education Committee (TEC).

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