



The Oxford Clinical Neuroimaging Course Programme

This self-paced online Course covers around 50 hours of **practical aspects of adult brain MRI in the clinical setting** through a combination of lectures, 3D interactive materials, tutorials and quizzes. The **course is targeted at clinical trainees and other healthcare** professionals keen to develop their understanding of:

1. Functionally-relevant surface anatomy and white matter bundles in pathological brains
2. How imaging sequences are interpreted to reach differential diagnoses in common neurological conditions
3. Methods to acquire and analyse advanced MR images for clinical monitoring and decision-making
4. Main interventional uses of MRI, including tractography-guided, endoscopic, ultrasound-guided and awake surgery
5. How research knowledge in brain imaging has been (or is being) translated into clinical practice for psychiatry, dementia and neurodegeneration

The course includes 5 modules that can be taken independently or together for CPD credits.

Welcome Overview

- Introduction to using the virtual learning platform “Canvas”
- Instructions on installing FSL on your computer for optional data analysis tutorials
- An ‘Introduction to Unix’
- Minimum course content required for continuing professional development (CPD)/continued medical education credits.

Section A: Brain Function, Cortical and Subcortical Brain Anatomy (Adult)

Overview of anatomy and function of the brain from the perspective of skills that are generally foremost in the clinician’s mind when it comes to preserving functions during treatment: language and movement

Lectures:

- Identifying Gyral Landmarks in MRI
- Identifying medial temporal lobe anatomy on MRI
- Fundamentals of Anatomy for Clinical Neuroradiology
- Neuropsychology in the Era of Imaging
- Linking Imaging and Cognition in Surgical Populations
- Introduction to Brain White Matter Fibre Tracts
- Linking MRI to Tissue Microstructure
- Introduction to the architecture of the pain system

Tutorials: *5 interactive 3D cortical surface models, 2 interactive 3D white matter tract models and illustrated white matter tractography examples, plus clinical cases to apply this learning*

Section B: Interpreting Clinical MRI

Diagnostic interpretation in a range of common and less common conditions, focussing on those which can look alike and what to look for to reach a differential neuroradiological diagnosis

Lectures:

- Basic Concepts of MRI for neuroimaging
- Diagnostic Neuroradiology in Inflammatory and Demyelinating Conditions
- Diffusion Weighted MRI in Clinical Neuroimaging
- Diagnostic Imaging in Neuro-Oncology
- Diagnostic MRI in Epilepsy
- Good and Bad Vibrations (MR Audiometry and Elastography)
- Clinical Applications of Ultra-high field 7T MRI
- Doing more with less: the value of low field MRI and CT

Tutorial: *Expert neuroradiologists present and interpret clinical cases*

Section C: Advanced MRI in the Clinic

The third module moves to more advanced types of MRI that generally involve some image processing (rather than visual interpretation), and their main clinical uses.

Lectures:

- Structural and Longitudinal Imaging Analysis
- Diffusion MRI in the Brain
- Introduction to MRI and fMRI – theory
- Clinical Applications of fMRI
- Arterial Spin Labelling for Non-Contrast Perfusion Imaging and Angiography
- Magnetic Resonance Spectroscopy
- Clinical Cerebro-Vascular Reactivity Mapping (CVRM)
- Fast Functional and Diffusion MRI (SMS)
- Computational Neuroimaging (AI) in Epilepsy

Tutorials: *Guided analysis tutorials using the free software FSL to analyse provided data*

- Hippocampal Volume Analysis
- Single Subject Task fMRI for Surgical Planning
- White Matter Hyperintensity Segmentation using BIANCA
- Perfusion from ASL data
- Segmentation Based on Structural Connectivity

Section D: Image Guided Intervention

This module focusses on demonstrating MRI as it is used in daily treatment practice, with extensive clinical case presentations discussing advantages and limitations of common image-guided techniques.

Lectures:

- Imaging in Deep Brain Stimulation
- Awake Intraoperative Testing
- Endoscope-assisted Glioma Surgery
- Tractography-guided Glioma Surgery
- Intraoperative Ultrasound for Tumour Surgery (Adult)
- Intraoperative Ultrasound in Paediatric Neurosurgery
- Imaging in Traumatic Brain Injury
- Interventional Neuroradiology

Section E: Brain Imaging in Psychiatry and Neurodegeneration

This module covers how research knowledge has been (or is being) translated into clinical practice for psychiatry, dementia and neurodegeneration.

Lectures:

- Clinical MRI in Dementia
- Standardised Brain MRI Acquisition and Reporting in Dementia Clinical Practice
- Introduction to Molecular Imaging (PET/SPECT)
- The Use of Neuroimaging in Drug Development for Depression and Anxiety
- Clinical Magnetic Resonance Imaging in First Episode Psychosis

Tutorial: *Applying standardised MRI reporting for dementia*

Sign up for the course via the University of Oxford shop:

<https://www.oxforduniversitystores.co.uk/product-catalogue/nuffield-department-of-clinical-neurosciences-fmrib/online-courses/oxford-clinical-neuroimaging-course>

For questions on the course programme, please do contact us: win-clinmricourse@ndcn.ox.ac.uk