

# MEDTEC SCHOOL

# Course: Neurosciences and mental health

Year (1<sup>st</sup>-2<sup>nd</sup>-3<sup>rd</sup>-4<sup>th</sup>-5<sup>th</sup>-6<sup>th</sup>): 5 th

Period (1<sup>st</sup>-2<sup>nd</sup> semester annual): \_1 st semester

Credits: \_9

# Objectives

Knowledge in Clinical Neuroscience is expanding fast. This interdisciplinary course will bridge different subspecialties into an integrated and comprehensive program. By completion of the program, students will have adequate knowledge of the main neurological and psychiatric diseases, their pathophysiology and treatment.

The Neurology module will address the approach to a patient with symptoms of neurological impairment including symptoms of cognitive, motor, sensory and autonomic impairment, which indicate involvement of brain, spinal cord, nerves or muscles. The approach is symptom-based and patient-centered. The students will learn how a physician should investigate these symptoms and assess the patient's neurological status.

The Neuroradiology module reviews the role diagnostic and interventional radiology applied to neurological diseases. This module instructs on some of the basic aspects of neurologic imaging, including anatomy of the brain and spinal cord as shown by CT and MRI, and diagnosis of diseases and abnormalities of the central nervous system.

The Neurosurgery module provides an overview of the surgical management of brain and spine neurological diseases. It integrates with diagnostic procedures and technological advancements with a special focus on intraoperative devices

The Mental Health module will let students become aware of the many interactions between mental and medical disorders and learn how to differentiate normality from pathology in mental health, to recognize the organizing principles of each mental disorders with their key psychopathological features and neuroscientific basis, make a differential diagnosis, choose among treatment options and understand the many links between mental and somatic disorder, all in the light of personalized medicine approach.

# Prerequisites

The course is dedicated to 5<sup>th</sup> year medical students who already master the fundamental knowledge required to approach the integrated field of Clinical Neuroscience. This includes the



neruanatomy and neurophysiology teaching . Neuroanatomy (1st year) frontal lessons have been given by the same teachers as per neurosurgery in this course

# Contents

# (Albanese/Lalli)

Learning goals: Understand the relationship between clinical neurology and internal medicine; Understand the relationship between neurology, psychiatry and neuroscience; Understand the clinical methodology in neurology; Describe the initial clinical approach to the patient with neurological problems; Describe the main categories of neurological diseases and their frequency.

# (Nobile-Orazio/Doneddu)

Learning goals: Describe the symptoms due to impairment of cranial nerve; Learn the neurological examination of patients with cranial nerve impairment; Learn the main diseases causing cranial nerve impairment.

# (Nobile-Orazio/Doneddu)

Learning goals: Describe the symptoms of motor and sensory pathways impairment; Describe the clinical assessment of motor impairment; Describe the clinical assessment of sensory impairment; Describe the symptoms due to cerebellar dysfunction; Describe the symptoms due to meningeal involvement; Describe the clinical assessment of cerebellar dysfunction and meningeal involvement.

# (Albanese/Lalli)

Learning goals: Revise the macroscopic features of the brainstem; Revise the internal organization of the brainstem: tegmentum and base, position of nuclei and pathways; Revise the organization of the blood supply to the brainstem.

(Albanese/Lalli)

Learning goals: Understand transient and permanent neurological syndromes; Understand the anatomical-clinical syndromes of the brain; Understand the anatomical-clinical syndromes of the spinal cord.

# (Albanese/Lalli)

Learning goals: Recognize the clinical presentations of parkinsonian syndromes; Learn diagnostic

# (Nobile-Orazio/Doneddu)

Learning goals: Review excitatory/inhibitory balance and the pathogenesis of seizures and epilepsy; Review genetic and environmental causes of neuronal suffering and neurodegenerative disorders; Review calcium overload (excitotoxicity), ROS and oxidative damage, mitochondrial derangement



and mitophagy, UPR, proteasome impairment; Review non-cell-autonomous factors (microglia, astroglia, neural stem cells).

#### (Nobile-Orazio/Doneddu)

Learning goals: Describe the clinical presentation of a patient with acute loss of consciousness; Describe the main causes of acute loss of consciousness; Recognize the main seizure types, Learn what are the main forms and causes of epilepsy; Learn how to treat patients with epilepsy; Learn how to manage and treat patients with syncope.

Priority Presenting Problems Portfolio: Seizure, Loss of Consciousness

(Nobile Orazio/Doneddu)

Review the etiopathogenesis of: Parkinson, Huntington, Alzheimer, Amyotrophic Lateral Sclerosis, Multiple Sclerosis.

(Albanese/Lalli)

Learning goals: Describe the varied clinical presentations of a patient with cognitive impairment;



This is a flipped class activity the students will discuss this topic after having reviewed: the activating reticular ascending aminergic pathways and their roles in affecting emotional and cognitive processing, the sensory-motor, motivational, learning and executive circuits that control motor and cognitive behavior

#### (Marcheselli)

Learning goals: Describe the different clinical presentations of a patient with stroke; Review the main stroke syndromes; Recognize transient ischemic attacks; Describe the main causes leading to stroke.

Priority Presenting Problems Portfolio: Stroke

(Marcheselli)

Learning goals: Describe the principal complication of stroke; Describe the prognosis of a patients with stroke; Describe the therapeutic approach to a patient with stroke; Describe the therapy in the acute phase of stroke; Describe the secondary prevention o stroke.

#### (Politi)

Learning goals: Learn to recognize an acute ischemic stroke on CT and MRI images; Learn timing and indication of the different neuroimaging modalities in the management of a patient with acute ischemic stroke; Gain familiarity with CT angiography. Learn to recognize normal vasculature and vessel occlusions; Understand the differences between cytotoxic and vasogenic edema; Understand the fundamentals of endovascular thrombectomy; Learn how to depict brain chronic ischemic lesions on CT and MRI.

#### (Albanese/Lalli)

Learning goals: Describe the clinical presentation of a patient with fainting and loss of consciousness; Describe the main causes of fainting and loss of consciousness; Learn what is the assessment of fainting and loss of consciousness; Learn how to treat patients with fainting and loss of consciousness; Learn how to manage and treat patients with fainting and loss of consciousness.

Priority Presenting Problems Portfolio: Transient Loss of Consciousness

(Nobile-Orazio/Doneddu)

Learning goals: Describe the clinical presentation of a patient with pain in the head; Learn what are the main causes of headache; Learn how to diagnose different types of headaches; Learn how to treat patients with headache.

Priority Presenting Problems Portfolio: Headache

(Servadei / Pessina)

Learning goals: Describe the physiology and pathophysiology of the mechanisms underlying ICP control; Learn causes of ICP dyscontrol; Learn the clinical presentation of ICP hypertension and hypotension; Learn how to treat patients with ICP disorders.

(Nobile-Orazio/Doneddu)



Learning goals: Describe the clinical presentation of a patient with fever and acute neurological impairment; Learn what is meningitis and encephalitis; Learn how to approach patient with suspected meningitis and encephalitis; Learn how to establish the diagnosis of patient with suspected meningitis and encephalitis; Learn how to treat patients with suspected meningitis and encephalitis; Learn how to treat patients with suspected meningitis and encephalitis; Learn how to treat patients with suspected meningitis and encephalitis; Learn how to treat patients with suspected meningitis and encephalitis; Learn how to treat patients with suspected meningitis and encephalitis.

Priority Presenting Problems Portfolio: Fever

# (Nobile-Orazio/Doneddu)

Learning goals: Describe the clinical presentation of a young patient with relapsing neurological deficits; Learn what is multiple sclerosis; Learn how to diagnose multiple sclerosis; Learn how to treat patients with multiple sclerosis.

#### (Albanese/Lalli)

Learning goals: Describe the different hyperkinetic movement disorders; Learn how to diagnose a patient with hyperkinetic movement disorder; Learn how to manage patients with hyperkinetic movement disorders; Describe ataxias; Learn how to diagnose a patient with cerebellar ataxia

#### (Albanese/Lalli)

Learning goals: Describe the clinical presentations of a patient with motor neuron disease; Learn how to assess a patient with progressive muscle weakness and atrophy; Learn how to diagnose amyotrophic lateral sclerosis; Learn how to manage the patient with amyotrophic lateral sclerosis.

# (Nobile-Orazio/Doneddu)

Learning goals: Describe the clinical presentation of a patient with rapidly progressive palsy; Learn how to evaluate a patient with rapidly progressive palsy; Learn the main causes of rapidly progressive palsy; Learn how to distinguish peripheral from central rapidly progressive palsy; Learn what is acute demyelinating inflammatory polyradiculoneuritis (Guillain-Barré syndrome); Learn what is acute myelitis; Learn how to diagnose and treat Guillain-Barré syndrome.

# (Nobile-Orazio/Doneddu)

Learning goals: Describe the clinical presentation of a patient with pain and weakness in the feet; Learn how to evaluate a patient with a suspected neuropathy; Learn what are the main causes of neuropathy; Learn how to distinguish the main causes of neuropathy; Learn what are the inflammatory neuropathies; Learn how to treat patients with neuropathyain and weakness / Dor**®** 0 5**£**(o)-**8**.g(u)*£* 



Learning goals: Describe the pathophysiology of intracranial tumor formation and expansion; Describe the clinical presentation of a patient with brain tumor; Learn how to diagnose brain tumors; Learn how to treat patients with brain tumors.

# (Politi)

Learning goals: Learn how to distinguish intra- and extra-parenchymal mass lesions; Gain familiarity with imaging features of low and high-grade primary brain tumors; Learn how to identify complications arising from increased intracranial pressure; Understand the usefulness of advanced MRI techniques for tumor characterization and tumor grading; Understand the complexity of assessing brain tumor treatment response.

(Servadei)

Learning goals: Describe the clinical presentation of a patient with head trauma; Describe the direct effects of head trauma; Describe the secondary effects of head trauma; Describe the neuroradiological approach to a patient with head trauma; Describe the management of a patient with head trauma; Describe the complication of head trauma.

Priority Presenting Problems Portfolio: Trauma

(Servadei/Pessina)

Learning goals: Describe the clinical presentation of a patient with different types of brain hemorrhage; Learn the diagnostic workout; Learn the surgical indications in these patients; Learn which are the main causes of brain hemorrhage; Learn the different surgical approaches; Learn the clinical outcomes of surgery of the brain hemorrhagic patients.

#### (Politi)

Learning goals: Learn how to recognize an acute intracranial hemorrhage on CT and MRI images; Being able to distinguish intraparenchymal hemorrhage from subarachnoid hemorrhage, and subdural hematoma from epidural hematoma; Understand the complication of intracranial hemorrhages and learn how to depict them; Discriminate between a skull fracture and a suture on CT images; Understand the basics of endovascular treatment options for brain aneurysms, arteriovenous malformations and dural arte 21din g 1 381 7887 m0 g0 G(()10(P)(f9.2 8.2 re(m)-2 8.2 re(m)-2 8.2 re



#### (Servadei, Albanese)

Learning goals: Describe the clinical presentation of a patients with hydrocephalus and learn the differential diagnosis with other dementia patients; Learn the diagnostic workout; Learn the surgical indications in these patients; Learn which are the main causes of hydrocephalus; Learn the different surgical approaches; Learn the dinical outcomes of surgery.

# (Politi, Albanese, Pessina)

Learning goals: Describe the possible neuroanatomical sources of pain in the head region; Classify the various clinical forms of headache and migraine; Understand the role of the trigeminal ganglion and the trigeminovascular system in the pathogenesis of migraine; Review the pharmacological treatments for headache and migraine; Organize an integrate reasoning on headache, its causes, pathophysiology, clinical presentations, diagnostic and therapeutic approaches

#### (Albanese)

Learning goals: Identify and solve difficulties in learning clinical neurosciences; Review interdisciplinary and bridging topics; Test learning through examples

#### (Perna/Caldirola)

Learning goals: Understand what mental health is and what is the field of psychiatry; Understand the the distinction between normality and psychopathology. Understand the concept of comorbidity in psychiatry.

# (Perna/Caldirola)

Learning goals: Defining the concept of personalized medicine in psychiatry. Apply personalized medicine in psychiatric disorders. Become aware the future of personalized medicine in psychiatry. Understand the role of mental health in the digital era.

#### (Perna/Caldirola)

Learning goals: Define the organizing principles of the different anxiety disorders, Describe the main clinical features of the different anxiety disorders Discuss the etiopathogenetic models, Organize a treatment plan.

# (Perna/Caldirola)

Learning goals: Define the organizing principles of the different obsessive-compulsive spectrum and eating disorders, Describe the main clinical features of obsessive compulsive and eating disorders, Discuss the etiopathogenetic models. Organize a treatment plan.

(Perna)

Learning goals. Define the organizing principles of the different mood disorders. Describe the main clinical features of the different mood disorders. Discuss the etiopathogenetic models. Organize a treatment plan.

(Perna)



Learning goals: Define the organizing principles of the different psychotic disorders. Describe the main clinical features of the different psychotic disorders. Discuss the etiopathogenetic models. Organize a treatment plan

(Perna)

Learning goals: Define the organizing principles of the different personality disorders. Describe the



Handbook of Neurosurgery, 9<sup>th</sup> Edition, by Mark S. Greenberg – Thieme Medical Publishers 2019

Stahl's Essential Psychopharmacology: Neuroscientific Basis and Practical Applications, by Stephen Stahl, 5<sup>th</sup> Edition, Cambridge University Press, 2021

Goodwin and Guze's Psychiatric Diagnosis, by North CS & Yutzy SH, 7th Edition, Oxford University Press, 2019.

Oyebode F. Sims' Symptoms in the Mind: Textbook of Descriptive Psychopathology, 7th Edition, Elsevier, 2022