



Course Regime

Course: **NERVOUS SYSTEM**

Study Programme:

Medicine Dental Medicine

Year of the Course: 1 2 3 **4** 5 6

Semester:

Winter

Course type:

Compulsory Elective

Number of ECTS credits: **10**

Lecturer(s): **Prof Zvezdan Pirtošek, MD, PhD**

Participating Organisational Units (Departments and Institutes): **Department of Neurology, Department of Diagnostic Imaging, Department of Public Health, Institute of Pathology, Institute of Pathophysiology, Institute of Pharmacology and Experimental Toxicology, Clinical Institute of Medical Genetics**

Date of Issue: **15. 9. 2023**

A. General part

1. Course objectives

Students will acquire the ability to understand the causes, mechanisms and treatment of neurological diseases, based on knowledge of the basics of disrupted physiological, biochemical and electrophysiological events in the nervous system. The first goal is achieved through theoretical and practical lessons in the field of clinical neurology, and the second goal through the important contribution of preclinical sciences that discuss the nervous system. In practices, seminars and problem based learning, the student learns to use the acquired knowledge in understanding the signs and symptoms of neurological disease, its course and complications, and learns the rational foundations for the prevention and treatment of disease.

Students use the knowledge and understanding of preclinical and clinical neurology in hospital and in outpatient treatment. In doing so, students learn the importance of understanding neurological disease for a rational approach to disease prevention, cognition, and treatment. They develop abstract thinking and practice thinking about diseases from the perspective of localization, causes and mechanisms, and manifestations of the disease. They acquire the ability to substantiate their knowledge and beliefs in professional discussion and get used to teamwork.

2. Comprehensive outline of the course organisation

Nervous System course lasts 5 weeks and takes place in fourth-year of medicine study. For Erasmus students the course is held in October and first two weeks in November of the academic year. The course consists of lectures, clinical seminars, clinical practice and other forms of study. During the 6th week students take a final course exam.

Lectures

The field of neurology is presented. In the first two weeks, students repeat and deepen their knowledge of the basics of the nervous system and learn about some important neurological syndromes. The rest of the lectures in the 3rd, 4th and 5th week are devoted to the overview of neurological diseases.

All lectures are optional and always take place in the Wooden Lecture Hall.

Seminars

On Mondays classes are held in the form of a "great clinical seminar". In a total of five meetings, major types of neurological diseases will be presented in the form of round tables, where neurologists, other specialists and lecturers of preclinical subjects will present their views on the topic or their contribution to the common treatment of the patient.

Covered topics include cerebrovascular diseases, spinal cord and peripheral nerve damage, brain tumors and dementia.

Seminars are compulsory and take place on Mondays between 8 am and 1 pm in the Wooden Lecture Hall.

Practices

Practices are divided into two parts.

In the first two weeks of the course, students from Tuesday to Thursday in small groups under the guidance of an assistant learn the technique of performing a neurological examination and learn the correct interpretation of clinical findings. Day 1 - Cranial nerve testing, Day 2 – Motor system testing, Day 3 - Sensory system testing and assessment of coordination. For this part of practices, students need a neurological hammer. Preparation for practices from the textbooks, mentioned in the Article 7 below, is mandatory. Practices are held in the basement at the Clinic of Neurology and in the Wooden Lecture Hall.

During the first two weeks of classes, students also learn about some topics in the field of neurological examination in the form of interactive lectures and discussions, some of which take place in small groups. Classes are held in the Wooden Lecture Hall.

In the 3rd, 4th and 5th week of the course, students are assigned to the neurology departments (Department of Neurology – KOBŽ, Department of Vascular Neurology and Neurological Intensive Care – KOVNINT and Institute of Clinical Neurophysiology – KIKN). From Tuesday to Friday, they participate in departmental activities under the supervision of a mentor. Practice begins with a morning meeting in the basement at the Clinic of Neurology at 9:00 a.m. During the practices, it is welcome that students show interest in the neurology field and a great deal of self-initiative, as they will learn the most. They will also learn about the outpatient treatment of patients with neurological conditions, and during the "outpatient day" they would independently examine one patient, who will then be presented to a mentor and consulted about the further course of treatment. The aim of the practices, held in departments and outpatient clinic, for students is to learn to take anamnesis and examine a patient with a neurological disease, to think about differential diagnosis, and to learn about the most commonly used tests and treatment options in neurology. During the clinical practices students need a white coat, which is mandatory, and a neurological hammer.

All practices are compulsory.

3. Description of on-going assessment of knowledge and skills

At the end of the 2nd week of the course, students take a short colloquium on clinical examination, divided into written and practical part. The written part consists of 10 multiple choice questions. Each correct answer is worth 1 point, incorrect 0 points. For a positive assessment of the written part, it is necessary to collect at least 6 points out of 10. The written part is followed by a practical part, where students show knowledge of neurological examination. If the student does not pass the colloquium, he/she has the option of additional defence before starting clinical practices.

4. Required conditions for the final examination (Course Exam)

Passed a colloquium on clinical examination and 80% attendance at seminars and practices.

If the student does not pass the clinical examination colloquium or does not achieve required presence in compulsory practices and seminars by the regular exam deadline, he / she can take these contents in the next course rotation or academic year and apply for the next course exam date.

5. Final assessment and examination of knowledge and skills (Course Exam)

The final exam is divided into three parts: the first is written (100 multiple-choice questions), the second is practical (examination of the patient and presentation of findings to the examiner) and the third oral. The subject matter covers clinical neurology as well as basic and other neurological sciences that are part of the Nervous System course.

In the written exam, the correct answers are assessed with 1 point, incorrect with -0.2 points of deduction and unanswered question with 0 points. If taking the exam for the first or second time, at least 50% of all possible points must be collected in order to take the practical and oral exam.

Taking the exam for the third time, the candidate approaches the practical and oral exam regardless of the score in the written part of the exam.

If the candidate receives an insufficient grade in the oral exam, he / she must retake the complete exam, regardless of the number of points achieved in the written part of the previous exam.

Each candidate must first take a written part of the exam, regardless of the number of attempts to take the examination.

The list of candidates who fulfil all the conditions for taking the exam and have registered for the exam on time is published on the website of the Nervous System course no later than two working days before the date of the written test. As a rule, the results of the written exam and the schedule for the oral exams are published on the same day as the written exam takes place, no later than 21:00 CET, exceptionally one day later. The oral exams period starts a day after the announcement of the written exam results and lasts for regular examination deadlines of one week, for others two weeks.

The practical part of the exam consists of an examination of a patient with a neurological disease, usually one that the family doctor is supposed to recognize; the focus may be on only part of the status, on a diagnostic imaging results, on a pathological, cerebrospinal fluid or other results; it may consist of video or image material. Sometimes an accurate diagnosis is important, but a properly performed examination is essential: a careful anamnesis, on the basis of which the student then directs his examination, taking into account the principle that what he did not look at can also be pathological. Based on the clinical examination, an assessment of the anatomical localization of the neurological lesion and an assessment of what this lesion is supposed to be (degenerative, vascular ...) follows. This is followed by differential diagnosis, examination proposals and therapeutic treatment. Already at this stage, the emphasis is on what the emergency physician should do in the fieldwork.

The practical exam is followed by an oral exam based on the questions from the field of clinical neurology. It is recommended that clinical cases are presented. At least one question is from the field of urgent neurology measures in the fieldwork or in the GP practice. A secondary examiner from any Department who participates in the implementation of classes within the Nervous System course may also be present at the oral exam. Secondary examiners can ask additional questions or sub-questions from their field, which are relevant to the exam topic.

The grade the student get at the end of the oral exam is also the final exam grade; the performance of the oral exam is in accordance with the Rules on the Examination and Assessment of Knowledge and Skills of the UL MF. The examiner's grade takes into account all three parts of the exam, but may be disproportionate.

Example a: excellent grade in written part, poor knowledge in oral part -> the examiner is likely to suggest that the candidate retake the oral exam.

Example b: 70% in writing, excellent in practical part and in oral part -> the overall grade can be excellent.

The student is entitled to see the written part of his / her exam in accordance with Article 39 of the Rules. The student can submit a request for access to his / her written exam within three working days after the results were announced. The student addresses the request in writing and sends it to the e-mail of the Department.

6. Other provisions

Article 34 of the "Regulations" applies. Only pen or pencil is allowed or needed for the written exam.

Students with special needs can have the additional time (up to 50 %) in all the form of tests of knowledge.

7. Fundamental study material and Supplement reading

For the successful study all learning material, presented through the Nervous System course by lectures, seminars and practices is recommended. Some of the materials are published in the e-classroom.

Primary literature:

Clinical Neurology (2003 or 2011, 2012; ed. Fowler & Scadding or Scadding & Losseff).

Topical Diagnosis in Neurology (Duus, 1997 or 2012).

Neurological Examination Made Easy (Fuller, 2004).

Neurology at the Bedside (Kondziella D, Waldemar G, 2nd Ed. Springer, 2017)

Additional literature:

For the basic (preclinical) sciences, related to neurology, are recommended:

NEUROPATHOLOGY: materials in e-classroom; *Peripheral Nerves and Muscles* (Ch. 21.) and *Central Nervous System* (Ch. 22) In: Eds. Kumar V, Abbas AK, Aster JC. *Robbins Basic Pathology*. 9th Ed.

NEURORADIOLOGY: materials in e-classroom; textbook Lisle DA. *Imaging for Students*. 4th Ed., Ch. *Neuroradiology*.

PUBLIC HEALTH: materials in e-classroom; book *Neurological Disorders: Public Health Challenge*, available on:

http://www.who.int/mental_health/neurology/neurological_disorders_report_web.pdf

NEUROPATHOPHYSIOLOGY: materials in e-classroom.

PHARMACOLOGY: materials in e-classroom.

NEUROGENETICS: materials in e-classroom.

8. Exam topics, clinical presentations and skills

Symptoms and signs of nervous system damage

Confusion; Delirium; Disorders of consciousness; Aphasia; Agnosia; Amnesia; Neglect syndrome; Dysexecutive syndrome; Hemianopsia; Ptosis; Double vision / paresis of the external eye muscles; Horner's syndrome; Dead pupil; Central and peripheral facial nerve damage; Wallenberg syndrome; Spastic paresis syndrome; Loose paresis syndrome; Hemiparesis; Tetraparesis; Paraparesis; Neurogenic bladder; Neurogenic erectile dysfunction; Nerve root damage syndrome; Syndromes of neck (C5, C6, C7) and lumbosacral roots (L4, L5, S1); Cauda Equina Syndrome; Peripheral nerve damage syndrome; Syndromes of radial, median, ulnar, femoral and sciatic nerve involvement; Brachial plexus involvement; Lumbosacral plexus involvement; Bulbar paresis; Pseudobulbar paresis

Diseases of the spine and spinal cord

Degenerative changes in the spine; Neck and upper limb pain; Low back and lower limb pain; Cervical spondylotic myelopathy; Spinal cord compression syndrome; Complete spinal cord disruption syndrome; Brown-Sequard syndrome; Subacute combined spinal degeneration; Radiation myelopathy; Tabes dorsalis; Syringomyelia; Amyotrophic lateral sclerosis

Dementia

Dementia syndrome; Reversible dementia; Alzheimer's disease; Vascular dementia; Pathophysiology of Alzheimer's disease

Demyelinating diseases

Multiple sclerosis

Phacomatosis

Neurofibromatosis; Tuberous sclerosis; Headache; Tension-type headache; Migraine; Headache in bursts; Giant cell (temporal) arteritis; Trigeminal neuralgia; Symptomatic headache

Expansive intracranial processes and tumors of the nervous system

Increased intracranial pressure; Brain edema; Tumors of the anterior and posterior cerebral cavities; Gliomas; Meningioma; Brain metastases; Spinal metastases; Brain abscess

Extrapyramidal disorders

Parkinson's disease; Parkinsonism; Dystonia; Huntington's disease; Gilles de la Tourette syndrome; Wilson's disease; Kernicterus; Pathophysiology of Parkinson's disease and parkinsonism

Epilepsy and other paroxysmal disorders

Heat cramps; Focal epilepsies; Generalized epilepsy; Status epilepticus; Narcolepsy; Sleep apnea syndrome

Congenital disorders

Psychomotor retardation; Hydrocephalus; Syringomyelia; Spinal dysraphism; Phenylketonuria

Cerebrovascular diseases

Transient ischemic disorder; Cerebral infarction; Cerebral hemorrhage; Hypertensive encephalopathy; Subarachnoid hemorrhage; Pathophysiology of stroke

Neuroinfectology (only neurological signs and symptoms of infection)

Meningitis; Encephalitis; Syphilis; Lyme disease; Herpes zoster; Tetanus; Toxoplasmosis; Tuberculosis; HIV infection

Head and brain injuries

Mild brain injury; Stroke; Intracranial post-injury bleeding; Chronic vegetative state; Brain death; Plexus injuries; Peripheral nerve damage; Spinal cord injury

Poisoning

Carbon monoxide poisoning; Neurotoxic drugs; Lead poisoning; Alcohol poisoning; Wernicke's encephalopathy; Korsakov's syndrome

Neuromuscular diseases

Carpal tunnel syndrome; Bell's palsy; Compression and compression mononeuropathy; Cervical and lumbosacral radiculopathies; Polyneuropathy; Multiple mononeuropathy; Guillain-Barré syndrome; Myasthenia gravis; Polymyositis; Muscular dystrophies; Amyotrophic lateral sclerosis

Theoretical foundations

Nervous system anatomy; Pathological anatomy of the nervous system; Nervous system physiology; Pathophysiology of the nervous system; Neuropharmacology

Neurological examination

Neurological History-Taking; Examination of an unconscious patient; Assessment of consciousness; Orientation assessment; Assessment of aphasia; Assessment of apraxia; Assessment of agnosia; Memory assessment; Attention assessment; Evaluation of executive functions

Examination of cerebral nerve function

Sense of smell; Assessment of visual acuity; Examination of the ocular background; Eye slit inspection; Evaluation of pupils (shape, size, reflexes); Evaluation of eyelid mobility; Dual vision assessment; Visual disturbances; Assessment of nystagmus; Corneal reflex; Visual field assessment; Evaluation of masseter muscle mobility and asymmetry; Assessment of facial sensations; Taste evaluation; Hearing assessment; Assessment of mimic muscle mobility and asymmetry; Examination of the soft palate; Pharyngeal reflex; Assessment of sternocleidomastoids and trapezius; Assessment of tongue function

Examination of the neck

Mobility; Meningeal signs

Examination of the motor system of the torso and limbs

Posture; Trophic / Development of limb muscles; Involuntary joints; Assessment of muscle tone; Assessment of active mobility; Assessment of passive mobility; Assessment of muscle strength

Reflexes

Myotatic reflexes (masseter, biceps, triceps, brachioradialis reflex, patellar and Achilles reflex); Abdominal reflexes (deep, superficial); Cremaster reflex; Anal reflex; Plantar response; Primitive reflexes (whipping, sucking, receiving)

Review of movement coordination

Inspection of walking (normal, on toes, on heels; walking on the spot; walking on the line "heel-toes"); Squat test; Romberg test; Postural reflex test (with urge); Finger-nose test; Heel-knee test; Diadochokinesis test

Sensory System Overview

Assessment of sense of touch; Assessment of pain sensation; Assessment of sensory failure by peripheral nerve type (median, ulnar and radial nerve in the upper limb and femoral, tibial and peroneal nerve in the lower limb); Assessment of sensitivity loss by radicular type (segments C5 C8 on the upper limb, Th4 and Th10 on the intermediate limb and L4 S1 on the lower limb); Assessment of temperature sensation; Assessment of sensation of vibration; Assessment of sensation for joint position; Extinction phenomenon; Identifying objects by touch

Special maneuvers in the investigation

Jendrassik maneuver; Lasegue's test; Fatigue test in myasthenia; Meningeal signs

Diagnostic procedures in neurology that the medical student should be familiar with

Lumbar puncture; Queckenstedt test; Muscle biopsy; Electromyography (EMG); Peripheral nerve conduction measurements; Electroencephalography (EEG); Measurements of evoked potentials; X-ray of the skull; X-ray of the spine; CT of the head; CT of the spine; MR of the brain; MR of the spinal cord; Angiography; Ultrasound examinations in neurology; Sensitivity, sweating; Motor skills; Muscle strength testing; Tendon Reflexes; Special tests (Tinel-Hoffman, Phalen test)

9. Other information

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