

**Odessa National Medical University**  
**Faculty of medicine**  
**Department of occupational pathology, clinical laboratory and functional**  
**diagnostics**  
**Syllabus**  
**Selective academic discipline**

**Modern methods of diagnosis, treatment and prevention of osteoporosis**

<b>Amount:</b>	<i>Total hours per discipline:</i> 90 hours, 3.0 credits. Semester XI - XII year 6
<b>Days, time, place</b>	According to the schedule
<b>Teacher(s)</b>	Honored worker of science and technology of Ukraine, doctor of medicine, professor O.M. Ignatiev, doctor of medicine, professor M.I. Turchyn, doctor of philosophy in medicine, associate professor Prutiian T.L.,PHD in Medicine,associate professor Oparina T.P.
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<b>E-mail</b>	<a href="mailto:prof.cl.lab@onmedu.ua">prof.cl.lab@onmedu.ua</a>
<b>Workplace</b>	Department of Occupational Pathology, Clinical Laboratory and Functional Diagnostics , Therapeutic Department of Odesa Regional Clinical Medical Center, Odesa, 1 Sudnobudivna St.
<b>Consultations</b>	Consultations: full-time - Wednesday 13.00–14.00 remotely - Tuesday, Thursday 13.00–14.00

### **COMMUNICATION**

Communication with applicants of higher education will be carried out through face-to-face meetings and during distance learning using the Internet, Microsoft Teams, Skype, Zoom, Telegram, WhatsApp social networks.

### **ABSTRACT OF THE EDUCATIONAL DISCIPLINE**

**The subject of study** of the selective discipline is the study of modern methods of diagnosis, treatment and prevention of osteoporosis.

The study includes consideration of issues related to:

- laboratory determination and assessment of bone remodeling markers, processes of bone tissue formation and bone resorption, indicators of osteoclastogenesis, phosphorus-calcium homeostasis;
- instrumental research of bone tissue, namely features and indications for the use of X-ray adsorption densitometry, ultrasound densitometry, the use of the Ukrainian FRAX model for assessing the ten-year risk of fracture development, a one-minute test for assessing the risk of developing osteoporosis;

- functional tests for assessing the state of the musculoskeletal system and the risk of falls ("tandem test", "get up and go", "sit-up" test);
- treatment of osteoporosis by prescribing calcium and vitamin D preparations, bisphosphonates or targeted therapy;
- prevention of osteoporosis, determination of the importance of the use of physical therapy and physiotherapy in the growth and preservation of bone tissue in patients with osteoporosis.

***Prerequisites and post-requisites of the discipline (place of the discipline in the educational program):***

***Prerequisites:*** anatomy, physiology, pathophysiology, histology and pathomorphology of the musculoskeletal system, biochemistry of vitamin D biosynthesis and bone remodeling, radiology, ultrasound diagnostics, pharmacology of osteotropic and targeted therapy drugs, calcium and vitamin D.

***Post-requisites:*** internal medicine, family medicine - general practice, rheumatology, endocrinology, geriatrics, valeology and sports medicine, traumatology and orthopedics, gynecology, oncology, oncohematology, neurology, nephrology, occupational diseases, clinical pharmacology, pediatrics.

**The purpose of the selective discipline** is to acquire theoretical knowledge and competences for the student of higher education regarding modern methods of diagnosis, treatment and prevention of osteoporosis, sarcopenia, prevention of falls and low-energy fractures.

**Tasks of the discipline:**

1. Determine the relevance of the osteoporosis problem in Ukraine and the world.
2. Gain knowledge about the modern classification of osteoporosis and features of the clinical picture.
3. To acquire competencies in the application of screening methods for assessing the risk of osteoporosis and osteoporotic fractures.
4. Master the skills of evaluating laboratory indicators of bone remodeling, the system of osteoclastogenesis, and phosphorus-calcium metabolism for further tactics in the management of patients with osteoporosis.
5. Master the technique of conducting and interpreting the results of X-ray adsorption densitometry, ultrasonic densitometry.
6. Master the technique of conducting and interpreting the results of functional tests for assessing the state of the musculoskeletal system and the risk of falls.
7. Gain knowledge about the features and indications for the use of drugs in the treatment of osteoporosis and osteoporotic fractures (calcium drugs, vitamin D, bisphosphonates, targeted therapy).

8. Providing students with knowledge about rehabilitation methods (kinesiotherapy and physiotherapy) of patients with osteoporosis and low-energy fractures.

9. To study the skeletal and extraskeletal effects of vitamin D.

**Expected results:**

As a result of studying the discipline, the applicant of higher education should know:

- modern classification, mechanisms of development and risk factors of osteoporosis;
- features of the clinical course of osteoporosis and sarcopenia;
- laboratory methods of researching disorders of bone remodeling and phosphorus-calcium metabolism;
- indications, advantages and disadvantages for prescribing X-ray adsorption densitometry and ultrasonic densitometry;
- the main screening methods for assessing the risk of osteoporosis and osteoporotic fractures.
- clinical pharmacology of drugs used in the treatment of osteoporosis;
- peculiarities in the rehabilitation of patients with diseases of the musculoskeletal system (kinesiotherapy, physiotherapy);
- skeletal and extraskeletal effects of vitamin D.

be able:

- evaluate the results of laboratory markers of bone remodeling (bone formation and resorption of bone tissue), osteoclastogenesis system, phosphorus-calcium metabolism;
- interpret the results of X-ray adsorption densitometry;
- interpret the results of ultrasonic densitometry;
- assess the risk of osteoporosis using a one-minute test;
- assess the risk of developing osteoporotic fractures using the FRAX model;
- conduct and interpret the results of functional tests for assessing the musculoskeletal condition and the risk of falls;
- determine the indications and contraindications for prescribing calcium and vitamin D preparations, osteotropic therapy (bisphosphonates, target therapy, etc.);
- to use physical therapy in the treatment of patients with osteoporosis and low-energy fractures;
- apply physiotherapy methods in the rehabilitation of patients with diseases of the musculoskeletal system;
- monitor the effectiveness of prescribed osteoporosis treatment and osteoporotic drugs.

**COURSE DESCRIPTION**

The course is taught in the form of practical classes (30 hours) and organization of independent work (60 hours).

### **Teaching methods:**

The study of the discipline is implemented on the basis of the following teaching methods:

- according to the dominant teaching methods (verbal, visual);
- blitz survey;
- solving creative problems;
- group discussions on problem situations;
- performance of written tasks;
- individual control interview;
- logical exercises;
- business games;
- situational tasks;
- performance of individual studies;
- problematic method of learning;
- "brain storm"

### **CONTENTS OF THE EDUCATIONAL DISCIPLINE:**

**Topic 1.** Osteoporosis. Classification, mechanisms of development.

**Topic 2.** Risk factors, features of the clinical course of osteoporosis.

**Topic 3.** Screening methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures.

**Topic 4.** Laboratory diagnostic methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures.

**Topic 5.** Instrumental diagnostic methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures.

**Topic 6.** Deficiency and insufficiency of vitamin D: epidemiology, diagnosis, prevention and treatment.

**Topic 7.** Clinical pharmacology of drugs used for the treatment of systemic osteoporosis and its complications.

**Topic 8.** Peculiarities of rehabilitation of patients with osteoporosis

**Topic 9.** Sarcopenia: epidemiology, mechanisms of development.

**Topic 10.** Features of the clinical course, treatment and rehabilitation of patients with sarcopenia.

### **List of recommended literature**

#### **Main:**

1. Porter JL, Varacallo M. Osteoporosis. 2022 Sep 4. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 28722930.
2. Williams C, Sapra A. Osteoporosis Markers. 2022 May 8. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 32644732.

3. Keen MU, Reddivari AKR. Osteoporosis In Females. 2022 Aug 7. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 32644582.
4. Ganesan K, Jandu JS, Anastasopoulou C, Ahsun S, Roane D. Secondary Osteoporosis. 2022 Oct 19. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 29262237.
5. Sizar O, Khare S, Goyal A, Givler A. Vitamin D Deficiency. 2022 Jul 27. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 30335299.
6. Martin FC, Ranhoff AH. Frailty and Sarcopenia. 2020 Aug 21. In: Falaschi P, Marsh D, editors. Orthogeriatrics: The Management of Older Patients with Fragility Fractures [Internet]. 2nd ed. Cham (CH): Springer; 2021. Chapter 4. PMID: 33347228.
7. Chauhan K, Shahrokhi M, Huecker MR. Vitamin D. 2022 Sep 9. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 28722941.
8. Ganesan K, Goyal A, Roane D. Bisphosphonate. 2022 Sep 5. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 29262103.
9. Veronese N, Kolk H, Maggi S. Epidemiology of Fragility Fractures and Social Impact. 2020 Aug 21. In: Falaschi P, Marsh D, editors. Orthogeriatrics: The Management of Older Patients with Fragility Fractures [Internet]. 2nd ed. Cham (CH): Springer; 2021. Chapter 2. PMID: 33347224
10. Ignatiev OM, Prutiian TL, Turchyn MI. Klinichna biokhimiia : pidruchnyk: u 3 t. / H.H. Lunovoi. – Lviv : PP «Mahnoliia 2006», 2022. T. 3. S. 66–91 ISBN 978-617-574-210-5
11. Levchenko OO. Osnovni mekhanizmy remodeliuvannia kistkovoï tkanyny. Dermatolohiia ta venerolohiia. 2016;2(72):5-12.
12. Povorozniuk VV, Pludovski P. Defitsyt ta nedostatnist vitaminu D: epidemiolohiia, diahnostryka, profilaktyka ta likuvannia. Donetsk: Vydavets Zaslavskyi O.Iu. 2014. 262 s.
13. Povorozniuk V.V., Binkli N.; Dzerovych N.I., Povorozniuk R.V. Sarkopeniia. Kyiv. PAT «Vipol». 2016. 180 s.
14. Ihnatiev OM, Prutiian TL, Turchyn MI. Klinichna biokhimiia : pidruchnyk: u 3 t. / H.H. Lunovoi. – Lviv : PP «Mahnoliia 2006», 2022. T. 3. S. 66–91 ISBN 978-617-574-210-5
15. Levchenko OO. Osnovni mekhanizmy remodeliuvannia kistkovoï tkanyny. Dermatolohiia ta venerolohiia. 2016;2(72):5-12.
16. Povorozniuk VV, Pludovski P. Defitsyt ta nedostatnist vitaminu D: epidemiolohiia, diahnostryka, profilaktyka ta likuvannia. Donetsk: Vydavets Zaslavskyi O.Iu. 2014. 262 s.

17. Povorozniuk V.V., Binkli N.; Dzerovych N.I., Povorozniuk R.V. Sarkopeniia. Kyiv. PAT «Vipol». 2016. 180 s.

**Additional:**

1. Leslie SW, Sajjad H. Hypercalciuria. 2022 Nov 28. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 28846247.
2. Davis S, Simpson E, Hamilton J, James MM, Rawdin A, Wong R, Goka E, Gittoes N, Selby P. Denosumab, raloxifene, romosozumab and teriparatide to prevent osteoporotic fragility fractures: a systematic review and economic evaluation. *Health Technol Assess.* 2020 Jun;24(29):1-314. doi: 10.3310/hta24290. PMID: 32588816; PMCID: PMC7357239.
3. Santy-Tomlinson J, Speerin R, Hertz K, Tochon-Laruaz AC, van Oostwaard M. Falls and Secondary Fracture Prevention. 2018 Jun 16. In: Hertz K, Santy-Tomlinson J, editors. *Fragility Fracture Nursing: Holistic Care and Management of the Orthogeriatric Patient* [Internet]. Cham (CH): Springer; 2018. Chapter 3. PMID: 31314473.
4. Osteoporosis: assessing the risk of fragility fracture. London: National Institute for Health and Care Excellence (NICE); 2017 Feb. PMID: 32186835.
5. Dreinhöfer K. G | Osteoporosis and Fragility Fractures. In: Verhaar JAN, Kjærsgaard-Andersen P, Limb D, Günther KP, Karachalios T, editors. *The EFORT White Book: “Orthopaedics and Traumatology in Europe”* [Internet]. Lowestoft (UK): Dennis Barber Ltd; 2021. PMID: 36327375.
6. Shetty S, John B, Mohan S, Paul TV. Vertebral fracture assessment by dual-energy X-ray absorptiometry along with bone mineral density in the evaluation of postmenopausal osteoporosis. *Arch Osteoporos.* 2020 Feb 24;15(1):25. doi: 10.1007/s11657-020-0688-9. PMID: 32095943.
7. Singh P. Treatment of Vitamin D Deficiency and Comorbidities: A Review. *J Assoc Physicians India.* 2018 Jan;66(1):75-82. PMID: 30341848.
8. Zaheer S, LeBoff MS. Osteoporosis: Prevention and Treatment. 2022 Dec 27. In: Feingold KR, Anawalt B, Boyce A, Chrousos G, de Herder WW, Dhatariya K, Dungan K, Hershman JM, Hofland J, Kalra S, Kaltsas G, Koch C, Kopp P, Korbonits M, Kovacs CS, Kuohung W, Laferrère B, Levy M, McGee EA, McLachlan R, Morley JE, New M, Purnell J, Sahay R, Singer F, Sperling MA, Stratakis CA, Trencle DL, Wilson DP, editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000–. PMID: 25905299.
9. Hildebrand GK, Kasi A. Denosumab. 2022 Feb 24. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 30571009.

## **EVALUATION**

### **Current control methods:**

The following methods of current control are used at each practical session:

1. Tests on the subject of the lesson.

2. Oral answers to standardized questions based on the material of the current topic and previous topics.
3. Practicing practical skills in interpreting laboratory and instrumental research methods.
4. Control of the acquirer's activity while working in small groups.

**Scheme of accrual and distribution of points received by applicants of higher education.**

**Current control.** Evaluation of the success of studying subjects of the discipline is carried out according to the traditional 4-point scale. At the end of the study of the discipline, the current success is calculated as the average current score, that is, the arithmetic average of all received grades on a traditional scale, rounded to a whole number.

**Structure of assessment of the current educational activity of the practical class:**

<b>Rating</b>	<b>Structure</b>
Perfectly «5»	The applicant is fluent in the material, takes an active part in the role-playing game, confidently demonstrates practical skills during the examination of a healthy and sick person and the interpretation of clinical, laboratory and instrumental research data, expresses his opinion on the subject of the lesson, demonstrates clinical thinking;
Good «4»	The applicant has a good command of the material, takes part in a role-playing game, demonstrates practical skills during the examination of a healthy and sick person and the interpretation of clinical, laboratory and instrumental research data with some errors, expresses his opinion on the subject of the lesson, demonstrates clinical thinking.
Satisfactorily «3»	The applicant does not have sufficient knowledge of the material, takes part in the role-play without confidence, demonstrates practical skills during the examination of a healthy and sick person and the interpretation of clinical, laboratory and instrumental research data with significant errors.
Unsatisfactorily «2»	The applicant does not possess the material, does not take part in the role play, does not demonstrate practical skills during the examination of a healthy and sick persons and the interpretation of clinical, laboratory and instrumental research data.

**Final control.** The study of the academic discipline ends with a test. Higher education applicants who have not missed seminar classes or completed missed classroom classes and have an average score of at least "3" will receive credit.

**The average score for the discipline** is translated into a traditional evaluation of the discipline on a 4-point scale and is considered as the ratio of this arithmetic average to the percentage of assimilation of the required amount of knowledge in the given subject.

**Independent work.** Assessment of the independent work of higher education applicants, which is provided for in the topic along with classroom work, is carried out

during the current control of the topic in the corresponding classroom session, as well as at the final control.

## **COURSE POLICY**

**Deadlines and Rescheduling Policy.** Tasks must be completed on time according to the deadline. For untimely completion of the task, the student of higher education receives an unsatisfactory grade. If the student of higher education was absent from classes for any reason, then the practice is carried out within the deadlines set by the teacher in accordance with the "Regulations on the organization of the educational process at ONMedU" (link to the regulations on the university's website <https://onmedu.edu.ua/wp-content/uploads/2020/01/osvitnijproces.pdf>). Reassembly is carried out in accordance with the approved schedule.

**Academic Integrity Policy.** The policy of the educational component is based on the principles of academic integrity (link to the regulations on the university website <https://onmedu.edu.ua/wp-content/uploads/2020/07/polozhennja-prodobrochesnist.pdf>) and is determined by the system of requirements that the teacher presents represents to the applicant when studying the educational component:

- independent performance of educational tasks, tasks of current and final control of learning results (for persons with special educational needs, this requirement is applied taking into account their individual needs and capabilities);

- references to sources of information in the case of using ideas, developments, statements, information.

**Attendance and Tardiness Policy.** Attendance and work at classroom classes (seminar classes) is mandatory for obtaining a satisfactory grade. A higher education student is allowed to be late for no more than 10 minutes.

**Attendance and Tardiness Policy.** Attendance and work at classroom classes (seminar classes) is mandatory for obtaining a satisfactory grade. A student who is late for class can attend it, but if the teacher has put "nb" in the journal, he must work it out in the general order.

**Mobile devices.** It is permissible to use mobile devices during the lesson with the teacher's permission.

**Behavior in the audience.** The following values should be cultivated while in the audience: respect for colleagues; tolerance for others; receptivity and impartiality; argumentation of agreement or disagreement with the opinion of other participants in the discussion, as well as one's own opinion; respecting the dignity of the opponent's personality during communication; compliance with the ethics of academic relationships.