

**MINISTRY OF HEALTH OF UKRAINE**  
**ODESSA NATIONAL MEDICAL UNIVERSITY**

Department of occupational pathology and functional diagnostics

«APPROVED»



*[Signature]*  
Vice-rector for scientific and pedagogical work  
Eduard BURIACHKIVSKYI

*01* " *September* 2023

**WORKING PROGRAM OF ELECTIVE DISCIPLINE**

**"MODERN METHODS OF DIAGNOSTIC, TREATMENT AND  
PROPHILAXIS OF OSTEOPOSIS"**

**Level of higher education:** second (master's degree)

**Field of knowledge:** 22 "Health care"

**Specialty:** 222 "Medicine"

**Educational and professional program:** Medicine

2023

The working program is compiled on the basis of the educational and professional program "Medicine" for the training of specialists of the second (masters) level of higher education in the specialty 222 "Medicine" field of knowledge 22 "Health care", approved by the Academic Council of ONMedU (Minutes No. 8 dated June 29 2023).

Authors : MD, Prof. Ignatiev O.M., PhD in Medicine, MD, Prof. Turcin M.I., PhD in Medicine, Associate Professor Oparina T.P., Doctor of Philosophy, Associate Professor Prutiian T.L.

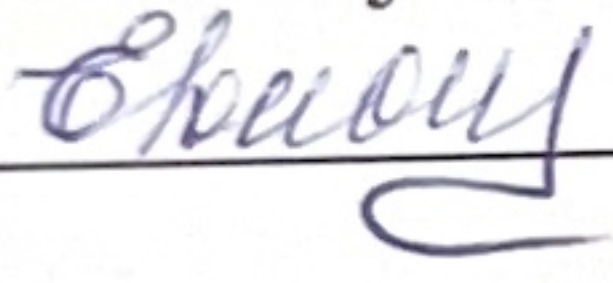
The working program is approved at the meeting of the department of occupational pathology and functional diagnostics, Minutes No.1 dated August 30, 2023.

Head of the department  Oleksandr IGNATIEV

Approved by the guarantor of the

Educational and professional program  Valerya MARICHEREDA

Approved by the subject-cycle commission for therapeutic disciplines of ONMedU, Minutes No.1 dated August 31, 2022.

Head of the subject-cycle commission for therapeutic disciplines of ONMedU  
 Olena VOLOSHYNA

*occupational diseases and functional diagnostics and phthisiopulmonol.*  
Revised and approved at the meeting of the department, Minutes No. 1 from "4" 09 2023.

Head of Department  Oleksandr IGNATIEV

Revised and approved at the meeting of the department, Minutes N\_ from " \_ " 202 \_.

Head of Department \_\_\_\_\_

## 1. Description of the discipline

Name indicators	Field of knowledge, specialty, specialization, higher level	Characteristics of education disciplines
The total number of: Credits: 3.0 Hours: 90 Content modules: 4	Field of knowledge 22 "Health care" Specialty 222 "Medicine" Level of higher education second (master's)	<i>Full-time education</i> <i>Elective discipline</i>
		<i>Year of study: 5</i> <i>Semesters IX- X</i> <i>Lectures (0 hours.)</i> <i>Seminary (0 hours)</i> <i>Practical classes (30 hours)</i> <i>Laboratory (0 hours)</i> <i>Independent work (60 hours)</i> <i>Individual orders (0 hours)</i> <i>The form of final control – test</i>

## 2. The purpose and tasks of the educational discipline, competences, program learning outcomes.

The purpose of studying a selective discipline is to acquire theoretical knowledge and competences 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 competences 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, phosphorus-calcium metabolism for further tactics of managing 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 applicants of high education 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.

The process of studying the discipline is aimed at forming elements of the following competencies:

**General competencies: (GC)**

- GC1. Ability to abstract thinking, analysis and synthesis
- GC3. Ability to apply knowledge in practical situations
- GC4. Knowledge and understanding of the subject area and understanding of professional activity
- GC6. Ability to make informed decisions
- GC10. Ability to use information and communication technologies
- GC16. The ability to evaluate and ensure the quality of the work performed

**Special competencies are (SC):**

- SC1. Ability to collect medical information about the patient and analyze clinical data
- SC2. Ability to determine the necessary list of laboratory and instrumental studies and evaluate their results
- SC3. Ability to establish a preliminary and clinical diagnosis of the disease
- SC8. Ability to determine tactics and provide emergency medical care
- SC10. Ability to perform medical manipulations

SC16. Ability to maintain medical documentation, including electronic forms

SC21. The ability to clearly and unambiguously convey one's own knowledge, conclusions and arguments on health care problems and related issues to specialists and non-specialists, in particular to people who are studying

SC24. Adherence to ethical principles when working with patients and laboratory animals

SC25. Adherence to professional and academic integrity, to be responsible for the reliability of the obtained scientific results

SC28. Ability to apply fundamental biomedical knowledge at a level sufficient to perform professional tasks in the field of health care

**Program learning outcomes (PRO):**

PRO1. Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.

PRO2. Understanding and knowledge of basic and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care.

PRO4. Identify and identify leading clinical symptoms and syndromes (according to list 1); according to standard methods, using preliminary data of the patient's history, data of the patient's examination, knowledge about the person, his organs and systems, establish a preliminary clinical diagnosis of the disease (according to list 2).

PRO5. Collect complaints, history of life and diseases, evaluate psychomotor and physical development of the patient, state of organs and systems of the body, based on the results of laboratory and instrumental studies, evaluate information regarding the diagnosis (according to list 4), taking into account the age of the patient.

PRO6. Establish the final clinical diagnosis by making a reasoned decision and analyzing the received subjective and objective data of clinical, additional examination, differential diagnosis, observing the relevant ethical and legal norms, under the control of the managing physician in the conditions of the health care institution (according to the list 2).

PRO14. Determine tactics and provide emergency medical care in emergency situations (according to list 3) in limited time in accordance with existing clinical protocols and treatment standards.

PRO19. Plan and implement a system of anti-epidemic and preventive measures regarding the occurrence and spread of diseases among the population.

PRO21. Search for the necessary information in the professional literature and databases of other sources, analyze, evaluate and apply this information.

PRO25. It is clear and unambiguous to convey one's own knowledge, conclusions and arguments on health care problems and related issues to specialists and non-specialists.

PRO27. Communicate freely in the national and English languages, both orally and in writing to discuss professional activities, research and projects.

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 the appointment of 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 extra skeletal 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.

### **3. Content of the optional educational discipline "Modern methods of diagnosis, treatment and prevention of osteoporosis"**

#### ***Content module 1. Osteoporosis as a social and medical problem.***

Topic 1. Osteoporosis. Classification, mechanisms of development.

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

#### ***Content module 2. Modern methods of diagnosing 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.

#### ***Content module 3. Modern methods of treatment and rehabilitation of osteoporosis.***

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

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

***Content module 4. Sarcopenia, mechanisms of development, clinical course, treatment and rehabilitation of patients.***

Topic 9. Sarcopenia: epidemiology, mechanisms of development.

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

#### **4. The structure of the educational discipline**

Subject	Number of hours					
	Total	Including				
		lectures	seminars	practical	laboratories	IWS
<b>Content module 1. Osteoporosis as a social and medical problem.</b>						
Topic 1. Osteoporosis. Classification, mechanisms of development.	10	0	0	4	0	6
Topic 2. Risk factors, features of the clinical course of osteoporosis.	6	0	0	2	0	4
<b><i>Total by module 1</i></b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>10</b>
<b>Content module 2. Modern methods of diagnosing osteoporosis.</b>						
Topic 3. Screening methods for assessing structural and functional changes in bone tissue and the	12	0	0	4	0	8



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.	6	0	0	2	0	4
Topic 5. Instrumental diagnostic methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures.	6	0	0	2	0	4
<b>Total by module 2</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>16</b>
<b>Content module 3. Modern methods of treatment and rehabilitation of osteoporosis.</b>						
Topic 6. Deficiency and insufficiency of vitamin D: epidemiology, diagnosis, prevention.	12	0	0	4	0	8
Topic 7. Clinical pharmacology of drugs used for the treatment of systemic osteoporosis and its complications.	12	0	0	4	0	8
Topic 8. Peculiarities of rehabilitation of patients with osteoporosis	6	0	0	2	0	4

<i>Total by module 3</i>	<b>30</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>20</b>
<b>Content module 4. Sarcopenia, mechanisms of development, clinical course, treatment and rehabilitation of patients.</b>						
Topic 9. Sarcopenia: epidemiology, mechanisms of development.	<b>10</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>6</b>
Topic 10. Features of the clinical course, treatment and rehabilitation of patients with sarcopenia.	<b>10</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>8</b>
<i>Total by module 4</i>	<b>20</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>14</b>
<i>Total</i>	<b>90</b>	<b>0</b>	<b>0</b>	<b>30</b>	<b>0</b>	<b>60</b>

### **5. Topics of lectures/seminars/practical/laboratory classes**

5.1. Lecture classes are not provided.

5.2. Seminar classes are not provided.

### **5.3. Topics of practical classes**

<b>№</b>	<b>Topics of practicals classes</b>	<b>Number of hours</b>
1.	Topic 1. Practical classes 1. Osteoporosis. Classification, mechanisms of development.	4
2.	Topic 2. Practical classes 2. Risk factors, features of the clinical course of osteoporosis	2
3.	Topic 3. Practical classes 3. Screening methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures.	4
4.	Topic 4. Practical classes 4. Laboratory diagnostic methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures	2
5.	Topic 5. Practical classes 5. Instrumental diagnostic methods for assessing structural and functional changes in bone tissue and the risk	2

	of developing osteoporotic fractures.	
6.	Topic 6. Practical classes 6. Deficiency and insufficiency of vitamin D: epidemiology, diagnosis, prevention.	4
7.	Topic 7. Practical classes 7. Clinical pharmacology of drugs used for the treatment of systemic osteoporosis and its complications.	4
8.	Topic 8. Practical classes 8. Peculiarities of rehabilitation of patients with osteoporosis	2
9	Topic 9. Practical classes 9. Sarcopenia: epidemiology, mechanisms of development.	4
10	Topic 10. Features of the clinical course, treatment and rehabilitation of patients with sarcopenia.	2
	<b>Total</b>	<b>30</b>

### 6. Independent work of applicant of higher education

№	Topics for independent work	Number of hours
1.	Topic 1. Osteoporosis. Classification, mechanisms of development. <b>Preparation for the practical class 1.</b>	6
2.	Topic 2. Risk factors, features of the clinical course of osteoporosis <b>Preparation for the practical class 2.</b>	4
3.	Topic 3. Screening methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures. <b>Preparation for the practical class 3.</b>	8
4.	Topic 4. Laboratory diagnostic methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures <b>Preparation for the practical class 4.</b>	4
5.	Topic 5. Instrumental diagnostic methods for assessing structural and functional changes in bone tissue and the risk of developing osteoporotic fractures. <b>Preparation for the practical class 5.</b>	4
6.	Topic 6. Deficiency and insufficiency of vitamin D: epidemiology, diagnosis, prevention. <b>Preparation for the practical class 6.</b>	8
7.	Topic 7. Clinical pharmacology of drugs used for the treatment of systemic osteoporosis and its complications. <b>Preparation for the practical class 7.</b>	8
8.	Topic 8. . Peculiarities of rehabilitation of patients with osteoporosis <b>Preparation for the practical class 8.</b>	4
9	Topic 9. Sarcopenia: epidemiology, mechanisms of development. <b>Preparation for the practical class 9.</b>	6

10.	Topic 10. Features of the clinical course, treatment and rehabilitation of patients with sarcopenia. <b>Preparation for the practical class 10.</b>	8
	<b>Total</b>	<b>60</b>

### 7. Teaching methods

A practical class is a type of educational class in which the teacher conducts a discussion on predetermined problems, for which applicants prepare abstracts of speeches on the basis of individually completed tasks (abstracts, essays, etc.), testing, solving situational tasks.

At the practical classes, the teacher assesses the quality of the applicants' performance of independent tasks, their activity in the discussion, the ability to formulate and defend their position, etc.

Independent work with recommended basic and additional literature, with electronic information resources, preparation for practical classes.

### 8. Forms of control and evaluation methods (including criteria for evaluating learning outcomes)

**Current control:** oral survey, testing, solution of situational clinical tasks, assessment of activity in class.

**Final control:** test

**Evaluation of current educational activity in a practical/seminar/laboratory session:** Survey, solving a situational clinical problem, determine the ability to correctly prescribe and interpret the results of laboratory and instrumental examination, justify the diagnosis based on the analysis of clinical and auxiliary methods.

**The structure of the current assessment in the practical session:**

#### 1. Evaluation of theoretical knowledge on the subject of the lesson:

- methods: survey, testing, solving a situational clinical problem - maximum score – 5, minimum score – 3, unsatisfactory score – 2.

#### 2. Assessment of work with the patient on the subject of the lesson:

- methods: assessment of: a) communicative skills of communication with the patient, b) correctness of appointment and assessment of laboratory and instrumental studies, c) compliance with the differential diagnosis algorithm, d) justification of the clinical diagnosis, e) drawing up a treatment plan - maximum score – 5, minimum score – 3, unsatisfactory score – 2.

### Criteria for current assessment in class:

«5»	The applicant is fluent in the material, takes an active part in discussing and solving a situational clinical problem, confidently demonstrates practical skills and interpretations of clinical, laboratory and instrumental
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	research data, expresses his opinion on the subject of the class, demonstrates clinical thinking.
«4»	The applicant has a good command of the material, participates in the discussion and solution of a situational clinical problem, demonstrates practical skills in the interpretation of clinical, laboratory and instrumental research data with some errors, expresses his opinion on the subject of the class, demonstrates clinical thinking.
«3»	The applicant does not have sufficient knowledge of the material, takes part in the discussion and solution of the situational clinical problem without confidence, demonstrates practical skills during the interpretation of clinical, laboratory and instrumental research data with significant errors.
«2»	The applicant does not master the material, does not take part in the discussion and solution of the situational clinical problem, does not demonstrate practical skills in the interpretation of laboratory research data.

Test is given to the applicant who completed all tasks of the work program of the academic discipline, took an active part in practical classes, completed and defended an individual assignment and has an average current grade of at least 3.0 and has no academic debt. The test is carried out at the last lesson - with the cyclic system of education.

**9. Distribution of points received by the applicant.** The obtained average score for the academic discipline for applicants who have successfully mastered the work program of the academic discipline is converted from a traditional four-point scale to points on a 200-point scale, which is shown in the table: **Conversion table of a traditional assessment into a multi-point scale**

<b>Traditional four-point scale</b>	<b>Multi-point 200-point scale</b>
«5» (excellent)	185-200
«4» (good)	151-184
«3» (satisfactory)	120-150
«2» (unsatisfactory)	Below 120

A multi-point scale (200-point scale) characterizes the actual success of each applicant in learning the educational component. The conversion of a traditional assessment into a 200-point assessment is performed by the information and technical department of the University. According to the obtained points on a 200-point scale, the achievements of the applicants are evaluated according to the ECTS rating scale. Further ranking according to the ECTS rating scale evaluates

the achievements of the students in the educational component, who are studying in the same course of the same specialty, according to the points they received. The ECTS scale is a relative-comparative rating that establishes the applicant's belonging to the group of the best and worst among the reference group of fellow students (faculty, specialty). An "A" grade on the ECTS scale cannot be equal to an "excellent" grade, and a "B" grade to a "good" grade, etc. When converting from a multi-point scale, the limits of grades "A", "B", "C", "D", "E" on the ECTS scale do not coincide with the limits of grades "5", "4", "3" on the traditional scale. Acquirers who received grades "FX" and "F" ("2") are not included in the list of ranked acquirers. The grade "FX" is awarded to students who have obtained the minimum number of points for the current learning activity, but who have not passed the final examination. A grade of "F" is assigned to students who have attended all classes in the discipline, but have not received an average score (3.00) for the current academic activity and are not admitted to the final examination.

Applicants, who study in one course (one specialty), based on the number of points scored in the discipline, are ranked on the ECTS scale as follows:

#### Criteria for determining the ECTS assessment

Evaluation of ECTS	Statistical indicator
«A»	is the best 10% of applicants
«B»	next 25% of applicants
«C»	next 25% of applicants
«D»	next 25% of applicants
«E»	last 10% of applicants

#### 10. Methodological support

- Working program of the discipline
- Syllabus
- Methodical recommendations for practical classes
- Methodical recommendations for independent work of higher education applicants
- Multimedia presentations

- Situational clinical tasks
- Electronic bank of test tasks by subdivisions of the discipline
- Educational and methodical literature

### **11. List of questions for preparing applicants for the test**

1. Classification of osteoporosis;
2. Mechanisms of development and risk factors of osteoporosis;
3. Features of the clinical course of osteoporosis and sarcopenia;
4. Laboratory methods of researching disorders of bone remodeling and phosphorus-calcium metabolism;
5. Indications, advantages and disadvantages for the appointment of X-ray adsorption densitometry and ultrasonic densitometry;
6. Basic screening methods for assessing the risk of osteoporosis and osteoporotic fractures.
7. Clinical pharmacology of drugs used in the treatment of osteoporosis;
8. Features of rehabilitation of patients with diseases of the musculoskeletal system
9. Physiotherapy, physiotherapy;
10. Skeletal and extraskelatal effects of vitamin D.
11. Laboratory markers of bone remodeling (bone formation and resorption of bone tissue), osteoclastogenesis system, phosphorus-calcium metabolism;
12. Adsorption X-ray densitometry;
13. Ultrasonic densitometry;
14. Osteoporosis risk assessment using a one-minute test;
15. Assessment of the risk of developing osteoporotic fractures using the FRAX model;
16. Indications and contraindications for prescribing calcium and vitamin D preparations, osteotropic therapy (bisphosphonates, target therapy, etc.);
17. Monitoring the effectiveness of osteoporosis treatment and osteoporotic drugs.

### **12. 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.

## 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.