# REVIEW

**by Prof. Maria Stoyanova Panchovska-Mocheva, MD, PhD,**
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on dissertation for awarding the educational and scientific degree of Doctor of Sciences
in the field of higher education 7. Healthcare and Sports,
professional field 7.1. Medicine,
doctoral program: Rheumatology

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**SUBJECT: DEVELOPMENT OF A SPECIFIC NATIONAL MODEL FOR PREDICTING THE OSTEOPOROTIC FRACTURE RISK AND ASSESSMENT OF THE BONE MINERAL DENSITY OF AXIAL SKELETON VIA RADIOFREQUENCY ECHOGRAPHIC MULTI SPECTROMETRY (REMS)**

The set of materials presented to me on paper and electronic media complies with the requirements of the Academic Staff Development Act (ASDA) in the Republic of Bulgaria, the Regulations for its application and the Regulations for the academic staff development of MU - Plovdiv.

**I. General presentation of the candidate.**

Dr. Elena Kirilova Kirilova completed her higher education in Medicine in 2016 at the Thracian University - Stara Zagora. She acquired a PhD degree in Rheumatology in May 2021. Since 2019, she has a Master's degree in Public Health and Health Management from the Medical University - Sofia. In 2018, she defended her doctoral dissertation on "Morbidity and Risk Factors for Renal Impairment and Renal Disease in Patients with Allogeneic Stem Cell Transplants: Retrospective Analysis" at the Medical University - Dresden, Germany.

Dr. Elena Kirilova has a significant number of internships and specializations abroad: in 2012, she conducted an internship under the ERASMUS program in the Department of Neuroradiology at the Otto-von-Guericke University in Magdeburg, Germany, and in 2016, an undergraduate internship under the ERASMUS program and a subsequent specialization in the Department of Stem Cell Transplantation. During the period 2016 – 2018, Dr. Elena Kirilova was a member of the German Society of Nephrology. She has several award-winning appearances at congresses in Berlin and Mannheim. The courses, conducted by Dr. Elena Kirilova in the field of Rheumatology for the period 2016 – 2021, are as follows:

1. International course on "Joint Aspiration, Joint Injections and Synovial Fluid Analysis" in Perugia, Italy, 2016.

2. Basic postgraduate course at the EULAR in Belgrade, Serbia, 2017.

3. Individual course on Radiofrequency Echographic Multi Spectrometry (REMS) in Lecce, Italy, 2018.

4. She was licensed as a world university center for REMS in 2020. In the same year, she obtained a certificate in Dual Energy X-ray Absorptiometry (DEXA) at the Medical University - Pleven.

5. Ultrasound course of the Bulgarian Association for Musculoskeletal Ultrasound (BAMSU), conducted by Prof. Batalov in 2021.

Dr. Elena Kirilova is an Assistant Professor of Internal Medicine at "Prof. Dr. Assen Zlatarov" University - Burgas.

Dr. Elena Kirilova is fluent in German and English.

**II. Evaluation of the candidate's research work.**

In relation to her dissertation, Dr. Elena Kirilova has presented 19 scientific publications: 6 publications in foreign and 10 publications in Bulgarian scientific journals, corresponding to 262.5 scores under indicator D of the minimum requirements; 1 dissertation, 1 abstract, 1 published monograph, and citations corresponding to a total of 230 scores under indicator E of the minimum requirements. According to the Regulations for the academic staff development of Medical University - Plovdiv and the required indicators, the research work, presented by Dr. Elena Kirilova, is sufficient for attaining the scientific degree of Doctor of Sciences.

**III. Relevance of the subject.**

The presented dissertation of Dr. Elena Kirilova studies a significant social problem - osteoporosis and the associated fracture risk, which affects the quality and duration of life. In her dissertation, Dr. Elena Kirilova developed a model for predicting the osteoporotic fracture risk, consistent with the specific national data. An innovative ultrasonic methodology for assessment of bone mineral density (BMD) of the axial skeleton, Radiofrequency Echographic Multi Spectrometry (REMS), was applied. The study was performed in 324 women. The objective was clearly and precisely defined. To achieve the objective, 11 tasks were set. In my personal opinion, tasks No. 9 and No. 11, tasks No. 6 and No. 8, as well as tasks No. 4 and No. 5, could be combined, thus formulating three instead of six tasks.

**IV. Methods of the study.**

The used innovative ultrasonic technique, Radiofrequency Echographic Multi Spectrometry, enables the fulfillment of the set objective and tasks. Adequate methods are used in the statistical processing to obtain reliable results. The study results are illustrated with a sufficient number of tables and graphs.

**V. Characteristics of the dissertation.**

1. **The literature review** is presented on 54 pages and 478 literature sources are cited. The review is thorough and competent, supporting the preparation of the candidate.

2. The **section of clinical material and methods** covers 19 pages. For the period 2015-2017, cases of femoral fractures were analyzed in women aged $\geq$ 40 years. The study

included patients from Stara Zagora region with diagnoses ICD: S72.0, S.72.1 and S.72.2. In 324 premenopausal and postmenopausal women, osteodensitometry of the axial skeleton was performed with the innovative REMS methodology. The distribution of women according to the BMD of the lumbar spine and femoral neck was measured by the REMS. According to the BMD, the T-score for the left femoral neck, respectively, the patients were divided into three groups.

3. **The study results** are presented on 41 pages and follow the set tasks. The obtained results make it possible to create a specific model for predicting the independent risk factors for FRAX major osteoporitic fracture > or = 20% by REMS.

4. **The discussion** is presented on 23 pages, and is in-depth and competent. The epidemiological study on the fracture risk for the Bulgarian population was carried out on the basis of the regional data for Stara Zagora region. The data on the regional frequencies of femoral fractures in the Stara Zagora region were compared to the data for the country and these for Romania, Serbia, Turkey, Greece and Mexico.

5. **The conclusions** are 11 in number. **The contributions** are given correctly and I accept them completely.

For the first time in Bulgaria, Dr. Elena Kirilova introduces the Radiofrequency Echographic Multi Spectrometry with Axial Osteodensitometry in the clinical practice. The study results for Bulgaria, obtained by Dr. Elena Kirilova, have been cited by world scientists and experts in osteoporosis. The Bulgarian FRAX model, developed by Dr. Elena Kirilova, allows accessibility and possibility for timely diagnosis and treatment of osteoporosis.

6. **The abstract** is prepared according to the requirements. It contains 8 tables and 22 figures. The main fragments of the dissertation are presented on 64 pages.

**VI. Critical remarks:** None.

I would recommend to Dr. Elena Kirilova to establish an interdisciplinary team on the issues of osteoporosis, as well as possible additions to the National Guidelines on Osteoporosis, as per the capabilities of REMS.

**VII. Conclusion.**

The dissertation of Dr. Elena Kirilova Kirilova ,MD contains scientific, applied and original contributions. The dissertation fully complies with the Academic Staff Development Act (ASDA) in the Republic of Bulgaria and the Regulations for its application, as well as the

Regulations of the Medical University – Plovdiv. Based on this, I give my positive assessment and recommend to the members of the honorable scientific jury to award the scientific degree of Doctor of Sciences to Dr. Elena Kirilova Kirilova, MD in the Doctoral Program of Rheumatology.

June 11, 2021
Plovdiv

The review was prepared by:
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