

**UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE**

**“CAROL DAVILA” BUCUREȘTI**

**ȘCOALA DOCTORALĂ**

**DOMENIUL MEDICINA**

**INTERDISCIPLINARY APPROACH IN  
NEUROLOGICAL REHABILITATION: FOCUS ON  
MINIMALLY INVASIVE PROCEDURES AND  
MODERN TECHNOLOGIES  
ABSTRACT OF THE HABILITATION THESIS**

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The habilitation thesis entitled "Interdisciplinary Approach in Neurological Rehabilitation: Focus on Minimally Invasive Procedures and Modern Technologies" represents a synthesis of rigorous, sustained scientific research results that I initiated after defending my doctoral thesis in 2020, in this highly topical field of great interest and particular relevance to current medical practice. Additionally, the thesis presents my career evolution to date, highlights my academic and scientific achievements, and details my academic career development plan. The thesis is structured in two main parts, followed by an extensive list of bibliographic references.

The first part of the habilitation thesis comprises 4 chapters. The first chapter provides an introduction to the field of Physical Medicine and Rehabilitation, presenting the current context and major research directions addressed, represented by the development of ultrasound-guided techniques for botulinum toxin administration in neurological spasticity, exploration of the regenerative rehabilitation concept through integration of biological and biophysical therapies, analysis of the COVID-19 pandemic impact on rehabilitation services, and extension of therapeutic applications in craniofacial musculature.

Chapter 2 presents the development of a systematic ultrasound-guided approach for botulinum toxin injection in neurological rehabilitation, covering upper limb musculature (distal and proximal), proximal lower limb musculature, and craniofacial musculature. I developed standardized protocols for 24 muscles, with precise ultrasound identification, safe anatomical windows, and controlled dose distribution. The methodology was published in 2025 as a series of four articles, including three guides in the journal *Toxins*.

Chapter 3 details theoretical concepts and study results regarding regenerative rehabilitation. I investigated standardization of PRP biological parameters, proposing seven essential parameters for characterization. I evaluated chronic wound healing techniques with NPWT and antimicrobial biomaterials. I demonstrated the efficacy of innovative mechanophysical techniques: ESWT for spasticity, NMES in cardiac patients, IHHT in obese patients, rPMS in lumbar radiculopathy, and PEMF in low back pain. I documented the efficacy of natural biotherapeutic factors from Techirghiol in gonarthrosis and geriatric rehabilitation.

Chapter 4 analyzes challenges generated by the COVID-19 pandemic. I documented the impact on long-term care facilities, discontinuity of services for chronic neurological patients, accelerated adoption of telemedicine, and post-COVID functional impairment patterns using the ClinFIT COVID-19 instrument, identifying 10% premature retirement due to disability.

The second part of the habilitation thesis is divided into 4 chapters. The first chapter presents my professional journey, from the decision to pursue a career in Physical Medicine and Rehabilitation to obtaining the title of senior physician, and from the beginning of my academic career as teaching assistant in 2016 to the permanent position in 2021.

The second chapter of the second part offers a detailed description of my scientific research activity, fields explored in the last decade, and publications resulting from studying diverse yet equally interesting and relevant topics, such as standardization of ultrasound-guided interventional techniques, regenerative rehabilitation with cellular and biophysical therapies, chronic wound healing, pandemic impact on rehabilitation, telemedicine in neurorehabilitation, and post-COVID sequelae. Sustained and systematic scientific research activity resulted in 44 articles published in extenso in ISI Thomson Reuters indexed journals, 21 articles published in journals indexed in other international databases, an international monograph, numerous chapters in national and international treatises, and participation in 4 international research projects. Due to these publications, I achieved a Hirsch index of 12 (Web of Science) and 15 (Google Scholar), with over 500 citations in Web of Science and 1049 in Google Scholar.

The third chapter of the second part highlights my academic achievements, firm commitment to continuous improvement of both medical knowledge and teaching style, and to maintaining professional excellence standards. It also presents the permanent concern for diversifying teaching methods through interactive courses, continuously updated, clinical internships and practical demonstrations of ultrasound-guided interventional techniques, for maintaining a balance between providing theoretical information and practical exemplification, and for increasing students' and residents' interest in studying neurological rehabilitation. Teaching activity includes 39 scientific events as international lecturer and trainer, being selected in December 2024 for the elite program "I Xellence – Train the Trainer".

The final chapter of the second part is dedicated to my academic career development plan, which includes establishing a Center of Excellence in Spasticity Management, continuing sustained scientific research and publication activity with the objective of minimum 5 ISI articles annually, developing a modern E-learning system, preparing a musculoskeletal ultrasound treatise and standardized protocols based on best international practices, permanent improvement of medical knowledge, and increasing and diversifying professional competencies.

The thesis concludes with the list of bibliographic references, valuable scientific sources that constituted the theoretical foundation of the conducted research.