

UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE „CAROL DAVILA” BUCUREȘTI

ȘCOALA DOCTORALĂ

DOMENIUL MEDICINĂ



TEZA DE ABILITARE

CANDIDAT:

HERDEA ALEXANDRU-DAN

Asistent Universitar

Universitatea de Medicină și Farmacie „Carol Davila”, București

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PERSPECTIVE ASUPRA APARATULUI LOCOMOTOR LA COPIL ȘI ADOLESCENT

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REZUMAT

The habilitation thesis with the title "*Perspectives on the Locomotor Apparatus in Children and Adolescents*" represents the summation of the entire academic, scientific and clinical activity that I have carried out starting with the beginning of my activity at the hospital level and later continuing with the admission to the doctoral studies, finalized by accessing the university career within the 11th Department of Pediatric Orthopedics and Surgery – UMF „Carol Davila” Bucharest.

The locomotor apparatus in children and adolescents represents one of the most dynamic and complex fields of modern medicine. It encompasses not only the growth and development of bones, muscles, and joints, but also the interactions between genetic, metabolic, and environmental factors that shape the future of an individual's mobility and quality of life. Pediatric orthopedics, therefore, stands at the crossroads of prevention, early diagnosis, surgical innovation, rehabilitation, and education. My professional and academic trajectory has been deeply anchored in this field, driven by the conviction that each child deserves a chance for a functional, pain-free, and active life.

From the earliest stages of my training, my career has developed along three interconnected axes: clinical practice, scientific research, and academic involvement. Each of these dimensions has fed into the others, creating a cycle of continuous learning and dissemination. Clinical exposure to thousands of patients in the Pediatric Orthopedics Department of the “Grigore Alexandrescu” Emergency Children's Hospital has provided a unique case base, one of the richest in Romania. This environment has not only refined my diagnostic and surgical skills but has also generated research questions with immediate clinical relevance. The doctoral thesis, dedicated to idiopathic scoliosis, was born precisely from this interaction between daily practice and the pressing need for scientific answers.

Idiopathic scoliosis has remained one of the most challenging disorders in pediatric orthopedics. During my doctoral research, conducted under the supervision of distinguished professors, I investigated diagnostic and predictive elements of curve progression in children and adolescents. The research combined radiographic evaluation, biochemical markers, and clinical scoring systems in order to create a predictive framework that could guide therapeutic decision-making. The findings, published in peer-reviewed journals, highlighted the role of

melatonin, calcium, and vitamin D in influencing the evolution of scoliosis. This was among the first prospective studies in Romania to approach scoliosis from both a clinical and metabolic perspective, paving the way for future interdisciplinary projects.

At the same time, I have devoted substantial attention to **pediatric trauma**, which represents a major component of the caseload in emergency orthopedics. Every year, thousands of children present with fractures, dislocations, and soft-tissue injuries. My research in this field has spanned epidemiological analyses, risk factor evaluation, and treatment optimization. One key contribution was the demonstration of vitamin D deficiency as a significant risk factor for pediatric fractures, an insight that can shape national prevention strategies. Further clinical trials have shown how supplementation with calcium and vitamin D may accelerate fracture healing, thereby reducing hospitalization time and long-term complications. Another line of work addressed the surgical management of fractures with elastic stable intramedullary nailing (ESIN), with the central question of whether casting is still necessary post-operatively. The studies demonstrated that immobilization can often be avoided, improving comfort, recovery, and reintegration into daily activities.

A third research direction has focused on the **child and adolescent athlete**. In recent years, the pressure for early specialization and high performance has generated a unique spectrum of injuries and musculoskeletal adaptations. From Osgood–Schlatter disease to stress fractures and patellofemoral instability, the demands placed on the immature skeleton have raised new clinical and ethical questions. My work has documented not only the incidence of such conditions but also their functional and psychological consequences. For example, in recurrent patellar dislocation, I have studied surgical reconstruction techniques such as MPFL (medial patellofemoral ligament) repair, emphasizing both mechanical outcomes and improvements in quality of life. Moreover, I have explored the paradox whereby flexible flatfoot, often tolerated in childhood, may predispose to chronic pain and reduced sports capacity in adolescence and adulthood. These findings underline the need for balanced counseling of families, coaches, and young athletes regarding both the potential and the limits of pediatric physical performance.

Closely related to this area, **gait disorders** and static deformities of the foot represent another pillar of my scientific activity. Flat-valgus foot, the most common postural deviation

in children, has often been trivialized or overtreated. Through clinical studies and international collaborations, I have analyzed the role of arthroereisis as a minimally invasive surgical solution that improves both functionality and quality of life. These studies have shown that children treated with arthroereisis not only experience correction of deformity but also regain confidence, aesthetic satisfaction, and improved participation in physical activities. Such findings extend the significance of orthopedic treatment beyond radiographic angles, emphasizing the holistic impact on the child's development.

In addition to pathology-focused research, I have been committed to **digital transformation** in medical practice. The “Mediweb” system, implemented within our clinic, has revolutionized patient flow management, electronic medical records, and surgical registries. This platform has facilitated not only more efficient clinical work but also the creation of databases usable for large-scale research. During the COVID-19 pandemic, the integration of digital bed-management tools proved decisive in controlling patient distribution, isolation, and transfers between units. The future perspective is to enrich these platforms with artificial intelligence, predictive analytics, and national registries that can provide a unified picture of pediatric musculoskeletal disorders across Romania.

The academic dimension of my career is equally central. Since 2017, I have been involved in teaching pediatric orthopedics to medical students and residents, both in Romanian and in English. My philosophy has always been to combine theory with practice, to expose students to real clinical cases, and to encourage critical thinking. Over the years, I have supervised 26 graduation theses, each of which achieved maximum evaluation grades, and many of which were later transformed into scientific articles published in international journals. I strongly believe that the value of a thesis is not limited to its defense, but grows when it contributes to the global body of knowledge. For this reason, I guide students towards publishing their findings, thus initiating them early into the culture of scientific communication.

The interaction with students and residents has been enriched by conferences, workshops, and lectures delivered at national and international congresses. I have been honored to present studies in forums such as EPOS, EFORT, and national meetings, where Romanian research was recognized and integrated into global discussions. These presentations

not only disseminate results but also strengthen networks of collaboration, which are vital for multicentric projects.

Looking to the future, my development plan rests on three pillars. First, **minimally invasive surgery** must be expanded and refined, with the aim of reducing tissue trauma, shortening recovery, and maximizing functional results. Techniques such as arthroscopy, percutaneous osteotomies, guided growth, and the use of biologics (PRP, stem cells) will increasingly shape the treatment of pediatric musculoskeletal disorders. Second, **artificial intelligence** holds the potential to transform diagnosis, prognosis, and management. From predicting scoliosis progression to detecting fractures on radiographs, AI can act as a reliable partner for clinicians, freeing time for patient interaction and personalized care. Third, **national standards and registries** are urgently needed in Romania, to ensure uniformity of care and equal access to best practices. These will include protocols for hip dysplasia screening, scoliosis management, fracture treatment, and rehabilitation of young athletes.

Equally important is the goal of creating a **center of excellence and fellowship training program** in pediatric orthopedics. By integrating our section and discipline into international fellowship networks, we can attract foreign residents, export our expertise, and raise the profile of Romanian medicine on the global stage. This would also allow for continuous inflow of ideas, skills, and research opportunities, benefiting both patients and professionals.

In conclusion, this habilitation thesis entitled *“Perspectives on the Locomotor Apparatus in Children and Adolescents”* is not only a synthesis of past achievements but also a projection into the future. It reflects a career dedicated to the health of children’s musculoskeletal system, combining clinical practice, scientific innovation, educational commitment, and institutional development. The central message is clear: pediatric orthopedics must evolve towards a personalized, minimally invasive, and digitally supported medicine, where each child is approached as a whole, and where treatment outcomes are measured not only in radiographs but also in quality of life, reintegration, and long-term potential. Through continued research, teaching, and collaboration, I aim to contribute to this transformation, ensuring that the locomotor apparatus of children and adolescents remains not a limitation, but the foundation of a healthy and active life.