

ABSTRACT

Occupational medicine is a complex medical specialty, with a pronounced interdisciplinary character, which carries out the health surveillance of the active population in relation to the workplace, the identification and prophylaxis of occupational and work-related diseases. It is a clinical medical specialty, etiological, of the relationship between man and his work, on the border between preventive and curative medicine, office and field specialty workplace visit, occupational risk factors identifying), which also involves a good knowledge and practical application of occupational health and safety legislation.

The habilitation thesis entitled "Actualities and perspectives in occupational medicine" contains the most important professional achievements of the author after obtaining the title of Doctor of Medical Sciences in 2005 with the thesis entitled "Obesity - risk factor", under the coordination of Mr. Professor Băcanu Gheorghe MD, PhD and Ms. Professor Rodica Avram MD, PhD.

The habilitation thesis consists of three large sections:

- the first section includes academic, professional and scientific achievements;
- the second section includes the plans and prospects for academic, professional and scientific career development;
- the third part contains references for the research and documentation activity presented in the first two sections, as well as appendices.

My professional career and postdoctoral research are closely related to the two positions I have: senior physician in the specialty of Occupational Medicine, respectively University Lecturer at the University Clinic of Occupational Medicine, within the Department V, Internal Medicine I.

The first part of the thesis covers the evolution and the main professional activities of the postdoctoral period.

Given the strong interdisciplinary character of occupational medicine, as well as the didactic activity, I had the opportunity to be part of several national and international research teams, from projects targeting aspects of musculoskeletal disorders and ergonomics, occupational risk factors and the consequences of exposure to them in agriculture, occupational pulmonary fibrosis, carcinogens and projects aimed at the educational process in our specialty.

The results of these projects have been published in scientific journals with an impact on the scientific community.

The scientific achievements were published in 147 scientific papers, 63 among them published in extenso (23 indexed in ISI Web of Science and 9 in national and international databases).

According to Web of Science, the Hirsch index is 6, with a total number of citations of 76.

I participated as an author, co-author or chapter author in the publication of 6 books.

I also participated as a co-author in the development of didactic materials in electronic format, both as course support for students and as informative materials for post-graduate occupational medicine programs.

The thesis highlights my main scientific achievements by presenting the results of the most important studies in which I participated.

The first section is dedicated to my scientific achievements so far and is structured as follows:

- ergonomics related aspects and musculoskeletal pathology;
- challenges in the medical surveillance of mineral agents occupational exposed workers;
- occupational risk management in the prevention and diagnosis of occupational diseases.

The first area represents a current problem of occupational pathology, diseases due to overwork being the top of the pyramid of occupational diseases, worldwide and at national.

Economic changes, through the disappearance of traditional industries, large factories and the emergence and development of SMEs, technology, are also reflected in the occupational pathology changes.

The introduction of computer work in many sectors of activity, the sudden increase in teleworking professions after the pandemic episode, draws attention to the need of ergonomics and the specialist in ergonomics introduction in the field of occupational health and safety. Sedentary work represents an important metabolic, cardiovascular and carcinogenic risk, but also osteomusculoarticular risk factor, due to the complexity and even severity of its effects.

Low back and neck pain are the most common symptoms associated with musculoskeletal disorders in the working population, associated with disability in high-income countries.

In a study that we conducted in a group of sedentary computer (PC) workers, low back pain was the main reason for rehabilitation therapy referral. The multifactorial character (biomechanical, individual, psychosocial factor) of musculoskeletal disorders (MSD) involves a complex assessment made by the occupational physician at the first examination and then at periodical examinations, to identify individual, anthropometric, hereditary factors, the level of physical activity, posture, non-ergonomic conditions, stressors, work schedule. The presence of the ergonomist and collaboration with the physiotherapist is required to prevent MSD while working at the PC.

In order to evaluate the effect of sedentarism, we proposed to test if ankle torque can be used as a parameter in the evaluation of sedentary activity. To this purpose, together with a group of researchers from the Polytechnic University, we initially described the calibration and setup method for ankle torque measurement to establish the reliability of a customized portable electronic dynamometer. Then, with this device and the established protocol, we evaluated the muscle strength at ankle level to assess the effect of sedentarism measured on two groups, one consisting of chronic sedentary people and another of sedentary people in a pandemic professional context, both subjected to sedentary or active actions for 6 hours. It has been recorded significant decrease in the torque force in the chronically sedentary group. The study highlights

the acute effects of the type of activity, especially sedentary lifestyle and the need to develop ergonomic programs to reduce the acute and chronic effects of sedentary lifestyle.

Repetitive movements are another occupational risk factor in the occurrence of MSD and especially in the development of carpal tunnel syndrome (CTS). For the correct classification of CTS as a professional pathology, I participated together with my colleagues from the "Carol Davila" University of Medicine from Bucharest in conducting a review study on the etiopathogenesis of STC.

For the MSDs prevention, it is important to assess the risk of their occurrence, thus different quantitative assessment methods have been developed. Within our discipline we collaborated on a study assessing the risk of MSD using the OCRA score in a group of repetitive motion workers.

The consequences of repetitive movements combined with non-ergonomic posture, alert work rhythm, work schedule and recovery type intervention through physical therapy and ergonomics were presented in the case of a female instrumental musician.

Recommendations for teleworking can be found in the guide "Ergo@Home Guideline - a Tool for Working from Home Using Information Technology, in Pandemic", where I am co-author and coordinator of the medical part, edited by colleagues from the Polytechnic University.

The second research direction addressed is that of pneumoconioses.

Silicosis is a severe occupational disease that continues to represent an important health problem due to the lack of early diagnosis, effective prevention and lack of specific treatment. Associated in the past especially with the extractive, metallurgical industry, now it represents an emerging risk related to the industry and the processing of artificial stone and the textile industry through sandblasting operations. A comparative study between Romania and Israel highlighted that in Romania, silicosis is a declared occupational disease with the highest prevalence, the origin being the mining industry. Romania is the only European country with an increased risk level for silicosis. In Israel the main sources of silicosis are related to the construction industry and the manufacturing/cutting of synthetic stone.

The mechanism of action of pneumoconiogenic agents is not fully known.

In collaboration with a Cluj-Napoca University of Medicine research team, we collaborated on an experimental study on the inflammatory response at the respiratory level in the case of exposure to glass fibers. High-dose exposure was associated with significantly increased inflammatory elements (increased macrophages in the inflammatory infiltrate, granulomas, collagen deposits on alveolar septa, and fibrosis).

Some mechanisms of action elucidation and implicitly finding of early diagnosis methods in pneumoconioses and in other lung fibrosis of occupational and non-occupational causes were the factors that determined the realization of a review type study on the role of club cells (Clara) in the etiopathogenesis of lung fibrosis in generally and in the context of occupational exposures. The study was carried out together with a group from the Medical University of Bucharest. The motivation for choosing club cells as a subject of study started from their role in the process of epithelial repair as a protective mechanism of the lung, but also in the specific

protection against the action of toxicants by being involved in the metabolism of xenobiotics (cytochrome P-450) as well as an antioxidant action (GSH, DH, AKR). Club cells secrete numerous proteins, the most representative of which are Scgb1a1 (secretoglobin family 1A member 1), known in the scientific literature as CC-10 (club cell secretory protein -10), CC-16 (club cell secretory protein -16), CCSP (club cell secretory protein) or uteroglobin.

In the occupational exposure to respiratory noxious, inflammatory reactions and alteration of the epithelial repair processes occurs, and the secretory products of club cells mediate the communication between macrophages, epithelial cells and fibroblasts with the mitigation of the inflammatory process and/or the reduction of the fibrotic process.

The CC-16 protein is the most studied of the secretory products of club cells in exposure to toxic substances. Based on literature data, CC16 could be a true biomarker in the early diagnosis of occupational diseases caused by exposure to dusts, fibers, chemical substances.

I analyzed occupational respiratory pathology in patients hospitalized in the occupational medicine department for the period 2008-2012. This was dominated by pneumoconioses (74%), especially silicosis (47.2%), pulmonary fibrosis due to chemical noxes (18.4%), bronchial asthma (5.6%), COPD and chronic bronchitis. As profession, most were miners (24.34%), followed by locksmiths (18.43%), welders (15.2%) and molders-formers (12.5%). The main etiological agents were: free silica dust, coal and metals dust. Most cases of pneumoconiosis were classified according to the ILO coding in categories 1 and 2.

In the third section I discussed aspects related to the identification of some occupational risk factors, which can be considered emergent, carcinogenic and neuropsychological stress factors.

Although occupational cancer represents, according to statistics, approximately at least 4% of cancer cases, in Romania, the number of new declared occupational cancer cases in the last 10 years was 23. In a retrospective observational study, we aimed to identify occupational exposure to carcinogens in a group of 148 patients diagnosed with cancer. The main locations of cancer were: lung (24.32%), digestive cancers (21.62%), breast (18.24%), ovarian and cervix (15.54%). The hereditary factor was present in 29.05% of cases. Professional exposure revealed 49.32% cases that worked in night shift, 43.24% with occupational stress. Other exposures were: welding fumes, mineral oil, organic solvents, solar radiation, electromagnetic field. Highly significant association was with smoking. In conclusion, the exposure to carcinogens was multiple both occupational and non-occupational factors (e.g. smoking) being difficult to establish the occupational etiology of cancer. It is needed to introduce occupational exposure, seniority at work, exposure duration, as parameters in the national cancer registry, in order to achieve the active prevention of occupational cancers.

The interest in carcinogenic agents and occupational cancer is also highlighted by the participation in two ongoing international projects, in the HORIZON program: "Cancer Prevention at Work (CPW): Occupational health surveillance in the implementation of prevention of infection-related cancer" – 2023-2027, proposal no.: SEP-210879398 and EXIMIOUS project - "Mapping Exposure - Induced Immune Effects: Connecting the Exposome and the Immunome" – 2020 - 2024.

Occupational stress is an emerging risk factor, due to the nature of work that is constantly changing, accelerated trend, with a large volume of information, new technologies appearing in a relatively short time. All these factors, through the content or form of work, overload the worker to adapt to the new working conditions. Stressors and stress itself are difficult to assess and manage. The consequences of stress on the neuropsychic level manifest from chronic fatigue, then anxiety, depression and reach the peak with the burnout syndrome. The health sector is recognized as the field of activity with the most causes of burnout. Together with a team from the Work Capacity Expertise Institute, we conducted a study on the burnout syndrome, causes and ways of coping among colleagues in this specialty. The MBI-HSS (Maslach Burnout Inventory - Human Services Survey) short version, Brief-COPE (Coping Orientation to Problems Experienced Inventory) questionnaires were used. An important percentage of the participants in the study showed elements of burnout, not only as a result of stress, but also as a decrease in self-esteem. The main occupational stressors were time and workload. The most effective attitudes to deal with burnout were mental disengagement through other activities, active coping through action, and acceptance of reality. Identifying and acting on occupational risk factors can be an extremely important link in managing occupational stress.

The COVID-19 pandemic was an important stress factor especially for the medical staff, both through the biological and the psychological component. Together with a team of cardiologists and occupational medicine doctors, the relationship between stress level and cardiovascular risk assessed by pulse wave velocity (PWV) was analyzed. The results of the study showed increased levels of stress and PWV during periods with a high number of hospitalized SARS-COV-2 patients and lower levels during periods with a low number of patients. Assessment of arterial stiffness may be a relatively simple method of assessing cardiovascular risk in the active population.

In the context of the pandemic, we analyzed the impact of SARS-COV-2 infection on the ankle joint two months after the infectious episode classified as a mild form. Peak ankle torque measurement was performed with a custom electronic dynamometer. No significant differences were obtained in peak torque variability between the group of subjects who had COVID -19 compared to the group without infection. A limitation of the study was the small group of participants (8). Future studies may also evaluate other muscle parameters (endurance, stability, and variation during MVIC) to assess the muscle consequences of SARS-COV-2 infection.

At the educational level, I participated in an international study, which purpose was the assessment, in terms of quantity and level and subjects regarding the knowledge of occupational medicine that medical students receive in different European countries.

Concerning **Plans and perspectives** for my future evolution and development I structured then as future directions in teaching career, in the scientific career and in the academic career.

As future directions in **teaching career** I will continue to promote an interactive teaching model based on accessible communication with students and resident doctors, using a lot of cases and practical situations to keep them interested, develop their practical sense and clinical thinking, and involve them in using databases to access current information in the field of occupational health.

I am advocating and will act for the re-establishment of the teaching cycle for radiology technician training. Currently, this category of medical personnel is trained within a high school structure. In order to sensitize nurses with higher education within UMFT to the presence of occupational risks, the prevention and recognition of occupational pathology, I propose the introduction of occupational medicine as a subject of study for students of this higher education segment as well.

Regarding the training of resident doctors, I will continue the necessary steps together with other university centers colleagues, to modify the education curriculum in the specialty, respectively harmonizing it with the other European curricula, in according to the Romanian requirements and situation.

Regarding my **scientific career**, I will continue to carry out most of the research activity in multidisciplinary teams including specialists in occupational medicine, physiotherapy and recovery, diabetology, cardiology, neurology, work capacity expertise, dentistry, as well as engineers, psychologists and biostatisticians. I want to continue this model of good practice because only a team of related specialties can analyze and solve the complexity of a problem.

In my future **research activity** I will continue to focus on the main directions consisted in: aspects related to ergonomics and osteomusculoarticular pathology, identification of occupational risk factors in the prevention and diagnosis of occupational diseases, surveillance of occupational exposures to mineral agents and introduce tests for early detection of diseases.

I intend to participate in grant competitions, including CNCSIS, and together with a complex team of experienced researchers, but also young researchers, both from our department and related departments, to succeed in attracting funds from research grants for the development of a research department.

I will participate whenever possible in national and international scientific events, because they always represent the opportunity to exchange experience between professionals, to learn something new, to see how colleagues from other countries, from other research collectives approach and solve the same clinical or workplace situations.

As future directions in the **academic career** I propose an axiological orientation of the learning process which includes individualization of the educational process, accessibility of the professional-scientific language, promoting active-participatory, student-centered methods, the use of various modern training methods.

To better anticipate the results of academic activities, I will take into account to design a teaching strategy appropriate to the subject to be mastered by students, to accept and encourage students' questions, alternative points of view, constructive criticism and personal solutions, to inform students in a timely and unequivocal manner about the criteria and ways of evaluating their activity and professional results and to establish tasks according with volume and degree of difficulty.

Through the achievements so far, the accumulated experience and the materialization of projects and future plans, I want to contribute to the academic activity of the University of Medicine and Pharmacy "Victor Babeș" Timișoara, bringing added value and contributing to strengthening the institution's prestige.

"Education is not preparation for life, it is life itself!" John Dewey