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METHODS, TECHNIQUES FOR PAIN DIAGNOSIS: MEDICINE AND BIOMEDICAL ENGINEERING

Abstract. Chronic myofascial pain syndrome leads to the development of myofascial pain syndrome, corresponding neurological symptoms. Neck pain syndrome is the fourth most common cause of disability. It is well known that the main factors in the mechanism of pain in the cervical spine, occipital area, upper extremities, dizziness, gait disturbances, paresthesia, and neurological symptoms are degenerative-dystrophic processes in the cervical spine and its complications, anomalies in the development of bone structure and musculoskeletal apparatus, post-traumatic manifestations, oncopathology, specific and nonspecific inflammatory processes. It is widely known that pain chronicity significantly disrupts people's lives and health, affects medical health indicators, social and economic indicators of the living object and the country as a whole. The degree of muscle pain in clinical practice is mostly determined by palpation. Three degrees of pain are distinguished: I – moderate pain, without motor reactions (subjectively); II – pronounced pain, accompanied by the patient's mimetic reaction; III – sharply pronounced pain, general motor reaction of the patient. Cooperation between specialists in biomedical engineering and doctors of various specialties is important. The goal of cooperation for each doctor with biomedical engineers is to maximize the objectivity of diagnostics, assessment of treatment methods, possibilities of disease prevention, rehabilitation, implementation of innovative techniques in medicine.

Key words: pain, bachelor's degree, Educational-Professional Program, rehabilitation, diagnosis.

Problem Statement

Based on the results of the second "rapid assessment" of damage to the medical infrastructure from large-scale war and reconstruction needs (RDNA) conducted by the Government of Ukraine, the World Bank Group, and the European Commission in cooperation with development partners, the reconstruction needs of the healthcare system of Ukraine are estimated at $16.4 billion over the next 10 years, as well as an increase in the volume of critical medical services for the population. Enemy attacks have already destroyed or damaged over 1,500 medical facilities [6]. Therefore, the training of biomedical engineering specialists who could be involved in restoration, affordable repair of medical equipment is difficult to overestimate. The leading university in southern Ukraine, the Odesa Polytechnic National University, particularly the Department of Biomedical Engineering, ID: 50578, provides training for bachelors and masters who participate in interdisciplinary projects, training, and scientific research during their studies. Based on the "Educational-Professional Program" and "Curriculum" under the bachelor's program, which provides a comprehensive system of physical, socio-cultural, pedagogical, and technical conditions ensuring the education and development of students at Odesa Polytechnic University [5]. Selective disciplines in the medical direction motivate biomedical engineers to collaborate with physicians of all specialties. The main task for neurologists, rehabilitologists, occupational therapists, physical therapists, traumatologists, vertebrologists, orthopedists, cardiologists, rheumatologists, and other clinicians is early, accurate, and objective diagnosis of pain [7]. In Ukraine, there are clinical-diagnostic, rehabilitation, specialized centers equipped with highly informative medical equipment for the treatment, prevention of pain. Biomedical engineers involved in the design, installation, testing, and maintenance of medical equipment must have special knowledge and skills in medicine and engineering. Engineers working with state-of-the-art diagnostic equipment, prevention of disease, treatment, physiotherapeutic rehabilitation of patients must possess advanced technologies and knowledge of software available in medical equipment institutions. Diagnostic examinations of people under modern conditions are conducted in DICOM mode. The usual use of manufacturer's software for interpreting images is possible with the help of Syngo Osteo, Horos available from the Mac App Store, and others. In particular, radiodiagnostics is based on fundamental medical and physico-mathematical disciplines. It reflects basic integrated knowledge of normal, topographical, pathological anatomy and physiology, biological physics, and chemistry [8]. Modernization and innovation of medical equipment, software ensure timely diagnosis, allow for optimal choice of treatment tactics or surgical intervention, reduce the number of complications and, consequently, the number of people with disabilities. Determining students' priority methods and techniques for diagnosing pain in various areas of the living organism with the help of teachers, working out and applying all available options in software is

the main task and goal of the educational process of the Department of Biomedical Engineering at the Odesa Polytechnic National University.

Conclusions

1. The implementation of innovative technologies, methods, and approaches to early diagnosis in medicine ensures improvement in people's quality of life.

2. Thorough study of the materials of the "Educational-Professional Program" and "Curriculum" at the bachelor's stage at the Department of Biomedical Engineering allows specialists, in particular, to determine priority methods of pain syndrome diagnosis.

3. Modernization, economic justification, feasibility, and ecological sustainability of medical equipment, as well as optimization of software, will shorten patient examination time, reduce chronicity and disability of patients, decrease economic burden, and enhance the rational use of medical equipment and technology.

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