

**EFFECTIVNES OF INTENSIFICATION AND ACCELERATION  
TECHNOLOGIES IN TEACHING CHRONIC HEART FAILURE TO STUDENTS**

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**Abstract.** This article analyzes scientific literature on the effectiveness of teaching chronic heart failure (CHF) to students using intensive and accelerated technologies. The study evaluates the impact of innovative teaching methods on students' understanding of the disease, clinical reasoning skills, ability to comprehend diagnostic and treatment principles, and practical competencies. The research findings confirm that applying interactive and modern educational technologies in CHF teaching accelerates students' learning processes and enhances their preparedness for clinical and practical work.

**Key words:** chronic heart failure, intensification, acceleration, interactive learning, innovative technologies, cardiac remodeling, learning through case-based scenarios, innovative teaching methods in team-based learning.

**Introduction.** Chronic heart failure is a disease in which the heart cannot fill and pump blood adequately for various reasons. These reasons include epicardial, myocardial or endocardial lesions, valvular heart disease, coronary artery disease, aortic disease, arrhythmias and endocrine disorders. However, left ventricular dysfunction is present in most cases of heart failure and is the most important factor in determining monitoring and treatment strategies. Therefore, heart failure should be diagnosed and classified according to left ventricular function [1]. In the United States and Europe, CHF affects approximately 26 million people, of whom 1% - 2% seek medical attention [2]. Although modern medicine is developing new approaches to effectively treat and prevent this disease, there is an increasing need to update, intensify and accelerate the methods of teaching this topic in higher medical education institutions. For medical students, a thorough study of the pathogenesis, clinical course, diagnosis and treatment of SYV is important not only for deepening scientific knowledge, but also for providing quality medical care to patients in future practice. Therefore, the introduction of innovative pedagogical technologies in medical education, enriching traditional approaches with modern methods, is one of the urgent tasks. Today, the use of information and communication technologies, virtual simulations, interactive teaching methods focused on clinical practice, and problem-based

learning methods are important in the effective organization of the educational process. Such technologies allow increasing student activity, faster mastering of the basic principles of the disease, and the development of independent analysis skills.

**Materials and research methods.** The study studied the results of the latest scientific literature, clinical studies, and meta-analysis published in 2019-2024. Using scientific databases such as ScienceDirect, PubMed, eLIBRARY Scribbr and Google Scholar, about 20 scientific articles were studied on the effectiveness of intensification and acceleration technologies in teaching SYY to students. The results obtained during the study were analyzed and the effectiveness of intensification and acceleration technologies in teaching SYY to students was assessed.

**Purpose of the study.** To analyze the effectiveness of intensification and acceleration technologies in teaching SYY to students based on scientific literature and articles and to assess the impact of this method on the process of students' learning.

**Background.** At least half of the millions of patients with heart failure (HF) worldwide have heart failure with reduced left ventricular ejection fraction (LVEF). The primary factor in the pathogenesis of HF is the initial decline in cardiac systolic function. However, for more than a century, scientists and physicians have failed to develop effective and safe oral therapies that directly improve systolic function [3]. Echocardiography, an important tool for diagnosing heart failure in primary care, is also limited. Therefore, early detection of HF is somewhat challenging, as cardiac remodeling may occur before symptoms appear [4]. Therefore, there is a need to study the causes of chronic heart failure and search for more effective treatments to improve the quality of life and survival rates of patients. Traditionally, the treatment of CHF has been focused on modulating the neurohumoral and sympathetic systems, using drugs such as angiotensin-converting enzyme (ACE) inhibitors, beta ( $\beta$ )-blockers, and mineralocorticoid receptor antagonists (MRAs) [5]. The use of innovative pedagogical technologies in medical education is becoming increasingly important. In particular, effective teaching of common and complex diseases such as chronic heart failure to students will improve the quality of medical practice. Therefore, medical students should study this pathology in depth. While traditional teaching methods are based on theoretical knowledge, modern methods are practice-oriented, allowing students to acquire knowledge independently and interactively. Modern educational technologies serve to deepen students' knowledge by intensifying and accelerating the learning process. Intensification and acceleration methods are effective in teaching CHF. Currently, there are several methods of intensive training of students, which we will introduce below.

For several years, traditional clinical practice and theoretical educational experiences have been replaced by virtual, remote simulation educational experiences for medical students and teachers. This process has used telemedicine, technology-enhanced scenario methods, and screen-based simulation methods. Reliable simulation is widely used in medical education. This method is safe and does not pose a risk to anyone's life. Also, the simulation method plays an important role in teaching and assessing the professional competence of students. According to the results of the conducted meta-analysis and systematic review, this method has been found to be highly effective in the educational process. It also helps students develop professional skills related to the medical profession, increase their knowledge, build self-confidence, enjoy learning, and develop practical skills such as

communication, clinical reasoning, and analysis that are necessary for medicine. In addition, a quasi-experimental study design is an important guarantee in confirming the effectiveness of simulation education [6]. Simulation education allows students to practically test their knowledge and skills by creating a realistic clinical environment. The use of simulation education in teaching chronic heart failure provides students with the opportunity to gain practical experience and better understand clinical situations. This method helps develop critical thinking, decision-making, effective communication, and teamwork skills. Therefore, the role of simulation education in the education process of medical students is very large.

Due to the limited teaching time, innovative teaching methods such as case studies and group learning are becoming increasingly important, as they help develop independent thinking and practical skills. The integration of multimedia tools, including virtual reality and 3D reconstruction, allows for a deeper understanding of complex anatomical structures and medical techniques. These approaches provide teachers with dynamic tools to make the teaching process more effective. However, balancing theoretical knowledge with practical application is not easy, as this field is very complex. The combination of innovative teaching methods such as case studies and group learning helps to overcome these difficulties, as it helps to improve knowledge acquisition and lesson effectiveness [7]. Teaching chronic heart failure based on case studies and clinical cases helps students apply theoretical knowledge to real disease situations. Advantages of this method: strengthening theoretical knowledge, i.e. students learn how to apply the pathogenesis, clinical symptoms and treatment principles of CHF in real life. Developing analysis and logical thinking, i.e. in each clinical case, patient complaints, laboratory and instrumental examination results are discussed. This teaches students to draw independent conclusions. Improving practical skills, i.e. students develop important clinical skills such as diagnosing a patient, prescribing medications and developing an individual treatment plan. Through case studies, students develop decision-making skills appropriate to various clinical situations. Developing teamwork and communication, i.e. through group work, students learn to exchange ideas, consult with colleagues and make evidence-based decisions. Using case studies in teaching chronic heart failure not only increases students' theoretical knowledge, but also prepares them for a real clinical environment. The knowledge and skills acquired through this method will serve to improve the professional training of future cardiologists and provide quality medical care to patients. While digital technology education cannot completely replace education provided in a clinical setting, it can help the learning process. This method explores the importance of technology-enhanced education in medical education, especially in the field of cardiology. The increasing popularity of this method is mainly due to its ability to overcome a number of barriers to education. The variety of digital learning tools allows you to adapt to the individual learning styles of students. Digital technology is flexible in time and space, creating the possibility of synchronous (simultaneous) and asynchronous (at different times) learning. Asynchronous learning is especially convenient for students with high workloads and limited time. In addition, this method facilitates the study of medicine, reduces travel costs, and allows students to participate remotely. The use of video conferencing tools such as Zoom, Microsoft Teams, and others has increased dramatically during the COVID pandemic. These platforms have allowed local scientific conferences, lectures, and small group classes to continue. However, it is important to apply the basic pedagogical principles outlined earlier to increase the effectiveness of virtual learning. Research shows that excessive use of these platforms increases feelings of fatigue and stress in students. In addition, it has been found that a lack of eye contact and nonverbal signals reduce

engagement and productivity among group members. To reduce these negative effects, it is recommended to create a strong sense of community within the study group, as well as use strategies that encourage vocal discussions and visual attention. Digital technology has now become an integral part of medical education. Its ease of use and on-demand delivery make it a perfect fit for the lifestyles of healthcare professionals and residents. The variety of available tools and formats allows students and teachers great flexibility [8]. Teaching HF in this way allows medical students to acquire not only theoretical knowledge, but also clinical skills. Modern digital technologies play an important role in making this process effective and interactive. There are several methods of teaching using digital technologies. Virtual and augmented reality This method helps students visually explain the pathophysiological processes of heart failure. In virtual simulators, students learn to manage cardiac activity, communicate with patients, and assess symptoms in a virtual environment. Augmented reality software allows students to better understand cardiac anatomy and pathologies by viewing them in real time. Clinical decision-making modules - simulations powered by artificial intelligence allow students to assess the patient's condition and choose optimal treatment strategies. Interactive patient profiles for heart failure - students improve their clinical skills by virtually analyzing patients of different ages, genders, and comorbidities. Mobile educational applications (UpToDate, Medscape, Complete Anatomy) allow students to study information about heart failure at any time. Electronic textbooks - students can read updated scientific information on heart failure at any time.

**Conclusion.** Chronic heart failure is one of the most important and widespread diseases in medicine, which is characterized by a disruption in the supply of oxygen and nutrients to the body as a result of insufficient functioning of the heart muscle. Since the number of patients suffering from this disease around the world is increasing every year, in-depth study of the pathogenesis, clinical course, diagnostics and treatment of the disease plays an important role in the training of doctors. Therefore, improving the teaching process in HF in medical educational institutions, organizing it using intensive and accelerated technologies is one of the priorities of modern medical education. Studies and best practices show that the use of modern interactive educational technologies in teaching ENT, along with traditional lectures and seminars, significantly increases the effectiveness of students' in-depth study and mastery of this disease. In particular, the widespread use of virtual simulations, multimedia technologies, distance learning platforms, case study teaching methods, and intensive practical training in the modern medical education system further consolidates student knowledge. Organizing ENT education using intensive and accelerated technologies provides several advantages: it allows students to consolidate theoretical knowledge with practical examples. It helps to develop the skills of analyzing real clinical cases and making quick decisions in emergency situations through the use of simulation technologies. Through the opportunity to work with virtual patients, students experience clinical situations that they may encounter in real life. It allows for independent learning through digitization of laboratory work and simulations. Interactive seminar sessions serve to develop communication skills between future doctors and patients. Unlike traditional education, accelerated technologies allow you to convey more information in a short time. Through distance learning opportunities, students can study materials at a time convenient for them. Multimedia materials, video tutorials, and interactive tests make the learning process more interesting and effective. Organizing the educational process in the SYU using intensive and accelerated technologies helps to improve the quality of medical education. This approach ensures that students' knowledge and skills are solidified, creating the basis for their future

development as highly qualified doctors. Therefore, the introduction of innovative technologies in higher medical education institutions and ensuring their effective use is one of the urgent issues of today.

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