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на рівень довіри населення до фармацевтів і системи охорони здоров'я загалом. По-друге, зменшується ризик професійних помилок, пов'язаний з недостатньою підготовкою молодих спеціалістів.

З етичної точки зору, важливою перевагою є можливість навчання без шкоди для пацієнтів, що відповідає принципу «не нашкодь». Інтерни мають змогу експериментувати, аналізувати наслідки своїх рішень та формувати відповідальне ставлення до професійної діяльності.

Таким чином, використання наукової технології «Віртуальна аптека» у викладанні фармацевтичної опіки фармацевтам-інтернам є ефективним інструментом удосконалення професійної підготовки в умовах сучасних соціально-етичних та деонтологічних викликів. Ця технологія сприяє формуванню практичних навичок, етичної свідомості та професійної відповідальності майбутніх фармацевтів.

Інтеграція «Віртуальної аптеки» в освітній процес відповідає сучасним тенденціям розвитку медичної освіти та є перспективним напрямом підвищення якості фармацевтичної опіки. Подальші дослідження доцільно спрямувати на оцінку довгостроковості впливу цієї технології на професійну діяльність фармацевтів і рівень задоволеності пацієнтів.

THE IMPORTANCE OF COGNITIVE-COMMUNICATION TEACHING IN THE STUDY OF PHARMACOLOGY AND PATHOPHYSIOLOGY AS COMPONENTS OF CLINICAL THINKING

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Abstract. In medical education, basic approach to mastering competencies is the formation of the foundations of clinical thinking, i.e., the cognitive ability to solve professional tasks based on previously acquired knowledge, primarily the ability to analyse information, identify the root cause of a problem, generate various options for its solution, and the ability to construct consistent, reasoned arguments and draw conclusions.

Keywords: professional competencies, clinical thinking, cognitive skills, cognitive-communication methodology

The current stage of development of higher professional medical education involves changing the system of knowledge that determines the understanding of the development, course and pharmacocorrection of a pathological condition (disease). According to the competence-based model of training medical specialists, a graduate of a higher medical educational institution must have the following professional competencies:

- the ability to take a systematic approach to the analysis of medical information using acquired theoretical knowledge and practical skills.
- the ability to perform pathophysiological analysis of clinical syndromes, justify pathogenetically justified principles of diagnosis, pharmacocorrection, and prevention.

An important category of competence acquisition is the formation of the foundations of clinical thinking, i.e., the identification of internal pathogenetic relationships between symptoms, combining them into syndromes and nosological forms. In general, clinical thinking is defined as the cognitive ability to solve professional tasks based on previously acquired knowledge [10].

Recently, cognitive technologies have been widely applied in the sphere of education [23]. They also play an important role in medical education, including their impact on learning, academic performance and professional competence of students, considering cognitive differences between students and their ability to apply already acquired knowledge to new and unfamiliar problems and situations.

The key cognitive skills in mastering clinical thinking include: first, critical thinking, as the ability to analyse information, assess its reliability and find cause-and-effect relationships. According to D. Halpern's definition, critical thinking is characterised by deliberation and logic, the use of cognitive skills that increase the likelihood of achieving the desired result [13]. Secondly, it is the ability to identify the root cause of a problem, generate different solutions, evaluate them, and choose the best one. Thirdly, it is the ability to keep several important facts in mind while simultaneously considering them, which is critically important for doctors. Fourth, it is the ability to construct coherent, reasoned arguments and draw conclusions based on available data. And fifth, it is the ability to focus on an important task, especially in the context of multitasking, which is inherent in medical practice [17].

Thus, thanks to the cognitive approach to studying pathophysiology and pharmacology, it is possible to accumulate and organise certain theoretical knowledge of students. Combining communicative and cognitive approaches to teaching pathophysiology and pharmacology contributes to the more effective use of previously acquired knowledge from other medical and biological disciplines (anatomy, physiology, biochemistry, histology, etc.).

To implement a cognitive-communication approach to mastering the fundamentals of clinical thinking when studying pathophysiology and pharmacology, the use of innovative methods may be most effective. Innovative teaching methods include the active use of technologies such as **case studies and discussions** that stimulate student engagement and promote the development of critical thinking.

Among the interactive forms used in teaching, the most common are: analysis of mistakes during discussion of a particular learning situation; the "discussion" method; commenting and evaluation with identification of key mistakes or situational misunderstandings; the problem-search method; work in small groups, etc.

The basis of the cognitive approach is the formation of complex ideas that link the basic level with current clinical situations [24].

Cognitive learning methods should be based on the following methodological components:

- forming an adaptive way of thinking – the ability to make diagnostic decisions based on the "how-to" factor
- developing cognitive flexibility, i.e., the student's ability to adapt to learning conditions in response to task requirements. Thus, developing adaptive thinking and cognitive flexibility is particularly important in medical education, as professional activity requires the simultaneous integration of diverse knowledge and skills.

The most acceptable method of presenting educational material is to create a so-called "predictive scheme". According to Naiser (1964), predictive schemes are cognitive structures that prepare students to accept certain types of information and thus guide their cognitive activity, laying the foundation for professional medical thinking.

Pathophysiology combines knowledge from various medical and biological sciences, providing a basic link between fundamental and clinical medical sciences and their application in clinical practice, as it promotes the mastery of basic concepts regarding the onset and development of diseases, i.e., a deep understanding of the pathogenesis of disease. Therefore, the task of pathophysiology is to identify and describe:

1. the causes and patterns of the onset of diseases and pathological processes (i.e., aetiology).
2. the mechanisms of their development as a complex of pathogenic and adaptive processes (i.e., their pathogenesis).
3. Principles of diagnosis and algorithms for their treatment and prevention [21].

The importance of studying pathophysiology is also determined by the effective use of the results of instrumental and laboratory diagnostics. Some students believe that by mastering modern equipment and instruments, they will be able to effectively diagnose and treat diseases [33], forgetting that interpreting only the results of clinical, laboratory, and instrumental examinations can lead to diagnostic errors [14], and thus to certain errors in choosing further treatment tactics [25]. A study conducted by Braun L.T., Zwaan L., Kiesewetter J. et al. (2017) showed that the main cause of

diagnostic errors in young doctors is an insufficient ability to correctly correlate the mechanisms of disease development and symptoms, which leads to errors in the creation of a further therapeutic contour [3]. Elstein et al. (1978) described two main types of errors made by medical students when analysing and interpreting the results of clinical and laboratory studies in the context of forming a preliminary diagnosis and a pharmacocorrection scheme for a pathological condition: 1) overinterpretation or underinterpretation, and 2) misinterpretation [6].

Identifying the most common, fundamental patterns and mechanisms of development and outcome of pathological processes and diseases allows us to answer the questions "why does it occur?" and "how does it develop?" in relation to a disease or pathological process, and, accordingly, "how to detect it?" and "how to treat and prevent it?" in relation to a disease.

The most reasonable method for implementing pathophysiology tasks is to combine traditional lectures with the study of specific cases or problems, group discussions, i.e. problem-based learning (PBL) [12]. Problem-based learning (PBL) is based primarily on the integration of existing knowledge and skills [2] and helps students develop critical thinking skills for independent problem solving [5]. Barrett (2005) [31] defines PBL as learning that is the result of a process of working towards understanding how to solve a problem. The use of multi-level situational tasks in the form of case studies that combine analysis, synthesis, generalisation and comparison will help students systematise information about a specific pathophysiological manifestation, such as the characteristics of the development of a typical pathological process, e.g. inflammation, in a 'hypothetical' patient. This will create conditions for searching, systematising and independently interpreting information on a specific topic from various information sources, i.e., the formation of the ability to make theoretical generalisations [20].

To implement problem-based learning (PBL) in pathophysiology, the case-based learning (CBL) method can be used. The essence of the case-based learning method is the use of a methodological approach based on specific clinical cases taken from real medical practice. The case study method focuses on developing the ability to act in situations where there is no single answer to a question, but rather several answers that may compete in terms of their degree of truthfulness. In such cases, it may be appropriate to use situational tasks in the form of structured (short and accurate description of the situation with the necessary data) mini-cases (a mini-case formulated in the form of one or two paragraphs, with questions to be answered), with the gradual use of components such as "analysis," "assessment," "problem solving," and "decision making" [30].

The essence of applying the case method in the process of studying pathophysiology is that students are asked to comprehend the information presented in a described situational task, which can range from a few sentences on one page (a short European-style case) to many pages (an extensive American-style case). The description of such a situation activates a certain set of knowledge already acquired by students in other fundamental disciplines (human physiology, biochemistry, anatomy and histology, etc.) [4]. Thus, the main outcome of the case discussion should be the identification of meaningful keywords, phrases, or instrumental and laboratory indicators that have a certain semantic load and perform the function of a "search algorithm for the correct answer." The use of this methodological approach in the study of pathophysiology additionally creates a basis for the implementation of simulation-based education (SBE), which can improve the transfer of theoretical knowledge into clinical practice [34].

It is more expedient to work with pathophysiological cases in small groups of students in classroom [19]. The case study describes the general condition of a hypothetical patient, lists characteristic symptoms and provides laboratory or instrumental examination data. To answer the questions in the case study, students can use not only the available resources (textbooks, pathophysiology manual), but also external sources (online resources).

When discussing case studies with students, the aim of the students' work is to form a preliminary conclusion about the case study based on theoretical reasoning [32], considering the connection between the pathophysiological mechanisms of the development of certain disorders of organ (tissue) function and their symptoms (syndromes). In this case, it is advisable to use the strategy of unfolding case studies (UCS)[16]. The main goal of this strategy is to develop skills and reasoning

for a deeper understanding of pathophysiology. It has been shown that the use of UCS increases student engagement, encourages teamwork, and promotes the development of clinical judgement [7]. Thus, students develop the ability to use the method of pathophysiological analysis to further substantiate the principles of pharmacotherapy of diseases [9].

Thus, the case study method is a tool that allows theoretical knowledge to be applied to solve practical problems [18]. The method promotes the development of independent thinking in students, the ability to listen to and consider alternative points of view, and to express their own views in a reasoned manner. With this method, students can demonstrate and improve their analytical and evaluative skills, learn to work in a team, and find the most rational solution to a given problem. The use of case studies in small teams when studying pathophysiology helps to transform students' individual knowledge into a unified system for forming the foundations of clinical thinking. The thematic structure of this discipline allows its educational topics to be considered as separate "nodes" of systematised knowledge that are logically connected to each other. In addition, knowledge of the basic concepts of pathophysiology, the mechanisms of development of typical pathological processes, and the mechanisms of cell damage will contribute to a more thorough study of clinical subjects.

Without a competent pathophysiological analysis of the disease, it is impossible to determine effective methods of etiotropic and pathogenetic pharmacocorrection of diseases, namely:

- **The basis for etiotropic therapy (impact on the cause):** To eliminate the cause of the disease, it is necessary to understand how the pathogen (virus, bacterium) or harmful factor interacts with the body. Pathophysiology helps to identify vulnerabilities in the life cycle of the disease.
- **Basis for pathogenetic therapy (impact on development mechanisms):** Many diseases have complex mechanisms (e.g., inflammation, thrombosis, autoimmune reactions). Analysis allows intervention in a specific link in the pathological process, stopping its progression, for example, by using immunomodulators in autoimmune conditions.
- **Individual approach:** Analysis allows us to understand why the same disease progresses differently in different patients, which allows us to select personalised treatment.
- **Predicting and preventing complications:** Understanding pathophysiology helps predict the development of complications before they occur.

Thus, the connection between pathophysiology and pharmacology is fundamental to medicine, representing the relationship between "understanding the mechanisms of disease" (pathophysiology) and "methods of influencing these mechanisms" (pharmacology). Pathophysiology explains why and how a diseased organism functions, while pharmacology provides the tools (medicines) to correct these disorders:

Understanding the mechanism of the disease allows us to identify drug targets. For example, knowing that the renin-angiotensin system is disrupted in arterial hypertension justifies the use of ACE inhibitors. Diseases of organs (liver, kidneys) alter pharmacokinetics – the processes of absorption, distribution, metabolism and excretion of drugs. Pathophysiology helps to predict how a disease will alter the efficacy of a drug (for example, reduced kidney function requires dose adjustment). In addition, the combination of pathophysiology and pharmacology helps to understand how disease changes receptor sensitivity, which affects efficacy and side effects, i.e., to study the interaction of drugs with damaged cells and tissues.

Studies have shown that newly qualified doctors make mistakes when prescribing specific pharmacotherapy [27]. Combining pathophysiology and pharmacology can therefore prevent such mistakes in their future professional practice.

The cognitive teaching method aims to activate prior knowledge in processing new information to create a stable platform for the further implementation of the new knowledge acquired [28]. An element of the cognitive approach in practical classes is that, after reading a text describing an "unknown" drug, the student identifies its main elements and justifies its use. The focus in the implementation of cognitive teaching methods in pharmacology should be on teaching clinical reasoning skills, during which relevant clinical data are identified, and priorities are set for confirmation or refutation [26]. The most optimal methods for engaging students in the learning

process may be constructivism and network learning theory, where constructivism requires certain experience in the use of medicines [8], and the teacher, using elements of network learning, guides the student to use certain Internet sources of information [22]. To teach the skills of arguing for the choice of a drug (drugs), it is reasonable to use complex practical-oriented tasks in a team-based learning (TBL) environment, as a type of problem-based learning [36].

All this will allow students to consciously assimilate certain information and form the most important methodological techniques for improving mental activity, and therefore clinical thinking, while the cognitive-communicative teaching method allows them to understand what factors influence the assimilation of material and how to present it effectively. Based on the above, we can formulate the methodological features of teaching pharmacology within the framework of cognitive methodology [29]. In the educational process, it would be rational to use tasks that allow students to identify not just one solution, but several. For example, you can give the following assignment: "Identify a list of diseases for which drugs can be used, based on the mechanism of action of the drugs," instead of asking the question: "For which specific disease can a drug be used?" You can ask students to give a comprehensive assessment of the use of drugs. To understand the effect of a drug, you can present information comparing the pharmacodynamics and pharmacokinetics of drugs (diagrams or graphs), considering age, gender, and the presence of concomitant pathological processes, using the principle of "from simple to complex" when considering the mechanism of action of a drug [1]. Another method could be to give students comprehensive practice-oriented tasks with elements of pathophysiological description of the course of the disease, which gives students the opportunity to understand how to construct their reasoning to arrive at the correct answer. For this purpose, online tests can be used to promote independent learning [11], followed by a discussion of the test results and justification of the correct answer. To improve the assimilation of disciplines, it is important to give students the opportunity to create 4–5-minute digital media material that analyses a specific journal article on a disease related to pharmacology with a description of the key aspects of the article [15].

Thus, the use of methodological techniques of the cognitive-communication approach will promote greater independence of students in discussing the task and allow them to build their own cognitive schemes in making the final decision. In addition, cognitive-communicative learning can not only help minimise the cognitive load on students, but also be aimed at improving practical thinking skills, which can be useful for medical education, which is primarily aimed at training specialists with high-level mental processes [35]. In this sense, cognitive learning theory is not outdated but can be effectively applied in modern medical education.

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НАВЧАЛЬНІ АСПЕКТИ ВИХОВАННЯ ЕТИКИ ТА ДЕОНТОЛОГІЇ У ЛІКАРІВ-ІНТЕРНІВ МЕДИЦИНИ КРИТИЧНИХ СТАНІВ

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Не є ні для кого секретом, що етичні та деонтологічні проблеми, а саме порушення етичних норм, є присутніми, на жаль, в сучасній медицині, особливо в медицині критичних станів, зокрема, у відділеннях інтенсивної терапії. Скільки б не говорили та не писали про права критично хворого пацієнта, у тому числі пацієнта, що потребує паліативної допомоги, порушення цих прав, у тому числі з боку середнього та молодшого медичного персоналу, є настільки частим, що викликає звикання та здається таким, що не потребує особливої уваги. Тут треба обов'язково пам'ятати і про величезний дефіцит саме середнього та молодшого медперсоналу у більшості відділень інтенсивної терапії, особливо на тлі скорочення ставок, викликаного економічними причинами. Працювати в таких умовах вкрай важко, тож стомлюваність та деяку невтриманість медичних сестер та молодших медичних сестер неважко зрозуміти, проте важко повністю виправдовувати підвищення голосу на пацієнтів, використання ненормативної лексики або ж відмову від допомоги пацієнту у побутових та гігієнічних потребах.

Цей самий дефіцит медичного персоналу, з однієї сторони, зумовлює потребу в чергуванні лікарів-інтернів в якості медичних сестер, з іншого боку – для самого лікаря-інтерна це чудова медична практика та придбання клінічного досвіду, який важко переоцінити. Проте, чи можемо ми назвати позитивним досвідом те, що окрім проведення медичних маніпуляцій лікарі-інтерни на робочих змінах навчаються також зневажливому