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IMPLEMENTATION OF NEW APPROACHES TO TEACHING RADIATION DIAGNOSTICS AND RADIATION THERAPY AT THE DEPARTMENT OF ONCOLOGY AND RADIOLOGY OF BSMU

ВПРОВАДЖЕННЯ НОВИХ МЕТОДІВ У ВИКЛАДАННІ ПРОМЕНЕВОЇ ДІАГНОСТИКИ ТА ПРОМЕНЕВОЇ ТЕРАПІЇ НА КАФЕДРІ ОНКОЛОГІЇ ТА РАДІОЛОГІЇ БДМУ

In the process of teaching to foreign students radiological diagnostic methods: fluorography, bronchography, angiopulmonography, pneumomediastinography, pleurography, fistulography, X-ray, fluoroscopy, ultrasound diagnostics, radionuclide diagnostics, computed tomography, CT angiography, high-resolution CT, dynamic CT, expiratory CT, multi-position CT, magnetic resonance imaging, we would like to share our practical experience and draw our colleagues' attention to the problems that most often arise for foreign students due to their difficult adaptation to the Ukrainian educational environment. In particular, V. I. Milko et al. state that "methods of X-ray examination of the chest organs are divided into non-contrast, contrast, and X-ray functional" [8, p. 34].

We have come to the conclusion that with the right organization of the educational process, namely the availability of computer equipment, foreign students can move from simply memorizing textbook material and lectures to a more rational application of their skills in line with the needs of patients and the labor market today. One of the main conditions for training future doctors is the development of professional competence, communication skills, and the ability to apply the acquired knowledge in further practical activities. Today's conditions require the training of competitive specialists who are able to effectively apply their theoretical and practical training in various professional situations.

During the training process, foreign students have the opportunity to acquire the following practical skills: interpreting X-ray images to identify pathologies, deciphering CT scan discs and ultrasound scans, forming medical conclusions, and planning further radiation therapy regimens.

Key words: radiation therapy, foreign students, computed tomography, ultrasound diagnostics, magnetic resonance imaging.

У процесі викладання студентам-іноземцям променевих методів діагностики: флюорографія, бронхографія, ангіопульмонографія, пневмомедіастинографія, плеврографія, фістулографія, рентген, рентгеноскопія, ультразвукова діагностика, радіонуклідна діагностика, комп'ютерна томографія, КТ-ангіографія, КТ-високороздільна, динамічна КТ, експіраторна КТ, полі позиційна КТ, магнітно-резонансна томографія, ми хочемо поділитися практичним досвідом та звернути увагу наших колег на проблеми, які найчастіше виникають у іноземних студентів з огляду на їх складну адаптацію в українському освітньому просторі. Зокрема, В. І. Мілько та ін. стверджують, що «методики рентгенологічного дослідження органів грудної порожнини поділяють на безконтрастні, контрастні та рентгенофункціональні» [8, с. 34].

Ми дійшли висновку, що при правильній організації навчального процесу, а саме наявності комп'ютерного оснащення, дає можливість іноземним студентам перейти від простого заучування матеріалу підручника та лекцій до більш раціонального застосування своїх навичок згідно потреб пацієнтів та ринку праці на сьогодні. Однією з основних умов підготовки майбутнього лікаря є формування професійної компетентності, комунікативної здатності, можливість використовувати набуті знання у подальшій практичній діяльності. Умови сьогодення вимагають підготовки конкурентоспроможних фахівців, здатних ефективно застосовувати свою теоретичну та практичну підготовку у різних професійних ситуаціях.

Під час навчального процесу студенти-іноземці мають можливість отримати наступні практичні навички: інтерпретувати рентгенівські знімки для виявлення патологій, розшифрування дисків КТ-обстежень, ультразвукових сканограм, для формування медичних висновків та планування подальших схем променевої терапії.

Ключові слова: променева терапія, студенти-іноземці, комп'ютерна томографія, ультразвукова діагностика, магнітно-резонансна томографія.

Statement of the problem. In recent years, automation, electronics, computing technology, and new methods of obtaining medical diagnostic images, in particular using ultrasound, X-ray, magnetic resonance, and emission tomography studies, have been intensively introduced into X-ray, radionuclide diagnostics, and radiation therapy. In particular, it is possible to diagnose diseases of the chest cavity. S. O. Myahkov, N. V. Tumanska, O. G. Nordio note that "unlike X-rays, computer tomograms provide a differentiated image of the anatomical structures of the chest wall: the pleura, muscles, and fat layers. The ribs are depicted fragmentarily on axial sections, since their location corresponds to the scanning plane[1]" [6, p. 10]. Scientific and technological progress, the growth of information, and forecasts for the further development of radiation diagnostics and radiation therapy require a restructuring of the system of teaching these disciplines in higher medical educational institutions and a search for new teaching technologies. T. Dimitrova and R. Borisova state here that "the involvement of qualified experts in Radiation Protection during any activity with ionizing radiation in Bulgaria, including medical applications, is mandated by EC Directive 97/43/Euratom (European Commission, 1997)" [12, c. 34]

First and foremost, this concerns the transition from separate teaching of rentgenology and radiology, as provided for in the current syllabus on radiation diagnostics and radiation therapy. In particular, I. Julkevich and I. Galaychuk, in their syllabus on Radiology states that "the Educational programmeme of the discipline "Radiology" is designed for university graduates of education, who study at the Ternopil National Medical University named I. Ya. Gorbachevsky of the Ministry of Health of Ukraine under the educational programmeme "Radiology" of the second (master's) level of higher education in the field of knowledge 22 "Health Care", specialties 222 "Medicine".

The Educational programme is developed according to the corresponding educational curriculum, discussed and approved at the meeting of the Academic Senate of I. Horbachevsky Ternopil National Medical University of the Ministry of Health of Ukraine dated 27.05 2025 y., Minutes № 8 and put into force by the order № 330 dated 27.05.2025y" [13, p. 8].

Secondly, it is the computerization of education, the transition from memorizing material to the ability to use information and apply it rationally in problem situations. This is especially true for teaching foreign students, who are acquiring higher medical training in Ukraine. This raises additional problems, namely, how to convey a large amount of information and teach students to use it in practical activities in the face of the so-called language barrier, varying levels of pre-university training in general education disciplines, and insufficient knowledge of technical and, especially, medical terminology. This requires the teacher to spend additional time explaining terms and reducing the difference in the level of general training by all available means, also because the teaching of radiation diagnostics and radiation therapy is carried out in accordance with the 2024 curriculum. In particular, I. Julkevich and I. Galaychuk in their syllabus on Radiology outline the topics that foreign students have to take in their third year of studies [13]. At this time, students still lack or have limited knowledge of clinical disciplines.

Analysis of recent studies and publications. The problems of teaching radiation diagnostics and radiation therapy were studied by V. M. Kazakov, O. M. Talalaenko, M. B. Pervak [3], O. V. Kovalsky, D. S. Mechev, V. P. Danilevich [4], A. P. Lazar [2; 7], S. Yu. Kravchuk [5], N. V. Tumanska, S. O. Myagkov, O. G. Nordio, D. V. Syvolap [10], S. O. Myagkov, N. V. Tumanska, O. G. Nordio [6],

[1] Here and onwards the translation of the quotes is ours

N. V. Tumanska, K. S. Barska, O. G. Nordio, I. P. Joss [9] T. Dimitrova, R. Borisova [12], and others. An analysis of these scientific sources reveals that the theoretical and methodological basis of this subject is insufficiently developed. This necessitates further research and the development of new teaching methods using modern computer technologies. A. P. Lazar notes that "the importance of radiation diagnostics in the training of doctors and in practical medicine is constantly increasing. This is due to the fact that today no branch of medicine can do without the use of radiation methods" [2, p. 133–134].

The **purpose of the article** is to introduce new methods in teaching radiation diagnostics and radiation therapy at the Department of Oncology and Radiology of the Bukovynian State Medical University.

Presentation of the main material. With the aim of integrating the teaching of radiation diagnosis and radiation therapy methods, we have revised the working curricula for lectures and practical classes, developed methodological guidelines for practical classes for teachers, and methodological guidelines for students to prepare for classes and for independent work [1]. In each class, all radiation examination methods are considered comprehensively, with attention paid to their sequential and combined use. The diagnosis of diseases, based on models of semiotics considered in practical classes, is based on the syndromic principle using the main symptoms. Diagnostic information is provided in the minimum amount necessary for a general practitioner to select a research method and correctly interpret the data obtained.

The study of radiation diagnostics begins with the structure of devices, the basics and principles of image acquisition, their diagnostic capabilities, the use of basic radiopharmaceuticals and contrast agents in each of the radiation methods and research techniques, and their clinical significance [4; 10]. O. V. Kovalsky, D. S. Mechev, and V. P. Danilevich note that "tumour diagnosis is based on the difference in absorption between tumour and surrounding tissues" [4, p. 107]. The study of these issues constitutes the first stage of the working curriculum, for which two lectures and two practical classes are allocated. The second stage involves a more in-depth study of the application of various radiation methods for the diagnosis of diseases of various organs and systems, their semiotics, and a diagnostic algorithm that allows for quicker orientation in the application of various radiation methods.

The pedagogical goal of practical classes in radiation diagnostics and radiation therapy is to develop the skills and abilities that doctors need in their practical work. To achieve this goal, we have developed and tested a curriculum for managing students' independent work over a period of six years. O. M. Yakubovskaya et al. argue that "in the process of mastering a particular discipline, independent preparation for practical classes is an important component" [11, p. 232].

The programme includes independent preparation for classes at home, which involves completing diagrams of normal human organs and organs with the most common pathologies in workbooks, as well as written answers to specific questions about the main symptoms of diseases or injuries of a particular organ.

During lectures and practical classes, teachers have to spend a lot of time explaining medical terms that students are unfamiliar with because the diagnosis and treatment of diseases studied in the course of radiation diagnostics and radiation therapy precede their study in the departments of propaedeutics of internal diseases, pathological anatomy, pathological physiology, and others.

Classes with foreign students are conducted in Ukrainian and English, which they learn in the Preparatory Department, and all teaching materials for them are also prepared and printed in Ukrainian. A textbook entitled "Modern Principles and Methods of Radiological Diagnostics" has been published, describing X-ray computed tomography, ultrasound examination methods, thermographic and radionuclide methods. The textbook clearly describes the capabilities of each method, indications and contraindications for use, advantages and procedures for their use in medical practice.

Given the language barrier, oral questioning to determine the initial level of knowledge is often replaced by schematic sketches of individual symptoms, demonstrating them on X-rays, scans, and diagrams.

During practical classes, foreign students, like their domestic counterparts, after determining their initial level of knowledge, receive an individual assignment and a diagram – an algorithm for their independent work and a set of radiological research materials that they must study and analyse. By comparing the images on the X-rays with their diagrams and sketches made at home, students can identify symptoms of damage or disease, formulate the leading syndrome of the pathology, and make a preliminary diagnosis. The results of the work are

recorded in a research protocol with a description of the symptoms, their characteristics, and a schematic sketch of the detected changes.

During independent work by students in practical classes, the teacher monitors their activities, assesses their knowledge of certain aspects of the topic, and provides advice on conducting inter-syndrome and intra-syndrome diagnostics. The instructor's review and evaluation of individual assignments, group discussions of the most typical tasks with the mandatory participation of all students, explanations of typical mistakes, and demonstrations of interesting clinical observations increase each student's responsibility for preparing for classes. By analysing the results of images obtained using various imaging methods, students not only identify symptoms of pathological changes, but also determine the advantages or disadvantages of each of the research methods used, which of them is the most informative.

Foreign students complete the examination report in abbreviated form, unlike domestic students. They make schematic sketches, name the symptoms they have identified, and draw conclusions based on them. When discussing the completed tasks, the teacher demonstrates the symptoms and syndromes not identified by the student and comments on their clinical significance, and the students make the appropriate corrections to their protocol.

Lectures are delivered slowly, are more specific, and include explanations of new medical terms. Special attention is paid to visual memory. To this end, the lecture is accompanied by schematic sketches, demonstrations of tables, slides with X-rays, computer and magnetic resonance tomograms, radionuclide and ultrasound scans, and radiation therapy planning diagrams using various irradiation methods. Up to 30–35 slides are shown in each lecture. S. Kravchuk notes that "the principle of the computed tomography method allows for obtaining a layered cross-sectional X-ray image of different parts of the human body" [5, p. 3].

Experience shows that this approach to organizing independent work for foreign students allows them to achieve the strategic goal of studying radiation diagnostics: to lay the foundations of X-ray, radionuclide, and ultrasound diagnostics, X-ray computed tomography and magnetic resonance imaging, and prepare students for a more in-depth study of clinical disciplines in subsequent courses.

To facilitate students' preparation for practical classes, the department has prepared negatoscope stands, which are available for use around the clock. Outside of class, students can view and study typical X-rays of the skeleton, respiratory organs, heart, blood vessels, digestive organs, and other systems in normal condition, as well as in cases of disease and injury, with corresponding labels indicating the nature of the pathology.

Conclusions and prospects for further research. Thus, the integration of teaching and the proper organization of the educational process using computer technologies, information, audio, and video resources will allow students to obtain a greater amount of information, which can be used in their professional activities in the future.

To improve students motivation to better master radiation methods of diagnosis and treatment of diseases, it is advisable to increase the number of practical classes and pay more attention to independent extracurricular training.

Prospects for further research lie in the study of Ukrainian and English languages, biology, chemistry, and physics by foreign students at the Preparatory Department. Medical and technical terminology, which will be widely used in scientific and practical medicine in the future, should be more extensively included in the programme.

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