

INNOVATIVE APPROACHES TO FORMATION OF PRACTICAL SKILLS IN MEDICAL STUDENTS DURING TEACHING THE BASICS OF CHILD PULMONOLOGY

S. Ilchenko, A. Fialkovska

Підготовка майбутніх лікарів в умовах реформування системи охорони здоров'я України потребує впровадження в навчальний процес нових методик, інформаційно-комунікативних технологій, сучасних педагогічних та наукових інновацій відповідно до світових стандартів. Метою роботи було удосконалення навчального процесу на кафедрі пропедевтики педіатрії під час викладання студентам основ дитячої пульмонології. У статті описана етапність проведення практичних занять, викладена методика формування практичних навичок у студентів під час викладання дитячої пульмонології. З метою вдосконалення практичної підготовки студентів на кафедрі активно використовуються симуляційні методи, що дозволяють оволодівати технікою аускультативу у дітей, диференціювати акустичні феномени при різних патологічних станах. Під час курації майбутні лікарі закріплюють практичні навички з обстеження хворого, узагальнюють отримані дані. Цифрова респіросонографія дозволяє проаналізувати, чи співпадають висновки студентів-дослідників щодо акустичної картини, отриманої під час прослуховування легенів за допомогою стетоскопів, з результатами комп'ютерного аналізу легеневих звуків. Як показують результати, засвоєння студентами практичних навичок на віртуальних тренажерах сприяє більш успішному оволодінню ними методів фізикального обстеження хворого, правильному оцінюванню тієї чи іншої клінічної ситуації. Поєднання традиційних методів викладання з інноваційними методиками сприяє підвищенню якості навчання студентів та підготовці нового покоління висококваліфікованих медичних працівників. Приведення до міжнародних стандартів навчально-методичного забезпечення навчального процесу, з одного боку, дозволить зменшити відтік молоді, яка бажає навчатися за межами України, з іншого боку, – дасть можливість залучати іноземних студентів до українських вищих навчальних медичних закладів, що може стати додатковим джерелом державного доходу у вигляді плати за навчання, а також сприяти припливу трудових ресурсів в вітчизняну медицину

Ключові слова: викладання, студенти, практичні навички, дитяча пульмонологія

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1. Introduction

Higher medical education undergoes today deep cardinal changes. One of main requirements, set to medical education in Ukraine today, is to train a high-qualified and competitive specialist, who would correspond to international requirements and standards [1]. The main task of practical training of students is to teach them methods of clinical examination of a patient, formation of clinical thinking in them [2]. The teaching is aimed at mastering theoretical knowledge and acquiring practical skills in the process of educational training of a specialist, at that the main attention must be paid to modern approaches to diagnostics and treatment of diseases that correspond to European standards [3]. This all favors the increase of requirements to the training quality of future physicians and needs introducing new methods, information, communication technologies, modern pedagogical and scientific innovations, according to world standards, to the educational process.

2. Literary review

One of leading places at training a qualified physician under modern conditions of reforming the health pro-

tection system of Ukraine is to study the discipline of pediatrics propaedeutics by third year students of medical HEIs [4]. As an independent discipline, it provides a basic level of knowledge in professional training of a future specialist. Successful mastering of knowledge and skills, ability to use them and clinical thinking formation condition further successful development in the learning process at next clinical disciplines [5]. Main ways of getting knowledge are teaching students near a patient's bed, examination of children of different ages, taking into account their main anatomic-physiological peculiarities, formation of the diagnostic search direction, based on obtained data, for verifying a diagnosis by using additional laboratory, functional and instrumental research methods [6]. Unfortunately, last time clinical departments suffer from a series of problems, connected with the absence or limited number of thematic patients in hospitals, great "load" on a patient (when tens of students a day come to him/her), limited time of practical activities [7]. All this persuasively testify to the use of a simulation (trainer) technique in the process of medical teaching that allows at imitating diverse clinical scenarios to get professional skills of concrete diagnostic and healing manipulations.

The development of devices that facilitate auscultation learning started already at the end of 1960-ies. Since that time dummies, electric stethoscopes, computer programs and trainers have been developed and realized [8]. First simulation laboratories were created at universities of Illinois and Maastricht already at 1970-ies for improving clinical practical skills of students [9]. Since 2002 such laboratories became a part of medical education at all medical faculties in Germany [10]. Today simulation teaching is developing abruptly and is a method of addition and improvement of medical students' clinical education. Special learning centers of practical skills are a distinctly established part of medical education in developed countries of the world. Modeling is realized in different forms – from simple models to computer dummies of the whole body that satisfies students' needs at each stage of their learning. Activities at simulation centers are conducted under teacher's supervision, taking into account methodological and didactic conceptions, in an ideal case creating an atmosphere that allows to repeat practical skills without causing anxiety and risk [11]. Simulation learning allows students to reproduce real life experience, using modeled scenarios, conditions or patients, creating a safe environment, where clinical confidence and competence may be developed, without fear of unfavorable results for themselves or patients [12]. These data confirm the importance of simulation as an educational technique; for make it effective, it is necessary to integrate it in the learning program in such a way that favors passing acquired skills to the clinical practice.

Diseases of respiratory organs throughout the world are an important medical-social problem, because they to the great extent determine the level of child morbidity and infant mortality. Starting in childhood, they result in disability of adult patients in some cases. All this determine the importance of problems of child pulmonology, not only for pediatrics, but for clinical medicine as a whole [13]. Connected with growing morbidity indices and prevalence of bronchial-pulmonary diseases in children of different age groups, there appears a need in improving the learning process at the department of propaedeutics of pediatric diseases at learning the course of child pulmonology.

3. The aim and objectives of the study

The aim of the study was to improving the learning process at the department of pediatrics propaedeutics at teaching students child pulmonology by introducing modern learning methods.

To achieve this aim, the following objectives were set:

1 – to characterize main peculiarities of teaching this topic at the department of pediatric diseases propaedeutics of SI “Dnipro medical academy of MHP of Ukraine”,

2 – to introduce modern innovative learning methods.

4. Materials and methods

Practical activities on child pulmonology are conducted at the pulmonologic compartment of the clinical base of the department of pediatric diseases propaedeutics of SI “Dnipro medical academy of MHP of Ukraine”. According to the learning program at the practical activity the students must master:

1. The method of collecting complaints and anamnesis of a disease;

2. The method of objective examination of the respiratory system in children depending on age, namely:

– to be able to conduct a general examination of respiratory organs in children and to assess a status of an ill child;

– to assess data, obtained at an examination, percussion, palpation;

– to reveal main symptoms and syndromes of respiratory system injuries in children;

3. The method of conducting laboratory, functional and instrumental research methods and interpreting obtained results.

At the preparatory stage of the activity a teacher mobilize students' attention by presenting the practical importance of the topic, forming the intensive cognitive activity, then checks the initial level of knowledge by testing control and random questioning at the classroom. Then the activity continues at wards, when the teacher demonstrates the method of respiratory organs examination in patients with pathology, making accent on its peculiarities in children of different ages. X-ray photographs, spiograms of patients are demonstrated if present. Then the students independently curate children with a bronchial-pulmonary pathology (relapsed and chronic bronchitis, obstructive bronchitis, pneumonia, bronchial asthma and so on) at the compartment for fixing practical skills. At the curation the students make a preliminary (syndromic) diagnosis, making correspondent records in the learning disease history. The teacher summarizes the conducted activity at the classroom.

For improving practical training of the students at the department of pediatric diseases propaedeutics, possibilities of a room of practical skills are used actively. The room of practical skills contains learning models of children for auscultation of the heart and lungs that allow to master the child auscultation technique, to differentiate acoustic phenomena at different pathological conditions (fig. 1). A phantom, managed by a panel, allows to listen to main (vesicular, tracheal and bronchial breath) and additional respiratory murmurs (stridor, stertors, crepitation, murmur of pleura frictions). It gives a possibility to simulate a real clinic pathology, for example, a syndrome of pulmonary tissue hardening, syndrome of respiratory tracts obstruction, symptom complex of bronchitis and pleurisy. Figure 1 presents the students' work at the room of practical skills with a learning model of a child for auscultation at practical lessons. All participants gave voluntary consent for publication of their photos.



Fig. 1. The work of students at the room of practical skills with a learning model of a child for auscultation:
a – mastering of skills of lungs auscultation by English-speaking students at a practical lesson;
b – solution of a clinic situation problem on child pulmonology at a practical lesson with native III year students;
c – demonstration of practical skills on child pulmonology at a summarizing lesson

Sounds from the lungs are essential indications of a respiratory system condition. But modern stethoscopes, used for auscultation, are rarely checked, assessed and compared, often chosen by students for their outlook or producer's reputation, have a limited diapason of sound perception [14]. So, for registering breathing sounds, a modern computer phonospirograph Kora-03MI was used, developer – The Institute of hydromechanics, NAS of

Ukraine, (certificate of state registration of the device of medical destination No. 5528/2006). The principle of the method is in registering respiratory murmurs, using special sensors with the high sensitivity in the wide spectrum of frequencies, including ones, not revealed at auscultation, but having an important diagnostic value [15].

Digital respirosography transform acoustic information into a graphic picture that allows visual identi-

fication of changes of the spectrum of lung sounds of even low intensity. A wider diapason of lung sounds became available, using the digital analyzer, comparing with a stethoscope. Using the respiroacoustic device a teacher has a possibility to repeat a record of fixed sounds many times, to increase their loudness, to discuss all questions, arisen in researchers [13, 14]. There were analyzed 128 respirosonograms in children of 1–18 years old, including healthy ones (n=44), patients with RB (n=23), patients with CB (n=31) and children of early age with signs of bronchial obstructive syndrome (n=30). For assessing an information value of the method, data of lung auscultation, obtained by the students, using a stethoscope, and ones of the respiroacoustic examination of ill children were compared in the student group.

5. Research results and their discussion

As it is indicated by the results, students' mastering of practical skills on virtual trainers favors more successful understanding of methods of physical examination of a patient, correct assessment of one or another clinical situation, observed at joint examination of real patients, passing of summarizing controls by students. At

the same time there is a series of advantages of simulation learning on dummies and trainers: realistic learning without harm for patients, duration and number of repetitions of the learning process are not limited, no stress for students, objective assessment of actions of a learning person. But simulation learning doesn't replace one "near a patient's bed". So, both technologies in the modern educational process must organically add each other. At the curation further physicians fix practical skills on patient's examination, generalize obtained data. Writing of a learning disease history is aimed at teaching skills of conducting primary medical documents at hospital. A learning disease history reflects the student's ability to learn all information about a patient successively, to substantiate and to formulate a preliminary diagnosis correctly.

Digital respirosonography is very informative for assessing lung auscultation skills among students. It allowed to analyze, if students-researchers' conclusions about an acoustic picture, obtained at listening the lungs by stethoscopes, coincide with results of the computer analysis of lung sounds. Examples of respirograms and spectrograms of a 16 years old child with chronic bronchitis are presented below (Fig. 2, 3).

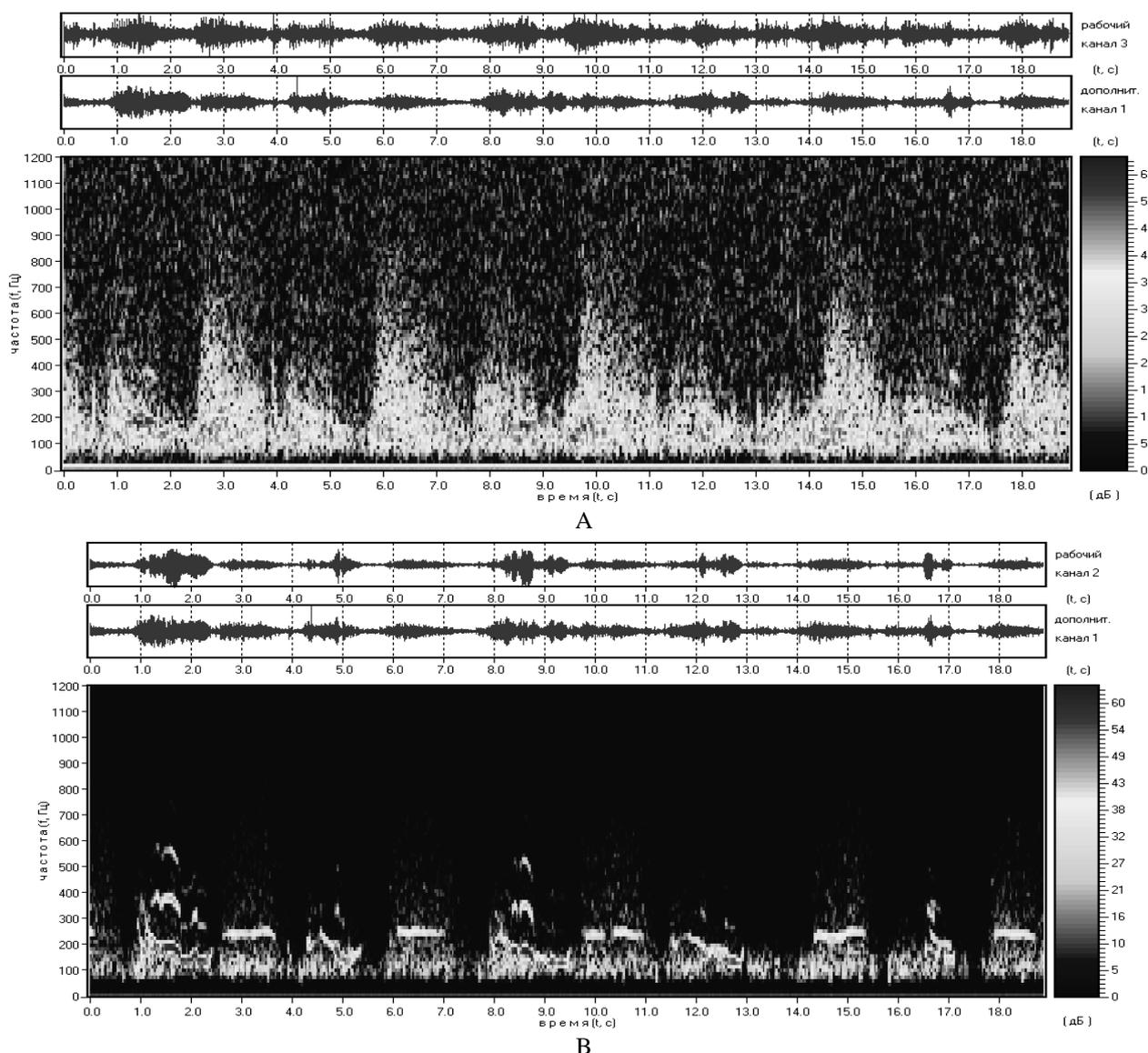


Fig. 2. Respirosonograms (A-left, B-right) of 16 years old child with chronic bronchitis

The respirosonograms, made from the right and left lung (Fig. 2), the normal acoustic picture above the left lung and pathological horizontal deformations above the right one are graphically presented at both inhalation and exhalation.

5 of 12 students determined a breath weakening on the left and hard breath on the right in this patient by

auscultation using a stethoscope and by the audiography data. Only 7 researchers noted crepitation on the right, mainly wet, moderately vesicular. The spectrograms of the same child visually demonstrate that the maximal amplitude of acoustic oscillations on the left doesn't exceed 40 dB, and on the right it is 58 dB that is the difference is 18 dB (Fig. 3).

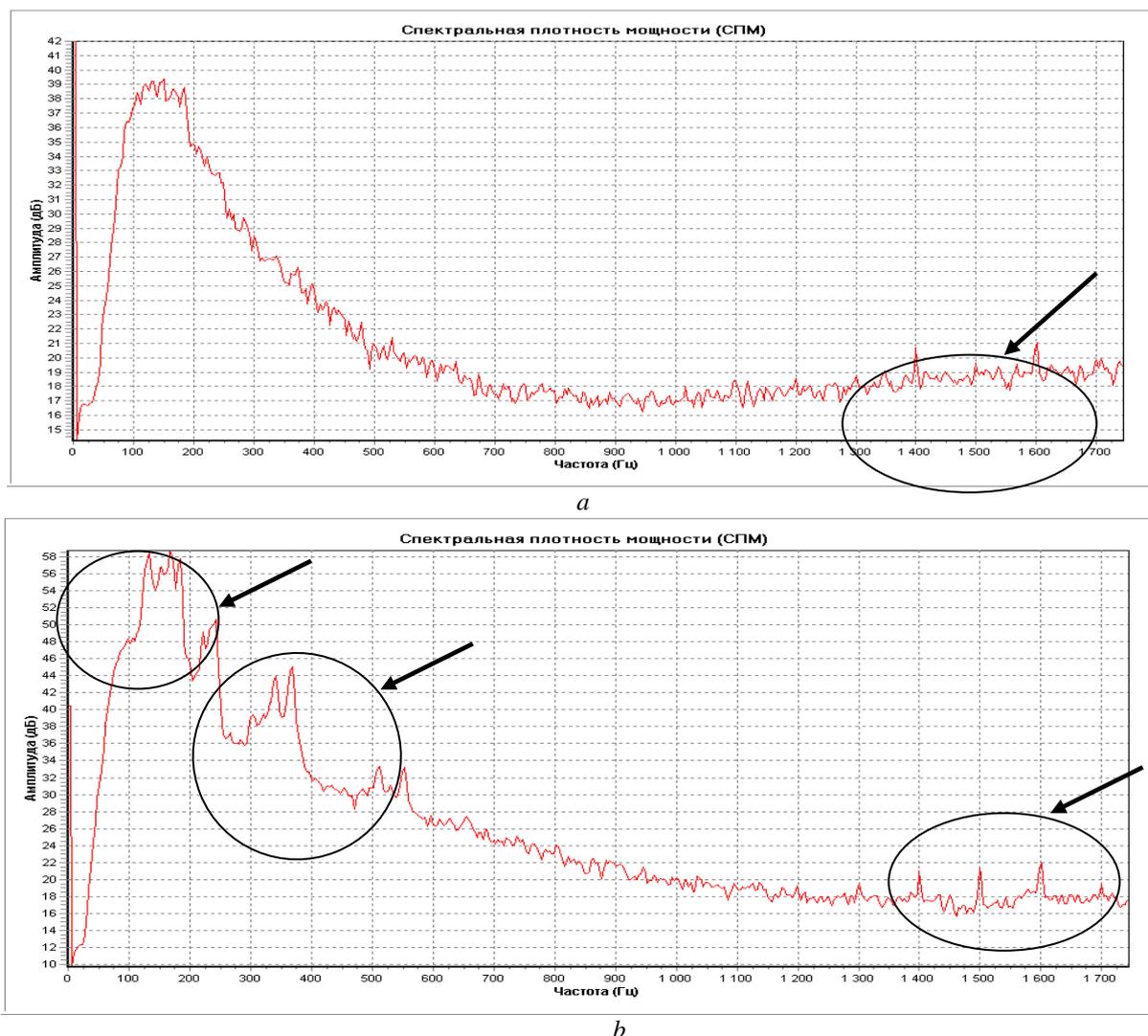


Fig.3 Spectrograms of the same child: *a* – on the right; *b* – on the left

Sound asymmetry is accompanied by different pathologic complexes. Thus, on the left there are complexes in the diapasons of low, medium and high frequencies (A, B and C), on the right – only in the diapason of high ones (C). C complexes testify to pathologic processes at the level of small bronchi or interstition. Hard breath, A and B complexes mask C ones, so we cannot listen for any pathological sounds from small sections of the respiratory tracts by a stethoscope.

At 5 times increasing loudness on the audiogram, all 12 students heard little-vesicular crepitation from both sides. This fact may explain the phenomenon that in children, especially in early age, an auscultative picture, fixed by a stethoscope, is not a reliable reflection of all pathological acoustic signs of the respiratory tracts.

The simplicity and non-invasive character of this method, examination at calm breath of a child allowed to use it for children from the first year of life. At the same time the computer system of breathing sounds registration allowed to save information and to use it for many times for analysis and systematization of obtained data in future.

The questioning of 3 year students, conducted in 2019, demonstrated that almost all (98.9 %) respondents were satisfied with the quality of conducted activities on child pulmonology at the department of pediatric diseases propaedeutics of SI “Dnipro medical academy of MHP of Ukraine”. The combination of traditional teaching methods with innovative ones favored fast and simple perception of information and reduction of time for its understanding and comprehension in 90.3 % of stu-

dents, these activities developed skills of clinical examination of a patient in 92.5 % of respondents, 87.2 % – felt confidence at examining real patients, motivation to studying increased in 85.6 % of students.

Thus, Combining traditional teaching methods with innovative methods contributes to improving the quality of students' education and training of a new generation of highly skilled health care workers. Bringing to the international standards the educational and methodological support of the educational process, increasing the quality of medical services in Ukraine and proper logistics of higher educational institutions on the one hand, will reduce the outflow of young people, who want to study outside Ukraine, on the other hand – will allow to attract foreign students to Ukrainian medical universities, which can become an additional source of state income in the form of tuition fees, and also contribute to the inflow of labor into domestic medicine.

6. Conclusions

1. For improving the educational process at the department of pediatrics propaedeutics at teaching students the course of child pulmonology, teachers of the department are using the combination of both traditional and modern teaching methods.

2. Providing the educational process at the department of pediatric diseases propaedeutics with modern instruments gives a possibility to improve the teaching methodology of the child pulmonology course, to raise it at the qualitatively higher level and to improve the effectiveness of the educational process.

3. Bringing to the international standards the educational and methodological support of the educational process, increasing the quality of medical services in Ukraine and proper logistics of higher educational institutions allows to solve the question of labor migration staff.

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Svitlana Ilchenko, MD, Professor, Department of Propedeutics of Pediatric Diseases, State Institution “Dnipropetrovsk Medical Academy of Ministry of Health of Ukraine”, V. Vernadskogo str., 9, Dnipro, Ukraine, 49044; E-mail: ilchensv@gmail.com

Anastasiia Fialkovska, PhD, Associate Professor, Department of Propedeutics of Pediatric Diseases, State Institution “Dnipropetrovsk Medical Academy of Ministry of Health of Ukraine”, V. Vernadskogo str., 9, Dnipro, Ukraine, 49044; E-mail: fialkovskaja.a@gmail.com