

Modern Problems of Medical and Pharmacological Education

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ABSTRACT

The primary task of this article was to identify key problems of medicine and outline ways to solve them optimally. An innovative intellectual approach to making medical diagnostic decisions is proposed. Levels of knowledge and didactic systems, their limitations are described. Methodologies and computerized technologies are defined as tools to overcome obstacles.

Results: a series of didactic experiments were conducted to compare traditional and proposed innovative methods of diagnosis and vocational training. Evaluation of experiments demonstrates the significant benefits of innovation. The above problems can be successfully solved with the help of computerized diagnostics based on an algorithmic approach to evidence-based disease recognition and mass vocational training, mainly based on eLearning.

The term "diagnosis" has two definitions: 1. Intellectual process of disease recognition; 2. Nosological significance - determining the nature of the case. To distinguish these values, we use two different terms: diagnosis - an intellectual process that leads to diagnosis; diagnosis - the result of diagnosis. Differential diagnostic algorithm (DDA) and DDA algorithmization is the step-by-step determination of operations to diagnose all diseases based on leading syndromes, main symptoms or signs, such as chest pain, fever, jaundice, round shadow on chest X-ray, etc [1]. E-learning, corporate e-learning. The term eLearning is a widely used word today. E-learning has its place in the lexicon of learning and education, but it will be a long time before the practice of eLearning becomes commonplace and widespread.

Keywords: Modern problems of medical education, algorithm, didactic systems, problems of pharmacological education, diagnostic decision making.

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INTRODUCTION

Diagnostic skills of meaningful practice and optimization of medical education directly affect the lives and health of people around the world. Obviously, the representatives of this profession need the highest level of professional education, constant improvement (optimization) of their skills throughout their professional activities. How is this possible to decide the most effective? These issues are addressed in this article.

The article is based on four main trends:

1. A new original paradigm of intelligent diagnostic approach and adequate effective learning.
2. Fundamentally new computerized expert systems of medical diagnostics based on this approach.
3. A set of tools integrated into a computerized medical expert system of self-study, based on the most effective didactic system.
4. E-learning.
5. Two-way transmission of multimedia information between knowledge bases and users anywhere located via wired and wireless communication.

It should be emphasized that the medical student and therapist should minimize the likelihood of diagnostic errors by maximizing information acquisition and

diagnostic skills through prior use of innovative methodology/technology.

In modern medical science, practice and medical professional education, the following major problems can be identified: diagnostic; didactic and educational problems of medical education; economic; problems of communication technologies; psychological; social; strategic.

The value of problem optimization can only be assessed by looking at the report of the 24 member countries of the Organization for Economic Co-operation and Development (OECD): there are 1,947,840 doctors and 6,788,970 hospital beds per population of 884,560,000. 45 countries have 932 university medical schools and 2,625,000 doctors [2]. It is easy to predict the overall impact of medical professionalism in the diagnosis and treatment of diseases.

LITERATURE REVIEW

In their publications, the authors - experts in medical sciences emphasize the concern about current issues in medical and pharmacological education. Thus, authors [3] considers it correct to say that modern medicine has entered a crisis of knowledge - when the doctor is already unsure what is the evidence for decision-making in diagnosis and treatment. The author is concerned about

patient safety due to the high number of deaths and excessive economic costs, which are not always rational and threaten the bankruptcy of health care systems around the world. Scientists [3] believes that new concepts are needed to focus on effective medical care for people. And this, in turn, requires a person-centered education. In the medical program for students it is necessary to develop teaching innovations. This will be the beginning of achieving real progress in the integrity of modern medical education.

Authors [4] describes the problems of medical education in India, such as limited public resources, poor infrastructure and high cost of education. Civilsdaily [4] emphasizes that only the determination of the government can promote quality and equality in education.

Scientists [5] believes that medical education needs broad changes. Assessing the personal qualities of medical students, the doctor of medical sciences highlights the high assertiveness of students, their narcissism and high levels of stress and anxiety. Instead, he assesses their independence as low. The author emphasizes the introduction of greater interactivity of classes - through the Internet, video, images and cards.

An important problem is that modern doctors are not able to talk about the patient's illness at the patient level. The fact that, thanks to the Internet, a modern patient can easily find information about his or her state of health (which is extremely dangerous for him or her) should make it possible to improve health care standards by developing doctors' communication skills and teamwork skills. To do this, medical education must be more realistic and meet the needs of patients [6].

Authors [7] emphasizes the inexpediency of increasing the time devoted to pharmacological education. Curricula, given the ever-growing knowledge base, are simply overloaded. According to the author's theory set out in the European Journal of Pharmacology, learning should be more student-centered, focused on his skills and practice. This will allow you to learn throughout life and make your own decisions.

The World Health Organization [8] included in its resolution on a health strategy until 2030 the task of supporting the development of comprehensive measures to enable the effective implementation of primary health care. Other tasks include improving and reforming health facilities, establishing mechanisms to support society as a whole, and working with governments to support health laws and budgets.

METHODS

Innovative intellectual approach to making medical diagnostic decisions.

In the United States, pharmacy students from the School of Pharmacy, University of North Dakota, who were to take an IGE on an international medical mission in Guatemala, participated in the Photovoice study. The study was conducted as part of an experimental study of best practices in pharmacy practice (APPE). The IGE lasted 200 hours (a total of 5 weeks) and included ten days of travel in rural and urban areas of Guatemala. The students' activities were supervised by teachers Werremeyer A. and Aalgaard Kelly G. Each student was given a camera and asked to photograph the learning process that the students themselves thought would be of interest to others. At this time, they had to think about the following issues:

- that I saw
- what actually happened
- as it concerns our lives
- why everything is so
- why these pictures could teach others
- what can we do about it

Participation in the study did not affect the assessment of the success of ARRE.

The paper also highlights the results of an analysis conducted at the Evidence-Based Practice Center, a clinic in Mayo, that examines the "Proteus effect".

The issue of problems in medical and pharmacological education also concerns evidence-based medicine, which will be covered in this paper.

RESEARCH RESULTS

I. Diagnostic problems.

Tens of millions of patients with cardiovascular disease visit doctors every day. It is estimated that one in four people in the United States suffers from cardiovascular disease, or 68 million Americans. Half a million people die of heart attacks almost every year, half of them under the age of 65. More than 3 million patients with chest pain are hospitalized in the United States each year. Rapid and reliable differential diagnosis should be performed in emergency departments. However, diagnostic errors are very common. Among patients with chest pain suggestive of coronary heart disease (CHD) who are referred for coronary arteriography, up to 30% have no detected large vascular disease (300,000 normal coronary arteriograms annually!). Dozens of different diseases are accompanied by the same syndrome of acute chest pain.

Complications of differential diagnosis and diagnostic errors lead to the following suboptimal treatment tactics. Therefore, the search for an earlier effective diagnosis and adequate treatment of these diseases according to the standard and non-standard solution of the problem are urgent.

Moreover, the "Proteus effect", which was studied at the Evidence-Based Practice Center, a clinic in Mayo, sometimes shows a decrease, over time, in the effectiveness of treatment. Thus, when trying to treat a new drug or procedure, its effectiveness in the early stages is significant. But in later stages, the result was much more modest. This can affect the treatment of patients with several chronic diseases, so they should understand that the effectiveness of treatment with an effective drug may decrease over time. The attending physician should also be prepared for this and should constantly monitor the patient's condition to develop a new treatment regimen in a timely manne [9].

II. Didactic and educational problems of medical education.

The unsatisfactory level of diagnosis is the reason why we are constantly looking for ways to improve health care and medical education. Great hopes are placed on modern medical equipment and modern communications. Among the various technical innovations, special attention was drawn to computerized distance learning - eLearning. In recent years, more and more literature has been published on distance education. It uses almost all modern technical means - remote telephone and video consultations of highly qualified specialists, video conferencing, video discussion groups for complex diagnosis and treatment of patients, presentation of relevant medical information on CD-ROM, via the Internet, computer-assisted instructions and more. Local and international networks are evolving and constantly improving.

Table 1. Levels of learning.

Level of training	Name	Specifics of educational activity
I	Acquaintance	Identification, recognition, distinction
II	Copying	Reproductive activity (reproduction of information from memory)
III	Assimilation	Productive activities with the use of knowledge for practice, related to known objects and situations
IV	Transformation	Innovative and creative activity

Source: *Jeg Journal*

Distance medical education is of great practical importance. About 80% of doctors are internists, mostly family doctors. Most of them work in remote medical facilities located far from large clinics and medical centers. The huge amount of research in the field of distance education and good funding for these innovations allow us to expect clear results, demonstrating high quantitative and qualitative indicators of significant improvement of medical professional activity through e-learning. Unfortunately, most of the research is aimed at mid-level medical staff (nurses, midwives, dentists) and is devoted to a visual demonstration of relevant professional activities.

Such areas of e-learning, of course, are very useful and can provide better study or repetition of material about professional procedures, manipulation through visual animated images.

The fact that the use of photos and videos helps in learning and work is shown by the Photovoice study conducted by the School of Pharmacy of the University of North Dakota (Werremeyer A. et al, 2016). According to the terms of the

study, six took only 77 photographs that should reflect the learning process. From these data, four topics were presented, which represented the educational areas for students: attitudes, professional growth, change of cultural competence and experience on the ground.

The conclusions made by pharmacy students during their reflections and emotional experiences on the photo show the interaction between learning and emotional experiences. The Photovoice technique can help the learning process to better assimilate and memorize information and experiences through the emotions experienced during the learning process, which is recorded on camera.

However, the following is obvious: pedagogical didactic efforts and methods and modern expensive e-learning technologies should be directed primarily to primary, secondary and tertiary physicians [10].

Effective diagnosis and treatment are the products of intellectual activity. Therefore, different methodologies and technologies need to be used for effective learning.

Table 2. Comparison between standard and new methods of diagnostic decision making.

Criteria	Conventional methods	New algorithmic methods
Using Diagnostic Decision Making (DDM)	Nosological	Evidence (by syndrome)
Required number of medical tests for DDM	Maximum	Fixation at a certain min. Levels
Number of symptoms	Arbitrary, indefinite	Fixed
Method of verifying the diagnosis	By precedent	Deductive (based on exceptions)
Possibility of differentiation among other diseases	With complications	Easy to perform
Time required to adopt the DDM	Long period	Short period

Effectiveness of practice in the adoption of DDM	High	Low (training can take up to a decade)
Ability to computerize	With difficulties	Much easier to diagnose

Source: *Jeg Journal*

III. Economic problems of medical and pharmacological education.

The terms of diagnostic costs, economic efficiency of diagnostics, analysis of costs and benefits of diagnosis are constantly discussed in the world medical and economic literature in recent years. This is a really big and painful problem. Health care costs are very high and growing. The total annual cost of various health care programs ranges from 415 million to 56.9 billion US dollars per year. Health care costs associated with chest pain range from \$389 million to \$ 3.9 billion. The cost of several procedures in some cases ranges from \$2,106 to \$63,424 per patient. Only one percent (4 of the 410 used!) Among the tests was decisive for the primary tumor [11]. Unfortunately, there are no constructive alternative ideas for overcoming this impasse. The following arguments show the significance of the problem:

1. According to popular belief, the most reliable diagnosis is achieved through the most detailed examination with maximum detection of symptoms.
2. The desire of physicians to use new expensive examinations and tests without a rigorous assessment of the actual suitability of each test for the best diagnostic decisions in each case.
3. Numerous consultations with the best (and most expensive), usually experts.
4. Expensive multiple and multiple examinations are usually used for most patients. Therefore, the diagnosis of diseases is very expensive in medical practice.
5. The cost of diagnosis has gradually and significantly increased in all developed countries. Thus, the optimization of economic efficiency is a vital problem around the world.
6. Optimizing the cost-effectiveness of diagnostics is a particularly sensitive issue in regions where the level of health care and welfare of the population is lower than in developed countries.
7. Medical, organizational, methodological, social and financial alternatives should solve the problem of reducing the cost of diagnosis while increasing the quality of disease diagnosis.

The cost of diagnostics is the sum of individual elements:

1. Each medical examination and procedure.
2. Every symptom and sign that is an indication for diagnosis.
3. Time spent on various examinations. Salary of physicians.
4. Salary of medical staff performing procedures.
5. Reliability of the initial diagnosis and the need for additional tests, time spent, etc., if the diagnosis is incorrect.

The first two issues are the most economically important, the others depend on them. Economic problems will be solved by the ability of doctors to make a reliable diagnosis with minimal examinations and crucial signs. This practical approach will provide a very pronounced economic effect (many times cheaper final diagnosis). Diagnostic expert systems are a real way to reduce the cost

of diagnostics. This will optimize the health budget and overcome the economic impasse in internal medicine [12].

IV. Problems of communication technologies.

Why is the communication problem important? The biggest modern problem is the globalization of education. New unusual requirements for the effective learning of everyone who learns are combined with an extremely difficult task for the development of SLES [13]. Therefore, the best training IPs should be presented internationally and should be available to anyone in any country. The Internet and wireless technology will provide this challenge. The user will be able to provide optimal professional self-training at home at any time [14].

IV. Psychological problems:

1. Not all medical students and doctors have free access to a PC and the Internet due to living conditions.
2. Psychological contradiction between the interests of students and practitioners on the one hand and medical instructors on the other.
3. Students/doctors are interested in the fastest possible improvement of their professional activity.

The solution of psychological problems will be solved with the help of SLES, which offers qualified diagnostic intellectual activity and the best results in self-preparation, a regime with high motivation of students and various psychological incentives when working with SLES. This will ensure the effectiveness of everyone's learning, according to their individual abilities, regardless of the teachers and any other member of his group [16].

V. Social problems.

As mentioned above, the medical profession belongs to the category of dangerous professions. The social impact of doctors' activities is very strong, given that hundreds of millions of people turn to them every day; and the health and life of the patient directly depend on the doctor's ability to qualitatively diagnose the disease.

Family physicians mostly work in remote medical facilities located far from large clinics and medical centers.

Representatives of dangerous professions need the highest level of professional education, constant improvement of their skills throughout their professional activities. Improving medical professional skills has a significant positive impact on health, quality of life and social status of the population [17].

Solving social problems is a long-term goal that will be realized through the wide practical use of diagnostic principles of decision-making, implemented in SLES and mastered during self-study. Thus, the improvement of quality of life and health safety will be successfully achieved. New and expanded telecommunications links between the community and hospitals promise to reduce the professional isolation of physicians remote from large cities and to improve lifelong learning opportunities for the health of those living in rural areas [18].

VI. Strategic problems of pharmacological and medical education.

The XXI century requires the development and mass dissemination of the latest technologies, and their maximum use by health professionals. Therefore, an appropriate strategy should be adopted [19].

1. Diagnosis and treatment of the patient are the most important, most complex and most dangerous areas of medical activity, because this is where fatal errors often occur. Therefore, pedagogical didactic efforts and methodologies should be focused first on these issues.

2. Training in modern diagnostic technologies should be provided by optimal transmission of multimedia information (text, images, including movies, sound) for users, both directly from the SLES installed on the PC, and through wired and wireless technologies for remote users.

3. Optimization of clinical diagnostics and e-learning, the use of algorithmic decision-making based on evidence - the only real way to achieve the best results in professional medical activities [20].

RESULTS AND DISCUSSION

The author's innovative diagnostic expert systems called Aesculapius ES (AES) are dedicated to the diagnosis of diseases in the main clinical areas of internal medicine. Hepatobiliary AES is complete for practical use and provides rapid comprehensive radiological diagnosis of 97 hepatobiliary and other diseases manifested by jaundice (950 diagnostic findings based on history, clinical, paraclinical, laboratory and other examinations). AES, dedicated to the diagnosis of cardiovascular, pulmonary, gastrointestinal diseases, diseases accompanied by fever and all types of traumatic injuries is under development. Each AES provides computerized diagnosis of all, or at least most of the diseases of these organs and is manifested in all clinical laboratories, X-rays, etc. Didactic and educational problems of solving medical education will be achieved by developing and using the most effective didactic methodologies and tools [21]. Some authors emphasize the need to modernize education at the territorial and regional levels. This will improve the quality of the educational process [22].

CONCLUSION

Complex problems of modern medicine, as well as medical and pharmacological education can not be solved by conventional methods, techniques and means. The above shows that the theoretical and practical solution of these problems can be done in non-traditional ways.

This perspective is not a panacea, but it opens the way and begins the first steps in a real practical solution to the problems of modern clinical medicine and medical education.

Thus, the total computerization of disease diagnosis and independent e-learning, based on the original new paradigm, implemented using the most effective three optimal methodologies for clinical decision-making, are effective tools for solving problems. The proposed innovations will provide the most reliable diagnosis in the shortest and most effective way, using a minimum of medical examinations, a minimum of examinations, a minimum of efforts of doctors in the shortest possible time, and effective financial costs of diagnosis. SLES must be integrated into modern telematics programs and Internet / Intranet networks, and wireless technologies for the most effective individual professional rapid self-study.

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