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ANALYSIS OF THE STATES OF THE ACTIVITY OF THE LABORATORY SERVICE OF THE INDUSTRIAL REGION OF UKRAINE AND THE WAYS OF ITS OPTIMIZATION

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Ключевые слова: *деятельность лабораторной службы области, кадровый потенциал, пути оптимизации работы*

Abstract. Analysis of the states of the activity of the laboratory service of the industrial region of Ukraine and the ways of its optimization. Yeroshkina T.V., Derevyanko D.V. *The purpose of the study is to analyze the activity of the laboratory service of the Dnepropetrovsk region, to develop and substantiate the concept of optimizing its work. We have carried out in dynamics the analysis of the laboratory service of the Dnepropetrovsk region: its structure; staffing level of doctor-laboratory assistants, biologists and laboratory assistants; carrying out laboratory researches, their structure and quality, as well as the state of laboratory equipment and reagent base. The methods of research used: bibliosemantic – systematic and historical analysis of domestic and world literary sources on the organization of laboratory service; reports and legislative documents on the activities of the laboratory service of the region; systematic analysis – to identify the existing shortcomings and positive experience in the training system, the formation of an effective team of employees, quality of the provided laboratory services, ways to optimize the work of the clinical-diagnostic laboratories (CDL); medical statistics for the analysis and interpretation of research results, logical modeling – for the development of the concept. The article covers the state of the laboratory service of the region: changes of its structure due to restructuring of the treatment-prophylactic institutions (TPI), the reforming of primary medical-sanitary care; development of family medicine – the number of hospitals decreased by 39,8% in 2017 as compared to 1995, the number of hospital beds – by 38% per 10 thousand population; At the same time, the number of outpatient clinics increased by 70,1% during this period, which is in line with the WHO recommendations for provision of outpatient care to 80% of patients. Coefficient of provision of population of the region with doctor-laboratory assistants per 10 thousand of population is 0,68; staffing level of doctor-laboratory assistants by natural persons is 25,9% with tendencies to decrease. The staffing level of specialists with higher non-medical education is 63.6%. Clinical and diagnostic laboratories in most cases have a minimum of equipment that is often outdated, without means for equipment automatization. Problems of the laboratory service of the region consist in the presence of a large number of low-power CDLs, performing the minimum set of diagnostic tests, lack of programs of research in the framework of separate nosological forms of diseases at different stages of medical care provision, acute shortage of high-tech equipment; lack of a systematic approach; high turnover of personnel due to unsatisfactory material and technical and economic condition of the service and low wages. The main ways of optimization of laboratory services are offered.*

Реферат. Анализ состояния деятельности лабораторной службы промышленного региона Украины и пути ее оптимизации. Ерошкина Т.В., Деревянко Д.В. *Цель исследования – проведение анализа деятельности лабораторной службы Днепропетровского региона, разработка и научное обоснование концепции оптимизации ее работы. Нами проведен в динамике анализ деятельности лабораторной службы Днепропетровского региона: ее структура; укомплектованность врачами-лаборантами, биологами и лаборантами; проведенные лабораторные исследования, их структура и качество, а также состояние лабораторного оборудования и реагентной базы. Методы – библиосемантический – системно-исторический анализ отечественных и мировых литературных источников по организации лабораторной службы; отчеты и*

законодательные документы о деятельности лабораторной службы региона; системного анализа – для выявления существующих недостатков и положительного опыта в системе подготовки кадров, формировании эффективной команды работников, качестве предоставляемых лабораторных услуг, путей оптимизации работы клинически-диагностических лабораторий (КДЛ); медицинской статистики для анализа и интерпретации представления результатов исследования, логического моделирования – для разработки концепции, совершенствования деятельности лабораторной службы. В статье освещены состояние лабораторной службы, изменение ее структуры в связи с реструкторизацией самих лечебно-профилактических учреждений (ЛПУ), реформированием первичной медико-санитарной помощи, развитием семейной медицины – на 39,8% уменшилось в 2017 г. по сравнению с 1995г. количество больниц, на 38% – больничных коек на 10 тыс. населения; в то же время количество амбулаторно-поликлинических учреждений увеличилось за этот период на 70,1%, что соответствует рекомендациям ВОЗ по оказанию поликлинической помощи до 80% пациентов. Коэффициент обеспеченості населения региона врачами-лаборантами на 10 тыс. населения – 0,68; укомплектованность штатных должностей врачей-лаборантов физическими лицами – 25,9% с тенденциями к уменьшению. Уменшилась и укомплектованность штатных должностей специалистами с высшим немедицинским образованием и составила 63,6% КДЛ в большинстве случаев имеют минимум оборудования, нередко устаревшего, не имеют средств автоматизации, недостаточно вспомагательной аппаратуры. Проблемы лабораторной службы региона состоят в наличии большого количества маломощных КДЛ, выполняющих минимальный набор диагностических тестов, отсутствии программ (протоколов) иссследований в рамках отдельных нозологических форм болезней на разных этапах оказания медицинской помощи, остром дефиците высокотехнологического оборудования; большой текучести кадров в связи с неудовлетворительным материально-техническим и экономическим состоянием службы и низкой оплатой труда. Предложены основные пути оптимизации деятельности лабораторной службы.

In the process of treatment, patients undergo a large number of different types of diagnostic examination. Among them, clinical laboratory research is important. According to the Ministry of Health, their share accounts for 75-95% of all studies conducted to patients in health care facilities (HCF) [1]. In Ukraine, clinic and diagnostic laboratories operate in every HCF, in state-owned, departmental, and in private ones. Clinical laboratory diagnostics is a medical specialty, the subject of which is clinical laboratory research, that is, studying the composition of samples of biomaterials of patients with the task of detection - measuring their endogenous or exogenous components, determining the structure or condition that functionally reflect the activity of organs, tissues, systems of the organism, the damage of which is possible in the foreseen pathologies.

According to the results of laboratory studies doctors specify diagnoses, draw conclusions about the level of compliance of important parameters of life activity, organs – to normative values and their changes in the course of treatment and prediction of the quality of life in the future. Therefore, the reliability of the results of such specific assessments of compliance directly concerns health and life.

The service of clinical laboratory diagnostics is a combination of clinical and diagnostic laboratories - units of health institutions, operating in accordance with the common scientific and methodological principles. Prescribing of clinical laboratory research determines the possibility of various conditions for its implementation - in inpatient and outpatient health care institutions of various profiles and capacity, in emergency situations, in periodic health examinations and screening, in medical genetic study [6, 8].

The specific, complex character of the scientific and methodological basis of laboratory diagnostics is realized by the distinguishing within the framework of a single specialty of clinical laboratory diagnostics of a number of specializations: general clinical trials, clinical biochemistry, laboratory hematology, coagulology, cytology, laboratory genetics, molecular biology, immunology, isocerology, bacteriology, virology, mycology, parasitology, chemical-toxicological research, therapeutic monitoring of drugs, etc. There is a difference in labor productivity between laboratories with automated equipment and laboratories that use manual methods, it can reach as many as 20 times [6, 7].

It should be noted that the improvement of the existing model of laboratory service in Ukraine has been reflected in some national programs (in particular, "Health of the Nation") and programs devoted to the development of provision of medical care to certain categories of patients (diabetes, HIV/AIDS, cardiovascular diseases) [1].

Re-equipment of the primary care unit for the provision of medical care in the framework of the National Law of Ukraine "On the Procedure for Reforming the Health Care System in Vinnytsia, Dnipropetrovsk, Donetsk Oblast and the City of Kyiv", within the framework of projects for improving medical care (emergency and emergency care, oncological patients, patients psycho-neurological institutions, etc.), as well as the creation of the CDL in the HCF, the provision of high-tech medical care

(centers of perinatal, endocrinological, traumatological, cardiosurgical) substantially widened opportunities and improved quality of laboratory studies [1, 4]. Surely, this is an important step in the reform of the laboratory service, but the problem of providing population with the laboratory services is not solved fundamentally.

Thus, almost 80% in the structure of laboratory analyzes is low-informative types of research – general-clinical blood and urine tests, while modern clinical practice requires highly informative types of laboratory tests [4]. A poor quality and informative value of laboratory studies have generated distrust of doctors and patients to the results of the tests. On transition of a patient from one level of medical care to another, or transition to another health care institution, more than 50% of laboratory tests are redone. Obviously, operating CDLs are not able to fully address the challenges posed by modern healthcare [2]. One of the reasons of the technical lagging behind of clinical, laboratory research from the modern scientific and technical level is the lack of material interest of laboratory experts in improving labor productivity and research quality.

Scientific publications of domestic and foreign specialists in the field of laboratory work are devoted to the introduction or improvement of one or another method of laboratory diagnosis, neglecting the problem of organizing the system of laboratory service as a subsystem of the health sector.

The absence of special scientific researches in Ukraine on the activity of the laboratory service required scientific substantiation of a qualitatively new system of laboratory service at the regional level and the defining its effectiveness, was carried out by Tolstanov O.K. (2012) on the basis of the CDL of HCF of Zhytomyr region [6].

The novelty of his work was the systematic presentation of the problems of the laboratory service and ways of their solution with the achievement of positive medical, economic and social results at the regional level; the influence of organizational factors and resources on the availability and quality of laboratory research is determined; the influence of the use of modern laboratory technologies on the quality of the medical diagnostic process; the volume of expenditures for the development of a qualitatively new laboratory system at the regional level was substantiated [3, 6]. However, not all problems of the CDL have been solved, which has determined the relevance of this study.

The purpose of the study is to analyze the activity of the laboratory service of Dnipropetrovsk region, to develop and substantiate the concept of optimizing its work.

MATERIALS AND METHODS OF RESEARCH

We have conducted in the dynamics the analysis of the state of activity of the laboratory service of Dnipropetrovsk region: the number of laboratories in the sphere of HCF, their structure; staffing of CDL by doctor-laboratory assistants, biologists and laboratory assistants; performed laboratory studies, their structure and quality, as well as the state of laboratory equipment and reagent base.

The methods of research were: bibliosemantic - systematic and historical analysis of domestic and world literary sources on the organization of laboratory service; reports and legislative documents on the activities of the laboratory service of the region; system analysis – to carry out quantitative and qualitative analysis of the problems of the laboratory service, existing shortcomings and positive experience in the system of personnel training, the formation of an effective team of employees, improvement of the quality of laboratory services, ways to optimize the work of CDL; medical statistics: analysis of dynamic series by quantitative indices (intensive, extensive, average rate of increase / loss of hospitals, hospital beds, outpatient clinics, clinical laboratories, their personnel, made analyses etc.) for interpretation of research results; logical modeling – to develop a concept for improving laboratorys service in the region.

RESULTS AND DISCUSSION

It was established that in the Dnipropetrovsk region, as on a nationwide scale a gradual decrease in the number of hospitals is noted – by 39.8% and 55.5% respectively, while the number of patients per bed increased by 61.0% and 70.8%, respectively, resulting from centralization and closure of low-capacity hospitals in rural localities. Accordingly, the number of hospital beds decreased both in absolute and relative ratios (table).

At the same time, the number of outpatient clinics increased by 70.1% and 43.7%, the number of visits per 10,000 of population – by 20.8% and 15.7%, due to the development of primary health care and introduction of family medicine.

The average length of patients' stay in the hospitals of the Ministry of Health decreased from 16.8 days to 11.0 (by 4.5%)

With the decrease in the number of HCF, the number of clinical laboratories and made laboratory tests reduced. If in the Dnipropetrovsk region in 2013 the number of clinical analyses was 187461.1 per 10,000 of population, that is, more than 56 million, or an average of 18.7 per 1 person [5, 12], then in 2017 their number decreased by 1, 15 times. The decrease occurred as a whole in the region, and in cities and districts.

The dynamics of the number of health facilities in 1995-2017 in the Dnipropetrovsk region and in Ukraine *

Ratios	Dnipropetrovsk region				Ukraine			
	1995	2010	2017	Rate of growth 2017 to 1995	1995	2010	2017	Rate of growth 2017 to 1995
Number of hospitals	232	195	142	-39.8	3855	2763	1714	-55.5
Hospital beds, total	54134	35336	28254	-47.8	638883	42867	308736	-51.7
Per 10000 of population	141.0	106.0	87.5	-38.0	125.1	94.0	73.1	-41.6
Number of people per 1 bed	70.9	94.3	114.2	61.0	80.0	106.4	136.7	70.8
Number of out-patient clinics	529	711	900	70.1	7220	8993	10373	43.7
Number of visits per shift	93112	90930	94539	1.53	965509	992754	922880	-0.4
Per 10000 of people	242.4	272.8	292.9	20.8	189.0	217.7	218.6	15.7

N o t e . * – table made according the data of State Statistics Service of Ukraine.

Staffing of physician-laboratory assistants by individuals in the HCF of Dnipro city in 2014 was 27.4% and decreased to 25.9% in 2017. Staffing by specialists with higher non-medical education in 2014 was 65% and decreased to 63.6% in 2017.

In general, the percentage of laboratory analyses of the biochemical and toxicological profile has been increased in the region. At the same time, the proportion of microbiological, immunological and genetic analyses has decreased. In cities there was a slight increase only in biochemical analyses, in all other types of analyses the number decreased. By regions there is a tendency to decrease in 2017 the proportion of all types of performed tests (biochemical, microbiological, immunological).

The state of the laboratory equipment and reagent base in the HCF of the region varies considerably, as the nomenclature and the number of laboratory tests performed in the CDL of different levels.

In most cases CDLs have a minimum of equipment, often out-of-date, which does not allow to extend the range of research; do not have the means for automation, backup equipment, which creates the risk of stopping research in the event of a breakdown of devices. New equipment is often purchased without consistency with the plans for the development of CDL, often - not the best samples of laboratory equipment [3]. Auxiliary equipment – exhaust fume hoods, modern refrigeration chambers, analytical scales, electronic computers etc. are in deficiency. There is no single concept of equipping laboratories with up-to-date equipment.

The dissatisfaction of medical and scrub staff with the real working environment with the use of worn-out equipment, the lack of due attention to its technical maintenance and a low level of income leads to a constant outflow of personnel. Provision of population by doctor-laboratory assistants in the health care facilities of the region (per 10,000 of population) in 2017 was 0.68. Compared to 2014, this figure decreased by 20%. The decrease in the provision of population by doctors-laboratory assistants is observed in Ukraine – from 0.68 in 2014 to 0.6 in 2017.

The financial capabilities of the country do not make it possible to equip each CDL with modern laboratory equipment in a short time, to prepare a sufficient number of qualified specialists for clinical laboratory diagnostics [1, 2, 3].

Problems of the development of the laboratory service of the region can be described as follows:

1. The presence of a large number of low-power laboratories that perform the minimum set of diagnostic tests.

2. Inappropriate use of available equipment due to the unprofessional and inconsistent approach to the equipment of medical institutions with new equipment.

3. Absence of general programs of protocols of administering and performing laboratory research in the framework of separate nosological forms at different stages of medical care delivery.

4. The extreme degree of wear of laboratory equipment, the lack of planned replacement and availability of qualified service also leads to a decrease in the quality of analyses of biological samples.

5. Acute shortage of high-tech equipment, lack of a systematic approach to its ordering, uneven distribution, its low equipment and efficiency of usage, first of all biochemical and hematological analyzers.

6. Personnel outflow due to unsatisfactory material-technical and economic state of laboratory service, low salary.

7. Insufficient level of training of scrub staff and engineering staff.

All this convincingly testifies to the urgent need to optimize the structure and functions of the laboratory service of the region.

The solution to the problem of reforming the laboratory service lies in the organization of the cost-effective functioning of the CDL in the market of laboratory services. Despite the fact that the number of CDL in our country for the last 10 years has significantly decreased, but their number is higher than in developed countries [8].

The general significance of the service of clinical laboratory diagnostics for improving the quality of medical care at all levels and in all its forms dictates the need to develop a concept for the development of clinical laboratory diagnostics, first in the pilot region – Dnipropetrovsk region, and then – and in Ukraine will allow to maximally efficiently using the resources of the state and society, improve the quality and diagnostic efficiency of laboratory research for prevention and treatment of the population at the state level.

The main objective of the concept is to guarantee the quality of laboratory research by continuously improving the activities of laboratories and institutions of clinical laboratory diagnostics by providing the necessary laboratory information to doctors of clinical units.

Possible solutions are:

1) improvement of the existing model of management of laboratory service with the use of a systematic approach, including training of staff (preuniversity, university and postgraduate); 100% prpvision of CDL by skilled personnel (individuals); inventory of existing equipment, certification of workplaces, development of a real target program for providing CDL with high-tech modern equipment with qualified service maintenance, replacement of worn-out laboratory equipment; solution of logistics and rational financing of the laboratory, standardization of laboratory research, establishment of standard operating procedures (SOPs); preparation for accreditation of laboratories etc.

2) development of an alternative model by centralizing laboratory research and separating functions of CDL into profile-non-profile (facility - management). For the healthcare market in Ukraine, this form of partnership is not sufficiently widespread and innovative yet. Health care delivery and medical services (including laboratory) are the main functions of the HCFs. Catering service, payment for energy supplies, communication services, repair of premises, devices and equipment, resupply of material and technical base etc. All these non-core functions can be passed to specialized firms (outsoursers), which will enable CDL to concentrate on key concepts and provide them with competitive advantages.

CONCLUSIONS

1. Despite the extensive number of clinical and diagnostic laboratories in the HCF of Dnipropetrovsk region, their activity do not fully meet the current needs of clinical medicine, which necessitates the scientific substantiation of the conceptual framework for improving the existing system of laboratory service with the introduction of international approaches to the management of the quantity and quality of laboratory research.

2. Optimization of the structure and functions of the laboratory service of the region, rational investment of funds that need to be directed to its logistical support, in particular, to modernize diagnostic equipment stock, improve the quality of research, full laboratory examination of patients, reduce the percentage of repeatance of analyses performance.

3. Rationalization of laboratory examinations, introduction of more informative laboratory technologies instead of outdated tests, use of complex examination based on consolidated systems of laboratory analysis, expert systems, reasonable set up of express-laboratories, wider usage of them at the outpatient clinics, family medice clinics, at home, of such methods of analysis, as diagnostic strips, immuno-analytical test cassettes, microchips, laser photometers, biosensors, and the like.

4. Standardization of laboratory studies with the evaluation of the performed standards of research in

the certification of clinical-diagnostic laboratories. The standard, as a set of requirements, that provides the quality of laboratory research required for the clinic, determines the obligatory level below which the clinical- diagnostic laboratory is not entitled to work.

5. Improvement of the personnel training system for the laboratory service, starting with vocational guidance of school leavers and graduates of lyceums, professional training of students of higher educational institutions, interns and those completing postgraduate training, regular training of doctor-laboratory assistants. Dealing with problems of pay raise for specialists and modernizing the laboratory service at the expense of regional funding.

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