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Methodological aspects of evaluating the efficiency of the medical service provision based on Big Data

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Abstract—Improving the population's quality of life is one of the key tasks of our time for the social policy of the States. Ensuring a healthy lifestyle and promoting well-being for all at any age is one of the goals of sustainable development. The relevance of the research topic in this paper.

The paper discusses the directions of the implementation of the state policy in the field of health care, in the provision of medical services, namely, in the prevention of non-communicable diseases; regulatory documents that establish the priority of the development of the medical service provision in the Russian Federation in the form of primary health care have been examined. Also, a review of regional regulatory documents on the evaluating the efficiency of the medical service provision, in particular in the provision of primary health care (based on the example of clinical examination for certain groups of the adult population (hereinafter referred to as the "Clinical examination")), has been carried out.

The authors propose an indicator for evaluating the efficiency of the medical service provision (for example, clinical examination), the basis for the calculation of which is Big Data the results of the control and expert activities of insurance medical organizations based on the results of the medical service provision to insured citizens.

Based on the calculation results, it will be possible to draw a conclusion about the economic efficiency of the clinical examination, its effect on the detection of diseases, and, as a result, on the socioeconomic development of the region as a whole.

Keywords—service sector, medical services, clinical examination, primary health care, efficiency, Big Data.

I. INTRODUCTION

According to the World Health Organization (hereinafter referred to as the "WHO"), the leading causes of mortality in the 21st century are non-communicable diseases, such as cardiovascular diseases, oncological diseases, and diabetes mellitus [1]. In this regard, the key direction of public health policy in many countries is the development of medical care aimed at preventing the development of non-communicable diseases in order to reduce mortality: according to the experience of many countries of the world that have achieved a 2-3-fold reduction in mortality from non-communicable diseases, the contribution of preventive measures in this

decrease is from 40% to 70% [2]. Moreover, primary health care, subject to that it is provided in a quality manner, can reduce health care costs, including by reducing the number of hospitalizations.

Currently, the guideline for determining the goals of social policy is the goals of sustainable development. According to WHO, strengthening primary health care is important to achieve the Sustainable Development Goal (hereinafter referred to as the "SDG") No. 3 "Good Health and Well-Being" and to ensure universal health coverage, as well as able to influence the achievement of other goals [3].

In the total amount of health care financing, the share of financial support for the provision of primary health care (hereinafter referred to as the "PHC") in foreign countries does not exceed 25%, but tends to increase by 1-2% annually: in the USA, the share of primary health care financing in the structure of health care financing is about 8%, in the UK—about 22%, in Canada—about 15%, in Germany—about 12%. In 2018, an increase in PHC financing in the Russian Federation amounted to 20% [4].

The purpose of this paper is to analyze the implementation of the state policy in the medical service provision and formulate proposals to assess the effectiveness of primary health care in the face of increasing its role in the implementation of the state policy in the health care.

The tasks of the study are:

1) analysis of normative legal acts establishing the priority of primary health care in the Russian Federation and the possibility of using Big Data in health care;

2) analysis of the dynamics of the costs of clinical examination for certain groups of the adult population as one of the areas of primary health care in the constituent entities of the Russian Federation for the period from 2013 to 2018 (for example, Krasnoyarsk Krai);

3) a review of normative acts of the constituent entities of the Russian Federation establishing indicators for evaluating the efficiency of clinical examination for certain groups of the adult population;

4) formulation of a proposal regarding the establishment of indicators for evaluating the efficiency of clinical examination for certain groups of the adult population.



II. RESEARCH METHODOLOGY

In the study of the possibilities of Big Data using in evaluating the efficiency of medical services, the following methods were used: universal scientific methods, including empirical and theoretical levels, analysis and synthesis, content analysis.

The work of many scientists [5, 6] has been devoted to researching the features of management, analysis, and use of Big Data in health care [5, 6]. Among the features of Big Data in health care, there are the following:

- medical workers store various types of information (for example, the patient's medical history, laboratory data, etc.);

- with the advent of computer systems, the digitization of all clinical trials and medical records in health care systems has become a widespread practice;

- development and use of health monitoring devices and related software that can generate warnings and exchange patient health information with medical organizations (biomedical monitoring).

III. RESULTS

The priority of the development of primary health care in the Russian Federation is established in many program and project documents regulating the directions of socioeconomic development in the Russian Federation [7, 8, 9, 10].

Thus, at present, the priority is declared in the Russian Federation for the development of medical services in the primary health care provision and the strengthening of the preventive focus.

The implementation of this approach requires an increase in financial support from public funds, since it is necessary to eliminate existing problems in the primary care sector, such as a lack of medical personnel, outdated medical equipment, low public satisfaction with the quality of medical care, etc. A survey conducted by the Russian Public Opinion Research Center (VTsIOM) in 2017 has shown that citizens highlight a number of problems, the primary solution of which will improve the medical care provision [11]:

- insufficient level of professional training of doctors;

- lack of doctors;

- inaccessibility of medical care for the population (expensive medicines, services);

- insufficient facilities of medical institutions with modern equipment.

Obviously, the solution to these problems is impossible without increasing the financial support of the health care industry and PHC. In this regard, the question arises of how effectively the funds aimed at providing PHC will be used.

As noted earlier, the greatest efficiency in the provision of primary health care is achieved from preventive measures. One of the key directions of providing PHC, aimed at reducing the mortality rate from non-communicable diseases, is the clinical examination for certain groups of the adult population. Let's look at the example of Krasnoyarsk Krai, the change in the volume of financial support for the clinical examination for certain groups of adults.

In 2014, 513,576 people were subject to clinical examination for certain groups of the adult population in Krasnoyarsk Krai, 491,926 people were examined (95.8% of the persons to be examined) with the amount of financing of 639,503.8 rubles; in 2017—470,197 people, among which

435,975 people were examined (92.7% of the persons to be examined) with the amount of financing of 828,352.5 rubles. The average cost of the completed case of the clinical examination in Krasnoyarsk Krai from 2014 to 2017 increased from 1,298 rubles up to 2,281 rubles (by 983 rubles or by 43%).

Thus, it can be noted that the financial support for the clinical examination for certain groups of the adult population is increasing annually.

Some constituent entities of the Russian Federation establish indicators at the regional level to evaluate the efficiency of clinical examination for certain groups of the adult population in order to implement the socially significant task of preventing mortality from non-communicable diseases. The work considers the regulatory legal acts of Kemerovo Region and Krasnoyarsk Krai, establishing approaches to evaluating the efficiency of the clinical examination for certain groups of the adult population:

- the law of Kemerovo Region dated December 26, 2018, No. 126-OZ On Approval of the Territorial Program of the State Guarantees of Free Medical Care for Citizens for 2019 and for the Planning Period 2020 and 2021 [12];

- the Order of the Ministry of Health of Krasnoyarsk Krai dated September 9, 2015, No. 564-org On the List of Performance Indicators of the Regional State Healthcare Institutions in Terms of Clinical Examination for Certain Groups of the Adult Population [13].

Based on the results of the consideration of regulatory documents that establish indicators for evaluating the efficiency of the clinical examination for certain groups of the adult population, it can be concluded that the indicators proposed for evaluation can be considered as elements for evaluating the implementation of the main tasks of social policy in the field of health, since the indicators given in Table 2 allow to assess the detectability of diseases as a tool to prevent mortality from controlled causes.

At the same time, indicators are not set for evaluating the economic efficiency of using compulsory medical insurance funds aimed at the clinical examination for certain groups of the adult population.

In this regard, it is necessary to evaluate the economic efficiency of the use of funds on the basis of the situation: when providing primary health care (clinical examination for certain groups of the adult population), health care organizations need to ensure the achievement of desired results using the least amount of funds (economy) and (or) achieving the best result using the amount of funds determined by the budget (efficiency).

It is proposed to use the results of quality control of medical care conducted by insurance medical organizations, which are Big Data, to evaluate the economic efficiency of using funds for clinical examination for certain groups of the adult population. Currently, this regulatory act has been repealed, the Order of the Federal Compulsory Medical Insurance Fund (FCMIF) dated February 28, 2019, No. 36 *On Approval of the Organization and Control of the Volumes, Terms, Quality, and Conditions of Providing Medical Assistance for Compulsory Medical Insurance* (hereinafter referred to as the "Order No. 36") has entered into force [14].

Among the innovations of Order No. 36 in terms of monitoring the medical service provision in the form of preventive measures, we can distinguish the appearance of cases of non-inclusion or untimely inclusion in the dispensary observation group, untimely admission to the dispensary observation, non-compliance with the established frequency of examinations of citizens included in the dispensary observation groups in the objects of medical and economic control, medical and economic examination, and quality examination of medical care.

Based on the results of the monitoring of the volumes, terms, quality, and conditions of medical care providing, the following typical violations in the medical service provision during the clinical examination for certain groups of the adult population have been identified:

• inconsistency of the data to the primary accounting records;

• failure to provide primary medical documentation;

• increase in the number of medical services in the absence of evidence;

• failure to perform the necessary diagnostic measures for the patient.

These violations are detected by medical insurance companies based on the results of medical and economic control, medical and economic examination, examination of the quality of medical care and they are grounds for refusing to pay for medical care. Standards for conducting these forms of control on the volume of medical assistance to insured citizens are as follows:

• when conducting medical and economic control: 100% of the registries of bills for medical care provided by health organizations;

• during clinical and economic examination: when providing medical care on an outpatient basis—0.8% of the number of cases of medical care accepted for payment;

• during the examination of the quality of medical care: when providing medical care on an outpatient basis—at least 0.5% of the number of cases of medical care accepted for payment.

The results of the monitoring of the volumes, terms, quality, and conditions for the medical care provision are documented in acts in the forms established by FCMIF, which indicate the violations identified. The certificate is drawn up in two copies; one copy is handed over to the health organization, the second copy remains in the insurance medical organization/territorial fund.

When evaluating the cost-effectiveness of clinical examination for certain groups of the adult population, it is proposed to use the indicator "Damage to the system of compulsory medical insurance from poor-quality medical care, rubles", which is calculated by the formula (1):

$$Y = \sum \left(N_i \times S_i \right) \tag{1}$$

where V – the amount of damage caused to the system of compulsory medical insurance as a result of poor-quality medical care, in rubles, expressed:

a) an unreasonable increase in the number of medical services during the clinical examination for certain groups of the adult population (for example, conducting examinations in the absence of indications);

b) unjustified receipt of funds for unproven medical services (filing in the registers of medical services accounts not actually provided to the patient, if there are indications);

 $N_{i}\xspace$ – the number of the $i^{th}\xspace$ examination conducted by the patient unreasonably, units;

 $S_{i}-$ the cost of the i^{th} examination conducted by the patient is unreasonable, units.

The validity of the medical service provision is evaluated during the monitoring of the volumes, terms, quality, and conditions of the provision of medical care and it is reflected in the regulatory documents.

IV. DISCUSSION

An evaluation of the state of the health sector in order to fulfill the goals of sustainable socioeconomic development of the territories has shown that there are a number of systemic problems, which do not fully allow improving the quality of life of the population at the present stage. Moreover, normative legal acts in the Russian Federation establish the priority for the development of primary health care, which will ensure the achievement of public policy goals.

The analysis of normative acts of the regional level, which establish indicators for evaluating the efficiency of the clinical examination for certain groups of the adult population, has shown that the indicators proposed for evaluation are calculated according to the data from the register of accounts for the payment of medical care provided. The considered indicators allow us to evaluate the detectability of diseases as a tool to prevent mortality from controlled causes, but they do not allow us to evaluate the economic efficiency of using public funds aimed at financing the clinical examination for certain groups of the adult population.

In this regard, to evaluate the economic efficiency, it is necessary to expand the Big Data use through the use of data on the results of the control and expert work of insurance medical organizations.

V. FINDINGS (CONCLUSION)

Thus, in this paper, based on the consideration of the features of financial support for the provision of primary health care and regional systems for evaluating the efficiency of its delivery (using the example of clinical examination for certain groups of the adult population), oriented towards evaluating the fulfillment of social policy objectives, the need to expand methodological approaches to evaluating the efficiency of the medical service provision has been justified. It is proposed to apply the developed author's indicator for evaluating the economic efficiency of using compulsory medical insurance funds aimed at conducting clinical examinations for certain groups of the adult population



through assessment of damage caused as a result of assuming deficiencies in the medical care provision.

It should be noted that the continuation of research in the indicated direction will complement the indicators for evaluating the economic efficiency and form a system for evaluating it in relation to the clinical examination for certain groups of the adult population as a direction for the primary health care provision.

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