PRACA POGLĄDOWA
REVIEW ARTICLE

THE ESTIMATION OF ECONOMIC EFFECTIVENESS OF PREVENTIVE MEASURES OF NON-INFECTIOUS DISEASES

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ABSTRACT

Introduction: The world today is characterized by the globalization of processes affecting social development. The globalization of preventive work today necessarily involves inter-sectorial interaction. Such a huge work with the preventive aim allows to comprehensively influencing the positive effect on the prevention of negative manifestations in the health of both human and the whole population. That means, that we can talk about a preventive strategy, which should be inherent in total character. The Public Health Service should have a state approach. Many countries confirmed this, such as: USA, Sweden, France, Germany, Great Britain, etc. Prevention, in the broadest sense of the word, must take place, of course, both at the local level and at the interregionale one, and if we talk about a global approach, then we also can speak about the international level. The economic effect of such work is clearly demonstrated as a consequence of prophylactic programs on infectious diseases.

The aim of this article is to justify the economic effectiveness of the prevention of non-communicable diseases and to determine the criteria for calculating the economic forecast.

Materials and methods: The research was conducted with the help of theoretical and statistical methods, by studying scientific sources and systematic analysis and generalization of the experience of finding economic efficiency of preventive measures for non-communicable diseases.

Review and conclusions: The analysis of the considered methods of economic evaluation of preventive measures of non-infectious diseases made it possible to draw the following conclusions, the effectiveness of the health care system and individual treatment and prevention institutions should be considered in a complex way from the point of view of medical, social and economic efficiency. Economic efficiency, as a rule, is the result of medical and social efficiency. When calculating the cost-effectiveness of treatment and prevention measures, the whole complex of losses and costs associated with illnesses should be taken into account, in particular: direct costs directly related to prevention and treatment; Indirect losses associated with the illness, due to the unprocessed part of the gross domestic product, paid by sick leave letters.

KEY WORDS: economic efficiency, medical efficiency, social efficiency, non-infectious diseases/non-communicable diseases, risk factors

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INTRODUCTION

Reducing the incidence of NCDs in Ukraine is a priority task in the health sector. One of the important tools in this work is to improve preventive measures.

Social-preventive health care includes medical, sanitary, technical, hygienic and socio-economic measures [1].

The current and most important socio-economic and medical tasks of the state to date are the creation of a prevention system, which should include an individual and a social component.

Taking into account that the major problem of Ukrainian health care is the NCD, the issue of prevention of this pathology is becoming more acute. The risk factors that are causing NCD are known and studied today. The first place among the NCD is arterial hypertension (AH). Both the pathology itself and its complications are complicated hypertensive crisis, stroke, myocardial infarction, left ventricular septum, hypertensive kidney, angiopathy, aneurysm of the aorta, aortic valve deficiency, hypertensive encephalopathy require significant economic costs for treatment. According to many studies Babadzhanova A.[2], Kislyak O.[3], Morozova T.[4] low rates of controlled hypertension are found out in ambulatory conditions, within 7-15%. As a result, the high frequency of hospitalization due to complications of hypertension and the growth of economic costs for treatment. One of the main causes of uncontrolled hypertension is the irregular ingestion of antihypertensive drugs. Patients either do not take medications or violate the recommended regimen of their use [5]. It is clear that with an increase in the frequency of admissions increases the economic index.

Arterial hypertension among civil servants (CS) ranks first in the structure of the prevalence of circulatory system diseases (CSD) and is the leading cause of complications such as hypertensive crisis, stroke and myocardial infarction (Yezhel N., Dyachuk D., Pischikov V.)[6].

According to research by scientist Zozulia I. S. [5] acute cerebrovascular accident (ACA) and acute coronary syndrome (ACS) has a prevalence of 1.3% and 1.2% among the Ukrainian population, which leads to significant economic losses.

The economic efficiency of preventive measures consists in the implementation of innovative healthcare projects that ensure the needs of the population in preserving and strengthening health, reducing the morbidity, premature mortality, especially in working age, thus contributing

to the preservation and restoration of labor resources, increase of labor productivity and the growth of the gross national product and, thus, are definitely an economic component [7].

Economic efficiency is the sum of reducing the cost of treatment, sick pay and loss of production as a result of improving the health of the population - reducing morbidity, premature mortality, disability, etc.

It is common, that the economic efficiency is a consequence of social and medical efficiency. In some cases, therapeutic and preventive measures, having medical and social efficiency, deprive the economic effect. For example, these are expensive newest methods of treatment that preserve and lengthen the lives of the elderly, but do not justify themselves from an economic point of view. The economic justification for preventive measures does not require a compulsory positive economic effect in the presence of medical and social efficiency. The calculation of the required volume of material and financial resources, as well as their effective use, is an economic justification. In addition, the coefficient of economic efficiency of preventive measures determines the amount of savings per unit of expenditure.

Enough effective, from an economic point of view, are the preventive measures in the early childhood that provide health for future generations, preventive measures to reduce mortality in working age, etc.

However, one must understand where economic efficiency should be in the priority, and where not, since, the main goal of health care is to provide public health, rather than to achieve profitable activity. For example, measures to prolong life expectancy can not be called cost-effective, as it increases the economic burden on the able-bodied population to retain pensioners.

Estimates of the cost-effectiveness of treatment and prophylactic measures are indicative because they are based on average statistics and assumptions.

For the economic justification and determination of the economic efficiency of preventive measures in the health care it is necessary to calculate losses from morbidity, mortality, disability, etc. in the basic and current periods.

In the context of reforming the healthcare sector, when the transition from state funding to health care facilities to financing the provision of medical care to the population based on its needs, the scientific problem and the development of measures to preserve and strengthen the health of the population of the preventive orientation. Formation of an approach in carrying out preventive measures for elimination of the negative influence of social determinants of health, creation of conditions for preservation and strengthening of health of the population, formation of a responsible attitude of each person to personal health allows to reduce expenses on health protection both on a national scale, and in personal one. It is well-known that prevention of non-infectious diseases is 2.7 times less costly than treatment of patients. At the same time, a healthy lifestyle is 5 times more effective than the medical and diagnostic activity of the health care sector, connected with the preservation and strengthening of public health.

The socio-economic consequences of premature mortality are not only a reduction of the years of potential life and an increase in the amount of irrecoverable losses due to death, but also significant economic losses. Due to the premature mortality of the population of Ukraine, only about 4 million years of potential life are lost every year, and the volume of underproduced national product in recent years ranged from 47.9 to 89.1 billion UAH.

The rationality of the health system, in the current context of the European region, is to improve its performance and reduce costs by increasing the volume of investments involved in health promotion and disease prevention, as well as improving the effectiveness of treatment. and the rehabilitation of those affected by the disease. Consequently, conducting modern innovative scientific developments on the prevention of non-communicable diseases and the application of the results of scientific developments in the practice of health care is not only relevant, but also cost-effective.

THE AIM

To substantiate economic efficiency and to simulate the economic forecast in the implementation of multifactorial prevention of non-communicable diseases among affiliated contingents in a multidisciplinary health care institution.

MATERIALS AND METHODS

The research was conducted using theoretical and statistical methods, by studying and analyzing the experience of finding economic effectiveness of preventive measures of non-infectious diseases.

REVIEW

The study was conducted on an example of hypertension disease (HD) and its complications. The subject of the study were patients with a diagnosis of hypertension, which was treated in the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs.

Thus, according to the data (Table I), by the classes and individual diseases in the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs 14895 patients with hypertension were registered in 2015. 8403 and 13105 patients were subject to dispensary examinations and were under clinical supervision at the end of the reporting period, respectively. In 2016, 13896 patients were registered. 7516 patients were subject to dispensary examinations; 13318 patients were under observation. In 2017, 13639 patients were registered, of which 7084 were subject to dispensary examinations, and 13110 patients were under a dispensary supervision at the end of the reporting period.

During the analysis of the dispensary group of patients with hypertension (arterial hypertension) who were registered with the therapists, it was established that according to the data (Table II), in the State Scientific Institution

Table I. Registration by disease classes (2015 – 2017)

Name of classes and individual diseases	The code (rubric) according to MKH-10	2015			2016			2017		
		Registered diseases - total	Subject to dispensary inspections at the end of the reporting period	Under the dispensary supervision at the end of the reporting year	Registered diseases - total	Subject to dispensary inspections at the end of the reporting period	Under the dispensary supervision at the end of the reporting year	Registered diseases - total	Subject to dispensary inspections at the end of the reporting period	Under the dispensary supervision at the end of the reporting year
Hypertonic disease (all forms)	I10-I13; I20.X.7-I25.X.7;I60.X.7-I69.7	14895	8403	13105	13896	7516	13318	13639	7084	13110
including: hypertonic disease (without mention of ICD and vascular lesions)	I10-I13	2615	1112	1411	2373	1159	1498	1730	677	1466
Secondary hypertension	I15	55	10	0	41	20	0	42	9	0
Congestive heart disease	I20- I25	14154	8666	14720	13219	7503	14988	13412	7319	14811
including hypertonic disease	I207-I257	11655	7181	11512	11133	6256	11653	11369	6252	11503
acute and repeated myocardial infarction	I21-I22	31	10	0	40	7	0	22	5	0
including majestic (transmural)	I21.0-3,I22.0,1,8	4	3	0	16	2	0	2	1	0
cerebrovascular disease	I60- I69	5385	433	1961	4265	494	1695	4405	463	1680
of them with hypertonic disease	I60.7-I69.7	625	110	182	390	101	167	540	155	141
insults (all forms)	I60- I64	369	54	111	282	53	77	314	35	76
of them with hypertonia	I60.7-I64.7	252	37	108	207	36	74	241	31	73

Table II. Complications of hypertonic disease 2015-2017

№	Nosology	2015	2016	2017
1	Patients with hypertension (arterial hypertension) "D" accounting	1273	1484	1393
2	Examined during the reporting period	858	1238	892
3	Coronary heart disease with HD	11238	11308	10818
4	Examined during the reporting period	8542	9459	7235
5	Post-infarction cardiosclerosis with HD	No data	480	365
6	Examined during the reporting period	No data	418	257
7	Cerebrovascular disease with HD	1691	1544	1529
8	Examined during the reporting period	1021	932	923
9	Amount of patients with AH who had complications of hypertensive crisis	No data	No data	No data
10	Number of patients who had complications Total acute violations of cerebrovascular circulation with hypertension including hemorrhagic stroke	139/11	91/8	98/7
11	Amount of patients with complications of myocardial infarction Total / including with HD	80/79	63/62	68/68

"Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs during 2015-2017 years at the dispensary record was 1273; 1484; 139 patients who had a diagnosis of hypertonic disease (arterial hypertension) without concomitant pathology.

The high percentage of patients surveyed according to the records that were on the "D" accounting at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs, which is 67.4% in 2015, 83.42% in 2016 and 64.03% in 2017, of patients with hypertension and coronary heart disease with hypertension 76% in 2015, 83.64% in 2016, 66.87% in 2017, suggests proper dispensary control of this group of patients. However, as can be seen from the data of the record of complications, the course of hypertension in the form of hypertensive crisis in patients was not conducted.

In the analysis of complications, the course of hypertension in the form of hypertensive crisis, in patients with hypertension 1 st. and hypertonic disease of the 2-nd, which are on the "D" accounting at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs, found that such complications by district therapists during 2015-2017 years recorded a small amount.

Thus, out of 150 patients, only 15 (10%) were diagnosed with complications. One complication for 3 years was recorded in 12 patients (8%), two complications per year were recorded in 1 patient (0.6%), three complications were observed, also in 1 patient (0.6%): one in 2015 and two in 2016, and 5 complications in one patient (0.6%): two in 2015, one in 2016, two in 2017. It is noteworthy that the patients received preventive measures (according to doctors) is very small. Or once, or not at all. 83 patients did not receive the preventive measures, which is 55.33%. Three patients did not permanently receive drugs.

In 2017, in accordance with the regulatory documents on conducting medical examinations of the population, the plan for the provision of preventive medical examination services was approved at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs. The result of the analysis of services of preventive medical examination received and calculated using the database management program of the multidisciplinary medical institution ESCULAP. In analyzing the provision of preventive medical care services (data obtained only in 2017), it is clear that there is no accurate monitoring of the prophylactic process. The indicative plan for monitoring a patient from primary, secondary (specialized) and tertiary (highly specialized) medical care providers according to the unified protocol is presented in Table III.

According to the local protocol, Annex 4, which regulates the actions of the district therapist, regarding the dispensary supervision of patients at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs, the cost of dispensary supervision is 980.84. (Table IV).

The calculation was made in accordance with the price list of the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs, which is calculated in accordance with "Methodology for calculating the cost of providing medical services in state and communal health care facilities" in 2015.

The treatment of all patients was carried out in accordance with a local protocol, which was developed on the basis of unified clinical protocols of the Ministry of Health - "Local protocol of medical aid" Arterial hypertension 110-115", approved in the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs December 11, 2015.

The calculation of the cost of treatment and examination was calculated according to the protocol.

Table III. Tentative patient monitoring plan (according to the unified clinical protocol of primary, secondary (specialized) and tertiary (highly specialized) medical aid)

Name of the examination	Multiplicity	Cost (UAH)
Clinical examination	1 time per year if necessary	178,72
General blood test	1 time per year	15+10
General urine test	1 time per year	28,00
Glycemia on an empty stomach	1 time per year	27,00
ZHS	1 time per year	64,36
Creatinine	1 time per year	129,00
Electrocardiography	1 time per year if necessary	131,40
Conduct a risk assessment for SCORE	At initial treatment for patients with low and moderate risk - 1 time per 5 years	Not calculated
		Total: 583.48 UAH

Table IV. Annex 4. Plan of dispensary supervision of patients with arterial hypertension by a district therapist

Name of the examination	Multiplicity	Cost (UAH)
Clinical examination*	1 time per year if necessary	178,72
General blood test	1 time per year	15+10
General urine test	1 time per year	28,00
Glycemia on an empty stomach	1 time per year	27,00
ZHS	1 time per year	64,36
Creatinine	1 time per year	129,00
ALT	1 time per year	60,42
AST	1 time per year	60,35
Electrocardiography	1 time per year if necessary	131,40
Consultation of the cardiologist	Patients with high and very high risk – 1 time per year is obligatory, others - if necessary	276,59
		Total: UAH 980.84

* Clinical review includes:
1. Blood pressure measurement (PM)
2. Definition of Body Mass Index (MI)
3. Determination of waist circumference (WC)
4. Assessment of the status of tobacco smoke
5. Assessment of the level of physical activity
6. Assessment of compliance with the principles of healthy eating
7. Assessment of a heavily family history of cardiovascular disease (CVD) and diabetes mellitus (DM) - at the initial treatment
8. Information on planned therapy - a list of drugs, doses, frequency of admission and notes on the administration of prescribed drugs by the patient

According to the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs, the cost of treatment for arterial hypertension under the supervision of a physician and a cardiologist is 1,366.7 UAH. If an emergency doctor leaves for the challenge of complications of hypertension - the cost is increased by 814.42 UAH.

Medicinal cost of treatment for arterial hypertension, according to the local protocol is presented in table V.

Treatment on stationary beds at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs costs according to table VI.

In 2017, 26 patients (28 patients were prescribed) with a diagnosis of arterial hypertension were treated in a therapeutic hospital with therapeutic beds. The cost of treatment for one disease was, on average, 2497.54 UAH. The number of bed days from 1 to 11, on average, is 5.9 bed-days. 38 patients with the complication of hypertension were treated and 15 were re-treated. In total 53 cases. The average cost of treatment was 2682.66 UAH. The average bed day was 4.97 days. With the aggravation of hypertension, 23 patients were treated; the average cost of treatment was 2430.41 UAH. In analyzing the implementation of the plan of preventive actions in these patients, it was found that in any case they were not fulfilled in 100%.

Table V. Medicinal cost of treatment for arterial hypertension, according to a local protocol

№	List of medicines	Cost (UAH)		
		Total	Website of Ministry of Healthcare	Commercial price
	List of medicines (permanent)			
1	Bisoprolol 5mg №30 – 1t	0,42	12,54	
2	Enap 5mg №20 – 2t	3,3	33,06	
3	Konkor 5mg №50 -1t	3,09	154,44	
4	Nebilet 5mg №14 – 1t	6,71	93,96	
5	Koronal 5mg №30 -1t	0,77	23,24	
6	Arifon retard 1,5mg №30 -1t	3,24		97,14
7	Lozap 50mg №90 -1t	2,25	202,65	
8	Prestarium 5mg №30 – 1t	4,76		142,94
9	Lerkamen 10mg №60 -1t	4,12	247,3	
10	Berliprul 10mg №30 – 2t	3,26	49,14	
11	Amlodupin 5mg №30 – 1t	0,56	16,67	
12	Bi-pretarium 5/5 №30 – 1t	4,64		139,26
13	Azumex 5mg №30 – 1t	2,58	82,71	
14	Truplixam 10/2,5/10 №30 – 1t	7,35		220,53
15	Aspirin 100mg №28 – 1t	2,3	64,35	
16	Ramipril 5mg №30 – 1t	11,3		339
17	Deokor 160mg №30 – 1t	3,31	99,15	
18	Agen 5 tabl.5mg №30 – 1t	1,65		49,63
19	Korvitol 100mg №50 – 2t	4,74	118,45	
20	Zanidip 10mg №28 – 1t	4,74		132,95
21	Ko-renitek 20mg+12,5 №28 – 1t	3,9	109,05	
22	Rozykard 10mg №30 – 1t	2,13		127,69
23	Vazar 80mg №30 – 1t	3,29		98,56
24	Torvakard 10mg №90 – 1t	3,17	285,46	
25	Arifam 1,5 №30 – 1t	4,19		125,37
26	Koriol 6,25mg №28 – 1t	5,42	151,82	
27	Atoris 10mg №30 – 1t	6,38	191,35	
28	Ekvator 20mg+5mg №30 – 1t	5,72		171,71
29	Valsartan 80mg №80 – 1t	2,79		222,93
30	Krestor 5mg №28 – 1t	6,58	184,28	
31	Hipotel 40mg №28 – 1t	3,05	85,29	
		121,72	***4072,62***	
№	**List of medicines**	**Cost (UAH)**		
		Total	**Website of Ministry of Healthcare**	**Commercial price**
	List of medicines (course of treatment)			
1	Tiatriazolin 25mg/ml d/13ah. 2ml №10	219,78	109,89	
2	Predyktal MR 35mg №60	166,9		166,9
3	Trudyktal 20mg №60	91,83	91,83	
4	Venosmin 500mg №60	327	327	
5	Tivormin 42mg/ml d/in. 100ml	99,07	99,07	
6	Advokard №30	131,74		65,87
7	Magnium sulfat 25mg/13ahfor.5ml №10	15,16	15,16	
8	Dimedrol d/in.1% amp. 1ml №10	17,3	17,3	
9	Analgin 500mg d/in. 2ml №10	28,3	28,3	
10	Vestibo 24mg №60	198	198	
11	Sermion 10mg №50	3403,84	30,44	
12	Noobyt 0,25 №20	184,49	131,78	
13	Kratal №60	168,3	168,3	
14	Glicused 100mg №50	58,06	48,4	
15	Klopidogrel 75mg №30	67,45	67,45	
16	Mexukor 100mg №20	745,11		82,79
17	Lekoptin 40mg №50	53,05	44,21	
		5975,38	***1762,69***	
№	**List of medicines (for HC)**	**Cost (UAH)**		
		Total	**Website of Ministry of Healthcare**	**Commercial price**
1	Kaptopres №20 – 1t	2	40,04	
2	Anaprulin 10mg tabl. №50 – 1t	0,8	39,75	
3	Advokard №30	131,74		65,87
		134,54	***145,66***	

Table VI. Price for treatment on the stationary bed of a day stay at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs

№	Name of the service	Index	Price (UAH)	VAT	Price with VAT	Course of treatement	Total price
1	Single room in a therapeutic hospital with infarct beds	Bed-day	144,17	28,83	173,00	10 days	1730,00
2	Single room in a therapeutic hospital with infarct beds (12 hours)	Bed-day	97,50	19,50	117,00	10 days	1170,00
3	Single room in a therapeutic hospital with infarct beds (6 hours)	Bed-day	72,50	14,50	87,00	10 days	870,00

Table VII. Calculation of the cost of emergency medical aid

№	Ambulance	Name	Service/ procedure	Price (UAH)	VAT	Price with VAT (UAH)
1	Ambulance – 1	Servicing patients with brigade of Ambulance (1 doctor, 2 junior specialists with medical education)	Service	678,68	135,74	814,42
2	Ambulance – 2	Medical services in transportation of patients	Service	242,76	48,55	291,31
3	Ambulance – 3	Measurement of the level of glucose in the capillary blood at home by the brigade of Ambulance	Procedure	91,46	18,29	109,75
4	Ambulance – 4	Determination of cardiomarriers of myocardial damage (troponin) at home by the brigade of Ambulance	Procedure	171,19	34,24	205,43

An analysis of the cost of treatment for patients with myocardial infarction on inpatient beds revealed the average cost of treatment case of 4413.97 UAH. The cost of treatment of acute cerebrovascular accident on the stationary bed was on average 5077.3 UAH.

When calculating the cost of treatment for complications of hypertension, hemorrhagic stroke and acute myocardial infarction treated permanently, the calculation of the cost of emergency medical care should be added table VII.

The salaries of employees in calculating the cost of treatment for arterial hypertension and its complications were not separately calculated, as the calculations were carried out using the database management program of the multidisciplinary medical institution "Esculap", where the salary was taken into account.

The cost of examinations, studies and consultations of patients with arterial hypertension and its complications calculated according to the approved method at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs and calculated by the program Esculap are presented in tables VIII and IX.

DISCUSSION

The calculation of the economic effect should be made by comparing the cost of treatment of nosology with complications and without the absence of preventive measures, and the cost of treatment of nosology with complications and without the use of preventive measures. To determine the cost and economic effect of treating arterial hypertension with complications and without using a multifactorial model of prevention, a form of calculation has been developed and proposed in accordance with table X.

According to the proposed methodology:

1. Fill in the data table.
2. Calculate the cost of treating all cases of hypertension; multiplying the column 2x3, the result is entered in column 4.
3. Make a prediction of reducing the number of complications for each group of patients and find the cost of treatment according to the same algorithm.
4. Find the difference between the estimated cost of treatment and the actual one.

The result will be the economic effect of implementing a multifactorial model of prevention.

Taking into account that the concept of economic efficiency of prevention of chronic non-infectious diseases is complex and is characterized by three aspects:

1. Medical efficiency;
2. Social efficiency;
3. Economic efficiency

To determine efficiency, as such, it is possible to propose the following:

to determine **the medical efficiency** by the duration of treatment (the faster the patient will recover, the greater the

Table VIII. Assessment of diseases

№	Services	2015		2016		2017	
		Amount	Price (UAH)	Amount	Price (UAH)	Amount	Price (UAH)
	Laboratory						
1	Total blood analysis on a hematologic analyzer (18 indicators)	1762	38764	1940	42680	1804	39688
2	Total urine analysis	1762	52860	1940	58200	1804	54120
3	Blood analysis on sugar (venous blood)	1762	46693	1940	51410	1804	47806
4	Determination of total cholesterol	1762	47574	1940	52380	1804	48708
5	Determination of triglycerides	1762	53741	1940	59170	1804	55022
6	Determination of creatinine	1762	47574	1940	52380	1804	48708
	Total of the mentioned group	10572	287206	11640	316220	10824	294052
	Research						
7	Electrocardiography (12)	881	96910	970	106700	902	99220
8	Doppler examination of the vessels of the neck in pulsed mode	881	258133	970	284210	902	264286
	Total of the mentioned group	1762	355043	1940	390910	1804	363506
	Consultations						
9	Repeated consultation of a Terapist of the Highest Category	1762	134793	1940	148410	1804	138006
10	Primary Consultation of a Terapist of the Highest Category	881	165628	970	182360	902	169576
	Total of the mentioned group	2643	300421	2910	330770	2706	307582
	Total Price	14977	942670	16490	1037900	15334	965140

effectiveness of the treatment), as well as by the monitoring the complications (the less complications, the greater the medical effectiveness of treatment and prevention measures;

to determine **the social effectiveness** of which is to prevent and reduce morbidity, reduce the number of premature deaths, increase life expectancy, improve the quality of medical care to be monitored (measured) by the following indicators:

- the level of morbidity of the population,
- average life expectancy,
- the magnitude of mortality (especially of children),
- the number of disabled and premature deaths.

Taking into account that indicators of social effectiveness are applied not to each individual patient (as indicators of medical efficiency), but to certain contingents of the population the magnitude of the social effect of certain medical and preventive measures can be determined by the formula:

Ec = AoTn – (A1+A2+…+An),

where

Ec - the value of the social effect, expressed in reducing the number of diseases for a certain period of time;

Ao - number of diseases in the base period (before conducting of treatment and preventive measures);

A1, A2 ..., An - the number of diseases for each period (for a period it is possible to take 1 year or more) carrying out of medical and preventive measures;

Tn - the number of periods of medical and preventive measures.

• **Economic efficiency** (the result of social and medical effectiveness) of preventive activities includes three components:

- reducing the cost of treatment;
- reduction of expenses for payment of disability letters;
- reduction of production losses (reduction of morbidity, premature mortality, disability).

The calculation of the economic effectiveness of treatment and prevention measures can be carried out according to the formula:

Ee = P1 – P2,

where

Ee - the economic efficiency of medical preventive measures in hryvnias;

P1 - losses from morbidity, mortality, disability, etc. for the period preceding the current (base period);

P2 - losses from morbidity, mortality, disability, etc. during the period of medical and preventive measures (current period).

The amount of savings per unit cost, as **the coefficient of economic efficiency**, can be calculated by the formula:

Ke = (P1-P2) : Rl,n

where

Ke - coefficient of economic efficiency;

RL,n - funds spent on medical and preventive measures.

Table IX. Assessment of diseases

№	Services	2015		2016		2017	
		Amount	Price (UAH)	Amount	Price (UAH)	Amount	Price (UAH)
				Laboratory			
1	Total blood analysis on a hematologic analyzer (18 indicators)	5284	116248	4872	107184	3524	77528
2	Total urine analysis	5284	158520	4872	146160	3524	105720
3	Blood analysis on sugar (venous blood)	5284	140026	4872	129108	3524	93386
4	Determination of total cholesterol	5284	142668	4872	131544	3524	95148
5	Determination of triglycerides	5284	161162	4872	148596	3524	107482
6	Determination of creatinine	5284	142668	4872	131544	3524	95148
	Total of the mentioned group	31704	861292	29232	794136	21144	574412
				Research			
7	Electrocardiography (12)	2642	290620	2436	267960	1762	193820
8	Echocardiography with Doppler analysis	339	112548	199	66068	137	45484
9	Doppler examination of the vessels of the neck in pulsed mode	2642	774106	2436	713748	1762	516266
	Total of the mentioned group	5623	1177274	5071	1047776	3661	755570
				Consultations			
10	Primary consultation of the endocrinologist of the Highest Category	0	0	1	161	2	322
11	Repeated consultation of a Terapist of the Highest Category	5284	404226	4872	372708	3524	269586
12	Primary Consultation of a cardiologist of the highest category + Electrocardiography	1623	449571	1291	357607	685	189745
13	Primary Consultation of a Terapist of the Highest Category	2642	496696	2436	457968	1762	331256
	Total of the mentioned group	9549	1350493	8600	118844	5973	790909
	Total Price	46876	3389059	42903	3030356	30778	2120891

CONCLUSIONS

According to the analysis, the cost of preventive measures in the form of a complex of medical and organizational measures for the prevention of cardiovascular disease in a health facility (HF) at the level of primary care, according to the unified clinical protocol of the primary, secondary (specialized) and tertiary (highly specialized) medical treatment, which is calculated according to «Methodology for calculating the cost of providing medical services in state and communal health care institutions», is 1 082.76 UAH. The complex of preventive measures at the level of secondary and tertiary medical care is 1014.2 UAH. An analysis of the indicative plan for monitoring the patient from primary health care physicians (according to the unified clinical protocol of primary, secondary (specialized) and tertiary (highly specialized) medical care), according to the calculations according to the given method, allows to reduce the cost to 583,48 UAH, at the State Scientific Institution "Scientific-Practical Center for Prophylactic and Clinical Medicine" of the State Department of Affairs - 980,84 UAH.

Comparing the cost of preventive measures with direct costs for the treatment of the disease and its complications, it can be concluded that direct costs for treatment are significantly higher than for preventing the disease or preventing complications.

The effectiveness of medical care and prevention, as well as the improvement of the health of the population, depend on the observance of medical technologies, including compliance with the standards of examination and treatment of patients with cardiovascular pathology. The improvement of the quality of medical care, based on the analysis of cost minimization and economic forecast, is facilitated by the organizational and methodological methods employed among physicians.

Taking into account that the scientific analysis of preventive actions is based on the efficiency and cost, according to the given research it is possible to recommend dynamic observation (monitoring) for the patients of the «intervention group». Control over

Table X. Final table of cost of treatment (UAH) of arterial hypertension with complications and without the complications with the use of multi-factor model of prevention

№	Nosology	Cost of treatment of hypertension with and without complications in the absence of application of the model of multifactorial prevention			Cost of treatment of hypertension with and without complications in applying multivariate prophylaxis model (prognosis value)		
		Cost of treatment is one case	Number of cases of diseases	Total treatment costs (2x3)	Number of cases of diseases	Total treatment costs (2x3)	Difference in the cost of treatment (4-6)
0	1	2	3	4	5	6	7
1	AH without complications						
2	AH with complications (HC)						
3	Hypertensive Disease + Acute cerebrovascular accident including hemorrhagic stroke						
4	Hypertensive Disease + myocardial infarction						

the physical and emotional state of the patient - the final indicators of reducing the number of complications, reducing the number of episodes of pain; intermediate results and indicators - the number of crises, the number of episodes of pain, the progress of angiopathy and other complications. Monitoring results that may be related to the quality of life of patients should also include the ability to work well, the ability to self-service. If several results or side effects of treatment are achieved, it is economically necessary to evaluate all of them, both positive and negative. The indicators that are «inconceivable» for the patient should be monitored and appropriately assessed - the results of the analyzes on an example of hypertension (arterial hypertension), are cholesterol, lipidograms, and other indicators. The choice of indicators and evaluation criteria in each case should depend on the goals.

The second group of achievement should aim at monitoring the activities of the medical institution. Indicators - the time of service, procedures; the number of patients who receive a service or procedure for a specific time, the number of patients covered by the specified service or procedure at a certain time. Development and compilation of clinical guidelines or protocols to improve the coordination of doctors' work. Determining the priorities of providing medical care and prevention.

The standardization of methodological and organizational approaches in the assessment of preventive measures should be carried out on the basis of the study of indicators of the effectiveness, which characterize the level of achievement of goals and indicators of defects of activity, when the developed standards are not observed, which adversely affects the final results. To monitor the clinical efficacy and productivity of the treatment, diagnostic and preventive process, indicators reflecting the quality of health care should be used, the assessment of these indicators in the dynamics must be conducted quarterly and included in the annual report section of the economic efficiency of activities.

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