

3-3-2020

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Recommended Citation

Gulyamova, Shakhzoda S.; Gadayev, Adigaffar G.; Zakirkhodjayev, Rustam A.; and Ruzieva, Zebo I. (2020) "ALGORITHM OF COMPUTER PROGRAM FOR PERSONALIZED DYNAMIC OBSERVATION OF HYPERTENSIVE PATIENTS IN PRIMARY HEALTH CARE," *Central Asian Journal of Medicine*: Vol. 2020 : Iss. 1 , Article 1.

Available at: <https://uzjournals.edu.uz/tma/vol2020/iss1/1>

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ALGORITHM OF COMPUTER PROGRAM FOR PERSONALIZED DYNAMIC OBSERVATION OF HYPERTENSIVE PATIENTS IN PRIMARY HEALTH CARE

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Abstract

Introduction. The present research covers data and analysis on implementation of the "Algorithm of computer program for personalized dynamic observation of hypertensive patients in primary health care". In the health care system of Uzbekistan, as well as in the systems of other countries throughout the world, AH is a topical issue. **Study objective:** To increase the effectiveness of treatment and clinical observation of patients with hypertensive disease (HD) in primary health care settings. **Material and methods:** In the process of research data (for the past five years) of 222 randomly selected medical histories of patients with arterial hypertension, being under regular medical examination in family polyclinics (n=54) and in some rural health clinics of the Republic of Uzbekistan (n=168), was analyzed. Results of the analysis of the medical histories were compared with the results of examination of patients (questioning, medical examination, anthropometry, measurement of blood pressure, cholesterol test, etc.). **Results and discussion:** All the patients have been under the supervision for 2 years with subsequent repeated check-up and medical examination. In the core group (patients aged from 45 to 71 years, average age - 51.75 + 1.85 years; 29.5% males, 70.4% females), the patients were broken down by stages as follows: Stage

I hypertensive disease - 45 (36, 8%) patients; Stage II hypertensive disease - 62 (50.8%) patients; Stage III hypertensive disease - 15 (12.2%) patients. Hypertensive crisis was observed in 40 (32.7%) patients. The experimental group consisted of 114 patients (80 (70.1%) females and 34 (29.8%) males, aged 44-75 years, average age - 52.6 ± 1.62 years), they were treated by the traditional method and did not participated in the training. In the core group, as opposed to the experimental group, there were positive changes in the lipid profile: the number of arterial hypertension patients with hypertriglyceridemia decreased from 19.6% to 11.4% ($p < 0.001$); the number of arterial hypertension patients hypercholesterolemia decreased from 56.5% to 27.0% ($p < 0.001$). Taking into account the peculiarities of the existing model of prophylactic medical observation and using the accumulated data of numerous evidence medicine-based scientific studies of recent years, we have improved (personalized) and implemented into the inpatient practice of PHC physicians the individual tactic to observe hypertensive patients. For this purpose, there was developed the algorithm of a computer program to identify and individual tactic for dynamic observation of hypertensive patients, adjusted to PHC settings. **Conclusions:** The organization of training at the "school for hypertensive patients" led to a significant increase in the number of hypertensive patients with constant self-monitoring of blood pressure. The algorithm of electronic program for personalized dynamic observation of hypertensive patients was created on the base of obtained results of anamnesis, anthropometry, and laboratory and instrumental tests. Implementation of the algorithm of electronic program creates the possibility of routine detection of abnormal changes in the health status of hypertensive patients in the early stages of their development and the reasons of inadequate disease control. This increases the effectiveness of HD prevention and treatment at the primary health care level.

Key words: arterial hypertension, risk factors, awareness of hypertensive patients, effective control, computer program, prophylactic medical examination.

Introduction

Globally, about 1 billion people suffer arterial hypertension and over 7.1 million deaths per year are associated with high blood pressure (BP) [1]. According to the World Health Organization (WHO), about 20% of the world's adult population have problems associated with high blood pressure. In addition, alarming prognosis of WHO experts have been published, according to which, by 2025, a peak in arterial hypertension growth is expected, the incidence of which will reach 29% of the entire adult population of the planet [3,10].

The global prevalence of hypertension determines the clinical, social and economic significance of this condition for the population of most countries of the world. As a result of targeted health policy in the second half of the last century, a significant reduction in CVD mortality was achieved in North America, Western

Europe, Japan, and Australia [1,21]. Thus, in 1976-1980, among US. population, the number of patients receiving treatment was 31% of all patients with hypertension, and in 2004-2009, it achieved 59%. Blood pressure control (at a level below 140/90 mmHg) for the same period made 10% and 34%, respectively [22].

In the CIS countries, the epidemiological situation correlates with global data. In particular, studies conducted in various regions of Russia over the past 20 years indicate that hypertension remains one of the most common diseases. About 30 million people are hypertensive, which makes 20% of the total population [10]. According to the analysis of several European countries, hypertension is observed in 30% of the population, and 60% could reduce their blood pressure by maintaining a healthy lifestyle.

In the health care system of Uzbekistan, AH is also relevant issue. According to the results of human population studies (B. Kh. Makhmudov et al., R. Sh. Mamutov et al., S.Yu. Tursunov et al.), performed using standardized methodologies and unified criteria for evaluating results (WHO), more than 26% of the Republic's population over the age of 40 are hypertensive [11]. According to the Republican Institute of Health by the end of 2013, in Uzbekistan there were registered 343536 patients (1.4% of the population) with high blood pressure (above 140/90 mmHg), including 227831 ones, who were registered with clinics [11, 12].

Being the most common cause of death (56%) and disability (25%) in Uzbekistan, CVDs cause significant harm to the health of the nation and the state budget. The ongoing health care reforms in the Republic, specifically the organization of family polyclinics (FP) and rural health clinics (RHC) created a real opportunity for primary, secondary and tertiary prevention of cardiovascular diseases (Order No. 422 of the Ministry of Health of the Republic of Uzbekistan). Primary health care (PHC) workers, in particular general practitioners (GPs) are the key conveyors of this idea.

Diagnostics of arterial hypertension is aimed at a comprehensive examination of patients in order to: confirm the stability of increased blood pressure; rule out secondary hypertension; identify controllable and uncontrollable risk factors for CVDs; assess the presence of target organ damage, CVD, and other co-morbidities; assess the individual level of risk for coronary artery disease (CAD) and for cardiovascular complications [4, electronic source]. Awareness of the prevention of arterial hypertension is the "key to success" in patient treatment. Patient's motivation to eliminate risk factors reliably prevents new cases of hypertension. Only a combination of pharmacological therapy and risk factors control provides permanent normalization of blood pressure [7,8,9].

The main aim of treating hypertensive patients is to minimize the overall risk for cardiovascular complications and mortality. Association with a certain risk group, but not the increase level in arterial blood pressure, is the main criterion for prescribing pharmacological therapy [6,13]. Achieving the blood pressure target level below 140/90 mmHg is recognized as reasonable. [2]. In patients of young

and middle age, as well as in patients with diabetes mellitus (diabetes), achieving the blood pressure target level below 130/85 mmHg is set as safe and beneficial for further reduction of CVD [23,24].

Changing of the antihypertensive therapy tactics under condition of good tolerance is recommended no earlier than after 4-6 weeks. Duration of the period to achieve target blood pressure makes 6-12 weeks [16]. As for the benefits of any class of antihypertensive drugs, in terms of the level of decrease in blood pressure, the completed randomized trials did not reveal them [18]. Currently, the main criterion for choosing an antihypertensive drug is its ability not only to minimize blood pressure figures to an individually tolerated level and to bring along the prevention of progression of target organ damage, but also to reduce cardiovascular complications and mortality while keeping a good quality of life [18,19].

In addition, experimental and clinical studies of recent years show again that electrolyte imbalance is important in occurrence and progression of cardiovascular pathology, and the role of latent and magnesium deficiency in pathogenesis of cardiovascular and some metabolic diseases has been proved [14]. Numerous epidemiological studies indicate that serum magnesium levels are also related to CVD risk factors such as arterial hypertension, diabetes type 2, metabolic syndrome, and the presence of CAD. Other data from environmental clinical researches of autopsies indicate that increased content of magnesium level potentially protects from CVD [14]. AH naturally leads to the left ventricular hypertrophy (LVH). At the same time, genetically determined LVH also leads to the development of arterial hypertension. Therefore, LVH is currently a strong independent risk factor for sudden death, myocardial infarction (MI), cerebral stroke, and other cardiovascular complications [20]. A number of studies have shown that magnesium deficiency is much more often detected in patients suffered MI, however, it is not known whether it was the cause or the consequence of the disease. Several studies have shown improved survival of patients with MI against magnesium therapy. Studies evaluating the correlation of magnesium levels and sudden cardiac arrest revealed a significant reduction in the risk of sudden cardiac arrest if the serum magnesium level increases, regardless of other factors, such as hypertension, diabetes, potassium level, heart rate, history of CAD. Currently, there is evidence of a relationship between magnesium deficiency and atherosclerosis. It was found that magnesium deficiency is associated with an increase in total cholesterol (TC), triglycerides (TG), and low-density lipoproteins (LDL) [14].

Alongside this, a number of domestic and foreign studies convincingly show that, despite the presence of medications that can effectively reduce blood pressure and prevent the development of complications, patient adherence to treatment remains low [5,15,17]. In this regard, the study of the role of public awareness of risk factors, methods of control and prevention of hypertensive disease complications in improving patient adherence to treatment is becoming particularly urgent.

The Seventh Report of the USA Joint National Committee stated key recommendations on changing lifestyles for the purpose of arterial hypertension prevention and management. They are as follows: maintaining a body mass index (BMI) of 18.5-24.9 kg / m² helps to reduce systolic blood pressure (SBP) by 5-20 mmHg; adhering to a diet rich in vegetables, fruits and dairy products helps to reduce the SBP by 8-14 mmHg; decrease in salt intake to 5 g/day contributes to a decrease in blood pressure by 2-8 mmHg; regular aerobic exercise reduces the systolic blood pressure by 4–9 mmHg; giving up smoking; restriction of alcohol consumption increases SBP by 2-4 mmHg. Primary prevention consists in minimizing all of the above risk factors, which will enable to prevent or delay the development of hypertension, while timely treatment will reduce the risk of hypertensive complications.

Study objective: To increase the effectiveness of treatment and clinical observation of patients with hypertensive disease (HD) in primary health care settings.

Material and methods: A retrospective analysis of data (for the past five years) of 222 randomly selected medical histories of patients with arterial hypertension, being under regular medical examination at family polyclinics (n=54) and in some rural health clinics of the Republic of Uzbekistan (n=168), was conducted. Results of the retrospective analysis of the medical histories were compared with the results of examination of patients (questioning, medical examination, anthropometry, measurement of blood pressure, cholesterol test, etc.). There were interviewed by the physicians from the polyclinics of Tashkent and physicians from the health clinics in rural areas of the republic, who were undergoing the 10-month retraining courses for general practitioners. In general, 156 physicians have taken the questionnaire before the training and 119 physicians have taken the questionnaire after the training, as well as 236 hypertensive patients (being under regular medical examination in polyclinics and rural health clinics) were surveyed and examined. Subsequently, a number of them (the core group; n=122) underwent the training at the “school for hypertensive patients”, while the others (the experimental group; n=114) were not covered by the educational program. All the patients have been under our supervision for 2 years with subsequent repeated check-up and medical examination. In the core group (patients aged from 45 to 71 years, average age - 51.75 + 1.85 years; 29.5% males, 70.4% females), the patients were broken down by stages as follows: Stage I hypertensive disease - 45 (36, 8%) patients; Stage II hypertensive disease - 62 (50.8%) patients; Stage III hypertensive disease - 15 (12.2%) patients. Hypertensive crisis was observed in 40 (32.7%) patients. The experimental group consisted of 114 patients (80 (70.1%) females and 34 (29.8%) males, aged 44-75 years, average age - 52.6 ± 1.62 years), they were treated by the traditional method and did not participated in the training. In this group, there were exposed Stage I hypertensive disease in 41 (35.9%) patients; Stage II hypertensive disease—in 61 (53.5%) patients; and Stage III hypertensive disease—in 12 (10.5%) patients. Hypertensive crisis was observed

in 37 (32.4%) patients. The patient groups were comparable in terms of the main clinical benefits and the findings of laboratory and instrumental tests.

In the core group, 46 (37.7%) patients had a medium risk of cardiovascular complications, 63 (51.6%) patients were at high risk, and 14 (11.4%, $p < 0.05$) were at very high risk of cardiovascular complications. In the experimental group the figures are 41 (35.9%), 62 (54.3%) and 11 (9.6%, $p < 0.05$) patients, respectively.

Schools for hypertensive patients were arranged on the basis of the Training and Medical Center under the Tashkent Medical Academy, located in the Tashkent Family Polyclinic № 32 and in rural medical centers of two regions of the Republic; methodological materials were developed with consideration to the specifics of the work of family physicians. When compiling the training technology, the level of patient education was taken into account. In our opinion, with allowance for the mentality of our population, 10 classes can be considered optimal (once per week, preferably on Saturday). Training material should be provided in line with a structured program in a logical sequence according to the sections specified in the training program.

When arranging the schools for hypertensive patients, it is necessary to adhere to the following procedure of classes: each group should be composed of 10-12-14 patients; venue - specially prepared thematic room; necessary resources for training: banners, a multimedia projector, phantoms, scales, a height meter, a measuring tape, health device used to measure a person's blood pressure, etc.; presentation of material - interactive conversation-lecture; duration of classes 90-120 minutes with a 15-20 minutes break.

The trainees should be convinced to keep a patient self-control diary with the evaluation and monitoring of controlled risk factors, blood pressure results and a schedule for taking antihypertensive drugs. In order to acquire practical skills in self-control and self-help at acute blood pressure increase, particular attention should be given to classes where patients are trained in the principles of drug-free and medication-based treatment of hypertensive disease. To ensure the proper monitoring of blood pressure, the trainees should be taught the method of outpatient daily self-measurement of blood pressure, counting of pulse frequency and other practical skills (determining the body mass index, completing the first-aid kit and self-management at acute increase of blood pressure). This method allows to evaluate changes in blood pressure and pulse in the early morning and during the day several times before going to sleep, it is not burdensome for the patient, it is informative and increases the patient's adherence to treatment, enables control of the effectiveness of antihypertensive therapy.

Outpatient day-to-day self-monitoring of blood pressure is recommended as a mandatory method for the study of hemodynamics in outpatient settings in the evaluation of the effectiveness of antihypertensive therapy, in the diagnosing of hypertensive disease, especially in hypersensitive patients with high anxiety and depression, and in patients without any symptoms.

Results and discussion: In the core group, as opposed to the experimental group, there were positive changes in the lipid profile: the number of arterial

hypertension patients with hypertriglyceridemia decreased from 19.6% to 11.4% ($p < 0.001$); the number of arterial hypertension patients, hypercholesterolemia decreased from 56.5% to 27.0% ($p < 0.001$). Subsequent to the training and effective dynamic health control, all patients in the core group stopped drinking alcohol; 5 (4.0%) among 13 (10.6%) patients gave up smoking, hypodynamia was observed in 85 (69.6%) patients before the training and in 30.3% patients after the training ($p < 0.001$); the number of patients with impaired glucose tolerance decreased from 9.8% to 1.6% ($p < 0.001$); Excessive salt intake of more than 5-6 gr/day was observed before the training in 10 (8.1%) patients, and after training - only in 3 (2.4%) ($p < 0.001$) patients. There were noted significant changes in the clinical picture of the disease of trained patients: dizziness and headaches began to occur less often, exertional breathlessness tended to reduction. The course of hypertensive disease was accompanied by a significant decrease in the frequency of hypertensive crises from 32.7% to 3.2% ($p < 0.001$) in the group of patients taken under personal control and included in the educational program.

As mentioned above, arterial hypertension is not only a widespread disease, but also a leading risk factor for the development of CVD (MI, CAD, chronic heart failure, atrial fibrillation), cerebrovascular and kidney pathology, as well as untimely death of the population. This determines its extremely high individual significance for each person with arterial hypertension.

It should be emphasized that in order to maximize the effectiveness of the prevention of severe complications of arterial hypertension and their re-development, it is necessary to overcome the main paradox of the preventive work of cardiology - the existing discrepancy between the accumulated research data based on the principles of evidence-based medicine and this knowledge implementation into the clinical activity of primary health care physicians. Therefore, it is so important to improve the prophylactic medical examination of patients with arterial hypertension in family polyclinics and rural health clinics settings, drawing up an individual recovery program and choosing the optimal treatment tactics with proven effectiveness for each patient, aimed at correcting a number of CVD risk factors, rehabilitation of a set of syndromes and clinical states acquired for the whole period of illness.

The Russian system of prophylactic medical observation specifies three sets of pathological conditions of arterial hypertension, according to which, all patients with HD are broken down into three main groups. Each set contains the regularity of preventive visits, explanations of recommended interventions and survey tools. Preventive interventions and laboratory and instrumental tests are summarized, they are designed not individually for each patient, but for a group of patients included in one of the 3 sets of pathological conditions of arterial hypertension. They differ only in the number of ongoing laboratory and instrumental tests in the current year, there is no personal tactics and treatment strategy for each patient individually.

It is well known that the aim of prophylactic medical observation of patients with HD is to minimize the risk of complications: fatal and non-fatal CVDs,

cerebrovascular and chronic kidney diseases. To achieve this goal, a decrease in blood pressure to target levels, correction of controlled risk factors, slowing down the rate of progression and a decrease in the severity (regress) of target organ damage are essential. BP <140/90 mmHg is the target value for all categories of patients, excluding arterial hypertension patients with diabetes, for which the target value of BP is <135/85 mmHg. With low tolerance, the blood pressure is recommended to be decreased through several stages. Upon reaching the target level of blood pressure, it is necessary to consider the lower limit of the decrease in systolic blood pressure (SBP) to 110-115 mmHg, and in diastolic blood pressure (DBP) to 70-75 mm Hg.

Considering the peculiarities of the existing model of prophylactic medical observation and using the accumulated data of numerous evidence medicine-based scientific studies of recent years, we have improved (personalized) and implemented into the inpatient practice of PHC physicians the individual tactic to manage hypertensive patients.

For this purpose, there was developed the algorithm of a computer program to identify and individual tactic for dynamic observation of hypertensive patients, adjusted to PHC settings. In contrast to the existing model, this dynamic management system allows to personalize clinical approaches to each patient with HD taking into account his/her gender, age, the value of pulse blood pressure, burdened familial history, disease duration, modifiable risk factors, target organ damage, the presence of diabetes and associated clinical conditions (ACC), adherence to drug-free and medicamentous therapy methods.

The software was designed for PHC physicians to detail the approaches to the control and treatment of hypertensive patients depending on their personal, medical, socio-economic and other characteristics. Consequently, the dynamic management program is focused on a patient him/herself, using mathematical calculation of the scored points facilitates the monitoring of blood pressure levels, controlled risk factors, basic blood chemistry values (glucose, cholesterol, creatinine, etc.), target organ damage and the selection of the most suitable antihypertensive drugs or a combination of them, improving adherence to medical prescriptions.

According to the results of the study (a retrospective analysis of outpatient records of HD patients, a survey of general practitioners on tactics of observing and treating patients with HD, training and questioning of patients with HD), the implementation of prophylactic medical observation by PHC physicians requires a comprehensive follow-up revision. In-depth monitoring and correction of controlled CVD risk factors, the control of needed laboratory and instrumental studies in order to determine the depth of damage to target organs are necessary. Treatment and rehabilitation of hypertensive patients with ACC should be regular, which are, most often, of episodic nature.

Thus, the current system of medical examination of the population in family polyclinics and rural health clinics settings does not allow to individualize approaches to each patient considering his/her personality characteristics, existing

risk factors, target organ damage and ACC. Which worsens the quality of treatment and rehabilitation of patients in primary health care. Perhaps this is due to the lack of necessary computerized programs in family polyclinics and rural health clinics settings aimed at improving the health of the population suffering chronic noncommunicable diseases.

According to the results of the study, the implementation of programs for dynamic control of hypertensive patients increases the effectiveness of therapeutic and preventive activities in outpatient settings. They allow you to identify the leading risk factors for CVD in each patient, individually carry out their correction and monitoring. With the help of such programs, patients with target organ damages and ACC are detected at the early stages of their development, which allows adequate treatment and prevention of severe complications of hypertension.

All mentioned above motivated us to improve and to develop an algorithm for the computer program of personal tactics for dynamic observation of hypertensive patients (Certificate No. DGU 05595 dated August 24, 2018 on the official registration of the algorithm of the computer program for personalized dynamic monitoring of HD patients in primary health care was received). This system of electronic dynamic observation does not require large economic costs, is communicative, easy to operate and maintain, saves time and facilitates the practical activities of primary care physicians, and most importantly, it allows to protect the confidentiality of each patient's information and the accumulated database.

In order to implement this work, there were developed technical specifications according to the modern software programming language Borland Delphi and MySQL using information from the Server 5+ database. It is designed to be operated by means of both a personal computer, and through a local network for work in a polyclinic. For this, the software of MySQL 5+ information base must be installed on a personal computer. All collected information is constantly stored in the program database, with the help of which it is possible to view and control it.

Thus, we have obtained a software license, copyright protection series number and activation codes. The program has an interface for the convenience and understanding of users. The software design provides individual access for the administrator, physician-in-chief, and all doctors of the polyclinic. They enter the system using a login and a password, enter a patient related data into the established forms following the software requirements. All information about patients is stored in a server-computer. The software design enables simultaneous work of several users, i.e. network data exchange among general practitioners, is stored, processed and archived in the server. To ensure security of the data collected by all users, the software creates the ability to enter the database through login and password authentication.

The algorithm for HD patient-specific dynamic management in outpatient settings is as follows.

Algorithm of computer program for personalized dynamic observation of hypertensive patients in primary health care

1. Age and gender of the patient

- male aged under 55... **0 – point** over 55... **1 – point**
- female aged under 65 ... **0 – point** over 65... **1 – point**

2. Pulse Blood Pressure (ABP)

- in elderly persons (aged 65 or more ...) value of the pulse BP is not impaired ... **0 – point**
- in elderly persons (aged 65 or more ...) value of the pulse BP is impaired ... **1 – point**

3. Family medical history of early cardiovascular diseases (CVD)

- in males < 55 years old...no... **0 – point** yes... **1 – point**
- in females < 65 years old ...no... **0 – point** yes... **1 – point**

4. Remoteness of (disease) history

- less than 5 years... **1 – point**
- from 5 years to 10 years... **2 – points**
- more than 10 years... **3 – points**

5. Smoking

- no... **0 – point**
- yes... **1 – point**

6. Abdominal obesity (AO)

- no...**0 – point**
- waist circumference of males > 102 cm... **1 – point**
- waist circumference of females > 88 cm... **1 – point**

7. Dyslipidemia

- total cholesterol ... < 5,0 mmol/L ... **0 – point**
- total cholesterol ... > 5,0 mmol/L (190 mg/dL) ... **1 – point**

8. Plasma glucose

- under 5,6 mmol/L ... **0 – point**
- from 5,6 to 6,9 mmol/L (102-125 mg/dL) ...**1 – point**

9. Impaired glucose tolerance (IGT)

- no... **0 – point**
- fasting < 6,1 mmol/L... 2 hours after meals plasma glucose 7,8-11.1 mmol/L... **1 – point**

10. Target organ damage (TOD)

- no... **0 – point**
- ECG (EchoCG) signs of left ventricular hypertrophy ... **2 – points**
- small increase in serum creatinine:
for males... 115-133 mcmmol/l (1,3-1,5 mg/dL) ...**2 – points**
for females... 107-124 mcmmol/l (1,2-1,4 mg/dL) ...**2 – points**
- microalbuminuria (MAU) – 30-300 mg/day ... **2 – points**

11. Diabetes mellitus (diabetes)

- no... **0 – point**
- Fasting plasma glucose... $\geq 7,0$ mmol/L (126 mg/dL) at repeated measures... **3 – points**

12. Associated clinical conditions (ACC)

- no... **0 – point**
- cerebral stroke, transient ischaemic attacks ... **3 – points**
- myocardial infarction, cardiac angina, coronary revascularization, CHF ... **3 – points**
- diabetic nephropathy, kidney failure (serum creatinine >133 mcmmol/l (1,5 mg/dL) for males >124 mcmmol/l (1,4 mg/dL) for females) ... **3 – points**
- aortic dissection, symptomatic peripheral arterial disease... **3 – points**

- hypertonic angiopathy (hemorrhages or exudates; papilledema) ... **3 – points**

13. Adherence to non-pharmacological correction

- yes, regularly ... **0 – point** yes, irregularly ... **1 – point** no... **2 – points**

14. Adherence to pharmacological therapy

- yes, regularly ... **0 – point** yes, irregularly ... **1 – point** no... **2 – points**

15. Total points: _____

Interpretation of obtained results:

1. **Under 5 points (1st level)** – preventive counseling 1 time in the current year and correction of identified controlled risk factors, if necessary, prescription of pharmacological therapy.
2. **From 5 to 10 points (2nd level)** – in-depth preventive counseling 2 times in the current year, correction of identified controlled risk factors and prescription of regular medical treatment. If necessary, consultation of narrow specialists (neuropathologist, ophthalmologist, cardiologist, etc.).
3. **From 10 to 15 points (3rd level)** – in-depth individual and group counseling (**school for hypertensive patients**) 3-4 times in the current year, correction of identified controlled risk factors and prescription of regular medical treatment. Indications based consultation, treatment and rehabilitation by narrow specialists (neuropathologist, ophthalmologist, cardiologist, etc.).
4. **15 and more points(4th level)** – in-depth individual and group counseling (**school for hypertensive patients**) at least 4 times in the current year , correction of identified controlled risk factors and prescription of of regular medical treatment. Indications based consultation, treatment and rehabilitation by narrow specialists (neuropathologist, ophthalmologist, cardiologist, etc.).

Calculations of collected points according to identified criteria

Date “___” _____ 20___ year

Criterion	1st level (under 5 points)	2nd level (from 5 to 10 points)	3rd level (from 10 to 15 points)	4th level (15 and more points)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
Total:				
Calculation/risk	Minimal	Medium	High	Maximal
Personal	1 time in current	2 times in	3-4 times in	Over 4 times in

management tactics	year	current year	current year	current year
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It should be noted that the program allows to analyze and have a clear idea of which of the groups of evidence based antihypertensive therapies is the most suitable and what kind of information should be given to the patient. Incorrect prescription of medications entails ineffective and unsafe treatment, exacerbation and lengthened duration of blood pressure rise, stress and harm to the patient, coupled with increase in the cost of treatment.

Conclusions:

1. The organization of training at the "school for hypertensive patients" led to a significant increase in the number of hypertensive patients with constant self-monitoring of blood pressure, which was revealed in comparison with the experimental group (96.7%; 21.9%); in the core group a significant increase ($p < 0.001$) was noted in the number of patients regularly taking evidence based antihypertensive therapies (98.3%).

2. The motivation of core group of hypertensive patients to adhere to non-pharmacological correction and pharmacological therapy led to improvement in LVH ($p > 0.05$), total cholesterol, triglycerides, low density ($p < 0.001$) and high density ($p < 0.001$) lipoproteins, impaired glucose tolerance ($p < 0.001$).

3. The algorithm of electronic program for personalized dynamic observation of hypertensive patients was created on the base of obtained results of anamnesis, anthropometry, and laboratory and instrumental tests (ECG, ophthalmoscopy, cholesterol, blood sugar and plasma creatinine), which are available and easily done in primary care settings.

4. Implementation of the algorithm of electronic program creates the possibility of routine detection of abnormal changes in the health status of hypertensive patients in the early stages of their development and the reasons of inadequate disease control. This increases the effectiveness of HD prevention and treatment at the primary health care level.

Practical recommendations:

- With the aim of improving the effectiveness of HD prevention and treatment at the primary health care level, it is necessary to arrange the "schools for hypertensive patients". Doctors should form in hypertensive patients the adherence to correction of controlled CVD risk factors and to evidence based antihypertensive therapy.
- In order to personalize the clinical approaches to each hypertensive patient, considering his/her gender, age, burdened familial history, disease duration, modifiable risk factors, target organ damage, the presence of diabetes and ACC, adherence to drug-free and medicamentous therapy methods, implementation of the electronic programs of personal tactics of HD patient dynamic management should be carried out in family polyclinics and rural health clinics centers settings.

- For correcting electrolyte imbalance, which is important in the outbreak and progression of the disease with a background of baseline therapy, patients with cardiovascular pathology should be advised to use magnesium preparations (Bifolak®-Magniy) [14,p.68], which significantly reduce the number of heart beats and have antianginal, anti-ischemic and lipid-lowering effect.

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