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INCREASING THE EFFICIENCY OF ARTERIAL HYPERTENSION DISPENSARY CARE IN A FAMILY CLINIC

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Annotation. Effective control and active clinical observation of patients with arterial hypertension (AH) implies both the correctness of medical prescriptions (selection of medicine, dose, medication regimens, etc.), and regular correction of main risk factors for cardiovascular diseases (CVD), closely related to lifestyle.
In this article, we describe the survey on the awareness of patients with arterial hypertension and the implementation of the "Algorithm of computer program for personalized dynamic management of patients with arterial hypertension in primary health care". This computer program (software) will enable toidentify the risk of progression of disease complications at their early stage of development and to carry out proper treatment.
The past 5-year data from 222-randomly selected outpatient cards of hypertensive patients, who were followed up at a family polyclinic (n=54) and in a number of rural health clinics (n=168) of the Republic of Uzbekistan, were retrospectively analyzed. The findings of the analysis were compared with the results of patient study (questioning, examination, anthropometry, blood pressure measurement, determination of cholesterol, etc.). The physicians from the Tashkent family polyclinic and rural health clinics of a number of the Republic's regions, who had taken 10-month retraining courses for general practitioners, were questioned. Questionnaires were used to study 156 and 119 physicians before and after retraining, respectively.
Key words: arterial hypertension, risk factors, awareness of hypertensive patients, effective control, computer program, prophylactic medical examination.

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 forecasts of WHO experts have been published, according to which, by 2025, a peak in arterial hypertensiongrowth is expected, the incidence of which will reach 29% of the entire adult population of the planet[3,10].

The vast 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 U.S. population, the number of patients receiving treatment was 31% of all patients with hypertension, and in 2004-2009, it made achieved 59%. Blood pressure control (at a level below 140/90 mmHg) for the same period made 10% and 34%, respectively [22].

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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 estimates 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 a topical issue. Based on the findings 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 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 one registered with clinic [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 policlinics (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 treating patients. 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 goal of treating hypertensive patients is to minimize the overall risk for cardiovascular complications and mortality. Association with a certain risk group, but not the level of increase in arterial blood pressure, is the main criterion for prescribing pharmacological therapy [6,13]. Achieving theblood pressure target level below140/90 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 levelbelow 130/85 mmHg is set as safe and beneficial for further reduction in the burden of CVD[23,24].

Changing the tactics of antihypertensive therapy 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 essential to the occurrence and progression of cardiovascular pathology, and the

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role of latent and overt magnesium deficiency in pathogenesis of cardiovascular and some metabolic diseases has been proved [14]. AH naturally leads to 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.

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 provided 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; smoking cessation; 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 preventor 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 management of patients with hypertensive disease (HD) in primary health care settings.

Material and methods: The post hoc analysis of data (for the past five years) of 222 randomly selected medical histories of patients with arterial hypertension, being under regular medical check-up in family polyclinics (n=54) and in some rural health clinics of the Republic of Uzbekistan (n=168), was conducted. Findings of the post hoc analysis of the medical histories were compared with the results of examination of patients (questioning, medical check-up, anthropometry, measurement of blood pressure, cholesteroltest, etc.). There were interviewed physicians from polyclinics of Tashkent and physicians from health clinics in rural areas of the republic, who were undergoing the 10-month retraining courses for general practitioners. 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 check-up in polyclinics and rural health clinics) were surveyed and examined. Subsequently, a number of them (the core group; n=122) underwent the training in the “school for hypertensive patients”, while the others (the experimental group; n=114) were not covered by the educational program. All the patients were under our supervision for 2 years with subsequent repeated check-up and medical examination.

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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.

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 thetraining 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 g / 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 implementationinto the clinical activity of primary health care physicians.Therefore, it is so important to improve the prophylactic medical examinationof patients with arterial hypertension in family policlinics and rural health clinicssettings, 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.

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It is well known that the goal 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 mmHg.

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 manage hypertensive patients.

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 softwarewas 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 findings of our study (a retrospective analysis of outpatient records of HD patients, a survey of general practitioners on tactics of managing and treating patients with HD, training and questioning of patients with HD), the implementation ofprophylactic 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 policlinics and rural health clinicssettings 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 policlinics and rural health clinicssettings 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 patientsincreases 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

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programs, patients with target organ damages and ACCare detected at the early stages of their development, which allows adequate treatment and prevention of severe complications of hypertension.

All of the aforesaid 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 ofeach patient's information and the accumulated database.

In order to implement this work, there were developedtechnical specificationsaccording 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, andthrough a local network for work in a polyclinic. For this, the software of the above 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 management of patients with arterial hypertension 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**

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4. Remoteness of (disease) history

- less than 5 years… **1 – point**
- from 5years 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. Fasting 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 aftermeals plasma glucose 7,8-11.1 mmol/L… **1 – point**

10. Target organ damage (TOD)

- no… **0 – point**
- ECG (EchoCG)signs ofleft ventricular hypertrophy … **2 – points**
- small increase in serum creatinine:
for males… 115-133 mcmol/l (1,3-1,5 mg/dL) …**2 – points**
for females… 107-124 mcmol/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… ≥ 7,0 mmol/L (126 mg/dL) at repeated measures… **3 – points**

12. Associated clinical conditions (ACC)

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

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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 (1-stlevel)** – preventive counseling 1 time in the current year and correction of identified controlled risk factors, if necessary, prescription of pharmocological therapy.
2. **From 5 to 10 points (2-nd 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 (3-d 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 morepoints(4-th 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	1-st level (under 5points)	2-nd level (from 5 to 10 points)	3-dlevel (from 10 to 15 points)	4-thlevel(15 and morepoints)
1				
2				
3				
4				
5				
6				
7				
8				
9				

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10				
11				
12				
13				
14				
Total:				
Calculation/risk	**Minimal**	**Medium**	**High**	**Maximal**
Personal management tactics	1 time in current year	2 times in current year	3-4 times in current year	Over 4 times in current year

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 in 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 there was noted a significant increase ($p < 0.001$) in the number of patients regularly takingevidence based antihypertensive therapies (98.3%).

2. The motivation of core group 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 ground of obtained findings 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 improvingthe effectiveness of HD prevention and treatment at the primary health care level, it is necessary to implement 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, taking into account his/her gender, age, burdened familial history, disease duration, modifiable risk factors, target

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organ damage, the presence of diabetes and ACC, adherence to drug-free and medicamentous therapy methods, it is critical to implement the electronic programs of personal tactics of HD patients dynamic management in family policlinics and rural health clinics centers settings.

With a view to correct 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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