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Optimization of Drug Provision for Children with Diseases of Autonomic Nervous System under Inpatient Treatment

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***Abstract*—The article presents the results of the optimization of the drug supply for children with disorders of the autonomic nervous system (ANS) under inpatient treatment at the regional level; a socio-demographic portrait of a child affected with autonomic dysfunction syndrome has been developed; a pharmacoeconomic study of the drug assortment prescribed in the hospital has been conducted; a formulary list of drugs has been formed.**

Keywords— drug provision, autonomic dysfunction syndrome in children, formulary list, pharmacoeconomic study

I. INTRODUCTION

An important indicator characterizing the well-being of society and the state is the health status of children and adolescents [1].

In the structure of the general incidence of children in the Russian Federation, fourth place is occupied by diseases of the nervous system (6.5%). The most common somatic diagnosis made by pediatricians, general practitioners, therapists for young people is the autonomic dysfunction syndrome (ADS).

ADS is not an independent nosological form of the disease. However, 97% of Russian doctors use the diagnosis of “ADS” in their practice, and according to the ICD (10th revision) in the class “Diseases of the nervous system” in the block “Other disorders of the nervous system” under code G 90.9 there is a definition - “Disorder of autonomic nervous system, unspecified” [2,3].

Autonomic dysfunction is a condition determined by a violation of the autonomic regulation of the cardiovascular system, internal organs, endocrine glands associated with primary or secondary deviations in the structure and function of the central and peripheral nervous system [4-6]. This may affect the functioning of the heart, bladder, intestines, sweat glands, pupils, and blood vessels.

According to epidemiological studies, the prevalence of autonomic dysfunction syndrome in children and adolescents is very significant and ranges from 12.1 to 82% in the population [7].

By now, there is no consensus among doctors who exactly should treat such patients: therapist, neurologist, cardiologist, endocrinologist, psychologist or psychiatrist. This is primarily due to the abundance of complaints that this category of patients show [8].

The basic principles of treatment are individuality, an integrated approach, including prolonged pharmacotherapy using a significant amount of drugs.

However, at present, a number of negative problems are identified in the drug provision of children with disorders of the autonomic nervous system: a significant assortment of drugs in the Russian pharmaceutical market; lack of a standard of treatment and a formulary list of drugs for the treatment of ADS in children under inpatient treatment; information deficit among medical and pharmaceutical specialists in the field of medical care for children with ADS, etc. [9].

In connection with the foregoing, it is relevant to conduct studies on the optimization of drug care for children with ANS disorders based on the principles of rational pharmaceutical management and pharmacoeconomics.

The purpose of the work is to optimize the drug provision of the children with disorders of the autonomic nervous system under inpatient treatment.

The objects of the study are 398 patient histories of children being treated at the pediatric department of the City Children's Hospital of Belgorod municipal public health institution (MPHI "State Children's Hospital") with autonomic dysfunction syndrome; 80 questionnaires for expert evaluation of medical specialists.

II. EXPERIMENTAL

The methodological basis was made by the approaches of modern pharmaceutical management, the principles of system analysis, pharmacoeconomics, approaches to the assessment of drug consumption, the works of leading scientists in the field of pharmacy management and economics, legislative and regulatory documents of the Russian Federation and Belgorod Region.

The main methods used in study are: systemic, structural, graphical, content analysis, economic and mathematical (comparison, grouping, ranking, cost),

sociological (expert assessment, questionnaire), pharmacoeconomic (ABC analysis, VEN analysis).

III. Results and discussion

To achieve the goal, a research concept has been developed and includes 7 stages: 1) the formation of a medical and social portrait of a child with autonomic dysfunction; 2) determination of the information array of drugs used to treat children with autonomic dysfunction syndrome under inpatient treatment; 3) structural analysis of the assortment of drugs; 4) segmentation analysis of the assortment of drugs; 5) expert assessment of the range; 6) the formation of a formulary list of drugs; 7) cost analysis of the course of treatment for a child with autonomic dysfunction syndrome under inpatient treatment.

At the first stage of the study, in the course of a content analysis of 398 case histories of children with a nosology code according to ICD-10 G 90.9, a medical and social portrait of a hospital patient-child has been determined. That is a boy (55.2%), aged from 12 to 16 years (45.3%), an urban resident (79.0%), living with complete family (67.0%), directed for treatment by outpatient institutions (53.1%), who was treated in hospital on average 14.1 bed days, with the main diagnosis of “Autonomic Dysfunction Syndrome” (100.0%), proceeding according to the mixed type (55.0%), with cephalgic syndrome (58.3%), with a permanent course of the disease - (61.6%), secondary form (71.6%), with the background of chronic vertebro-basilar insufficiency (32.0%), with the main concomitant disease mitral valve prolapse of the 1st degree (39.4%).

At the next stage, a pharmacoeconomic study of the drug assortment for the treatment of children with ADS under inpatient treatment was carried out.

For this purpose, an informational array of medicines was formed, which amounted 110 trade names, 94 international nonproprietary names and 1483 packaging of medicines.

During the analysis of the assortment, it was found that its structure is formed by 5 groups, according to the ATC classification. Among them the leaders are: C - “Cardiovascular system” 37.7%; N - “Nervous system” 34.5%, A - “Digestive tract and metabolism” 13.1%; B - “Blood and hematopoietic system” 13.1%, etc. (Table I).

Then, using ABC analysis, the assortment was segmented by the frequency of prescribing drugs and the cost of the treatment. During the analysis, the prescription coefficient (Cp) was calculated for each drug, which is the ratio of the consumption of this drug to the total volume of drug consumption.

So, as a result of the analysis according to the frequency of prescription, it was found that group A includes 11 drugs with Cp borders from 13.53 to 2.54. The most consumed in the group are 2 drugs: Korsavin and Phenibut (more than 25%). The average assigned group "B" is formed by 25 drugs with Cp from 2.2 to 0.17. Group "C" presents 16 drugs with Cp from 0.15 to 0.0057, usually these are single drug appointments prescribed for concomitant diseases (table II).

When analyzing the monetary costs of the treatment course, it was found that the group of “high-cost” drugs for the treatment of ADS in children is formed by 9 drugs, with a specific gravity in the total costs of 80.08%. The group of “medium-cost” is represented by 11 drugs - 15.15% and the group of “low-cost” - 32 drugs with a specific gravity of 4.77%, respectively (Table III).

At the next stage, VEN-examination of the assortment of drugs was carried out with the aim of segmenting it according to the degree of clinical significance and economic feasibility. The examination involved 80 highly qualified medical experts - specialists of medical organizations of Belgorod. A generalized portrait of an expert doctor has been formed. This is a pediatrician (82.0%), with more than 20 years of experience (60.0%), with the highest qualification category (40.0%), with an average competency coefficient of 0.86, with a high degree of familiarity with the proposed assortment (80.0%).

TABLE I. The Structure of the Assortment and Consumption of Drugs Used in Treatment of ADS in Children Under Inpatient Treatment, by Groups According to the ATC Classification

№ п/п	ATC Code	Name of the ATC classification group	Assortment		Consumption	
			%	*Rank*	*%*	*Rank*
1	C	The cardiovascular system	37,7	1	8,9	3
2	N	Nervous system	34,5	2	60,7	1
3	A	Digestive tract and metabolism	13,1	3	21,4	2
4	B	Blood and hematopoiesis system	13,1	3	8,8	4
5	S	Sensory organs	1,6	4	0,2	5
		Total:	100		100	

TABLE II. The Results of the ABC Analysis of the Assortment According to the Frequency of Prescribing Drugs for the Treatment of ADS in Children in a Hospital

Drug group	Cp	The number of drugs	Names of drugs
A (frequently prescribed)	13,53 - 2,54	11	Corsavin tab 5 mg No. 50; Phenibut Tab 250 mg No. 20; Asparkam Tab 350 mg No. 50; Mexidol solution for inj. 5% 2 ml No. 10; Vinpocetine tab 5 mg No. 50, etc.
B (middle prescribed)	2,2 - 0,26	19	Cerebrolysin solution for inj. 1 ml No. 10; Sermion tab. 5 mg No. 30; Piracetam caps. 400 mg No. 60, etc.
C (rarely prescribed)	0,24 - 0,0057	22	Amlodipine tab. 10mg No. 30; Captopril tablet 25 mg No. 40; Trimetazidine tab. 35 mg No. 60; Veroshpiron tab. 25 mg No. 20, etc.

TABLE III. THE RESULTS OF THE ABC ANALYSIS OF THE DRUG ASSORTMENT AT THE COST FOR A COURSE OF TREATMENT OF ADS IN CHILDREN

Drug group	The number of drugs	Specific gravity in total costs for the course of treatment,%	Names of drugs
A (high cost)	9	80,08	Cortexin lyophilized, 10 mg No. 10; Actovegin solution for inj. 40 mg / ml 2 ml No. 25; Magnelis B6 tab.50 No. 50
B (medium-cost)	11	15,15	Cerebrolysin sol. for inj. 1 ml No. 10; Corsavin tab 5 mg No. 50; Grandaxinum tab. 50 mg No. 60.
C (low-cost)	32	4,77	Piracetam caps. 400 mg No. 60; Nootropil solution 200 mg / ml 5 ml No. 12; Diacarb tab 250 mg №30
Total	**52**	**100**	

Further, based on the results of expert analysis, a weighted average score was determined for each drug, taking into account the competence of experts. The assortment was segmented into groups: V (important), E (replacement drugs) and N (optional). The boundaries of the weighted average estimates were determined by calculation using the Sturges formula.

So, in particular, the “V” group included 5 drugs: Actovegin (solution for in.), Pantogam (tab.), Berlipril (tab.), Cardionate (caps.), Cortexin (lyoph.); the group "E" - 23 drugs: Piracetam (solution for inj.), Phenibut (tab.), Asparkam (tab.), Vinpocetine (tab.), Magnelis B6 (tab), etc.; the group “N” - 24 drugs: Cerebrolysin (solution for the inj.), Cerepro (solution for the inj.), Nicergoline (solution for the inj.), etc. (Table IV).

TABLE IV. THE DISTRIBUTION OF DRUGS FOR THE TREATMENT OF ADS IN CHILDREN IN GROUPS, ACCORDING TO THE VEN ANALYSIS

№	Names of drugs	«weighted average value»	VEN group
1	2	3	
1	Pantogam Tab 250 mg No. 50	5	V
2	Actovegin solution for inj. 40 mg / ml 2 ml No. 25	5	V
3	Berlipril tab 5 mg No. 30	4,68	V
4	Cardionate caps 250 mg No. 40	4,6	V
5	Cortexin solution 10 mg No. 10	4,59	V
6	Piracetam:	4,42	E
7	Phenibut Tab 250 mg No. 20	4,33	E
8	Asparkam Tab 350 mg No. 50	4,33	E
9	Vinpocetine tab 5 mg No. 50	4,33	E
10	Magnelis B6 tab. No. 50	4,32	E
11	Sonapax dragee 10 mg No. 60	3,98	N
12	Sermion Tab 5 mg No. 30	3,94	N
13	Cerebrolysin solution for inj. amp 1 ml No. 10	3,48	N
14	Cerepro 25% 4 ml No. 3	3,36	N
15	Nicergoline powder for inj. amp 4 mg No. 5	3,29	N

At the next stage, a formulary list of drugs for the treatment of children with autonomic dysfunction syndrome has been developed, which is divided into 5 groups of drugs, depending on their therapeutic effect - 1) Correctors of disorder of cerebral circulation; 2) Drugs that affect the psychosomatic situation; 3) Drugs that affect the mental processes of the brain; 4) Drugs that affect metabolism; 5) Drugs that affect the cardiovascular system. All drugs are divided into basic (primary) therapy drugs and reserve drugs.

At the final stage of the study, a standard-cost analysis of the developed formulary list was carried out, for which the average consumption of drugs per treatment course for one child under inpatient treatment was determined. So, the average cost of a course of treatment for one child with an ADS in the pediatric department of a hospital (14 days) is 4,556.74 rubles.

The results of the study were recommended by the Department of Health and Social Protection of the Belgorod Region for implementation in the activities of children's medical organizations in Belgorod.

IV. CONCLUSION

An analysis of the literature revealed that the prevalence of autonomic dysfunction syndrome in children and adolescents reaches 82% in the population.

Using the content analysis of 398 child patient histories of the pediatric department, a medical and social portrait of a child with the “Autonomic Dysfunction Syndrome” - a patient under inpatient treatment of a medical organization has been formed.

A pharmacoeconomic study of drug care for children with ADS under inpatient treatment was conducted, as a result of which, an information array of the assortment of drugs for the treatment of autonomic dysfunction was formed, which amounted 94 international non-proprietary names, 110 trade names and 1483 packaging of drugs from 5 groups according to the ATC classification.

Using ABC analysis, the assortment was segmented by the frequency of prescribing drugs and the cost of treatment.

A VEN examination of the assortment of drugs for the treatment of autonomic dysfunction in children was carried out with the aim of segmenting it according to the degree of clinical significance and economic feasibility (expert competency coefficient 0.86).

An indicative formulary list of drugs has been developed for the treatment of children with autonomic dysfunction syndrome under inpatient treatment.

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