

# СОЦІАЛЬНИЙ МАРКЕТИНГ ТА ФАРМАКОЕКОНОМІЧНІ ДОСЛІДЖЕННЯ

*Recommended by Doctor of Pharmacy, professor I. V. Pestun*

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## THE STUDY OF DEVELOPMENT TRENDS OF THE PHARMACEUTICAL MARKET OF NEUROPROTECTIVE DRUGS IN UKRAINE

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*The main trends in development of the pharmaceutical market of drugs with the neuroprotective action in Ukraine over the past five years have been studied in the article. The analysis of indicators in sales volume of drugs with the neuroprotective action in natural units and monetary value has been also conducted. An important aspect of the work is to determine the ratio of consumption of neuroprotective drugs of domestic and foreign production within each pharmacotherapeutic group of medicines.*

**Key words:** pharmaceutical market of Ukraine, neuroprotective drugs, ischemic stroke, sales volume.

**Statement of the problem.** A rapid development of the pharmaceutical market and appearance of new methods and regimens of pharmacotherapy on the one hand, and the growth of cerebrovascular pathology on the other hand, determine the necessity of the rational choice of drugs. Estimation of the sales leaders of drugs in each of the segments at pharmaceutical market, comparison with the structure of disease prevalence in Ukraine, the standards of treatment and the information concerning their proven efficiency provide the possibility to estimate the rationality of prescribing a drug under conditions of a certain nosology. Under the conditions of limited funding of the healthcare system of many countries in the world besides the

rationality estimation it is important to take into consideration the economical aspects of medical technologies [2, 3].

**Analysis of recent research and publications.** The importance of the problem of acute cerebral vascular disease, including ischemic stroke (IS), leads to a considerable interest of domestic and foreign scientists to search for ways of the rational pharmacotherapy of this disease, and improve pharmaceutical provision of patients with IS. It should be mentioned that an important role in treatment of IS belongs to neuroprotective drugs (ND), which diminish brain damage, as well as prevent the brain necrosis after an acute ischemia [4, 6].

Despite the current publications the studies of the dynamics of the ND market development have not been carried out, therefore, there is the relevance and need for further development in this direction.

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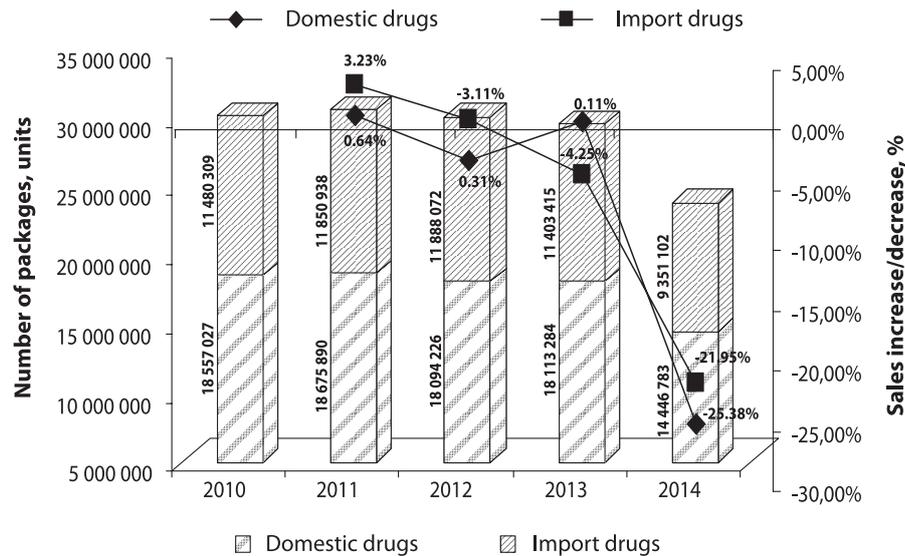


Fig. 1. The sales dynamics of the ND pharmaceutical market in natural units in 2010–2014 (taking into account increase and decrease of their sales rates)

**Identification of aspects of the problem unsolved previously.** Increasing the availability and improving the quality of pharmaceutical provision relate to the priorities of the healthcare sector. In this regard, the recent emphasis on scientific ground, development and implementation of measures aimed at optimizing the pharmaceutical care of patients with the most common pathologies, including IS, are of interest. Among the main issues that require urgent solutions the problem of prediction of the drug use occupies a leading position. Today determination of market trends of ND is of great importance because it allows to use the objective data while taking reasonable administrative and legislative solutions for improving the regulation of the pharmaceutical market of Ukraine, and also provides the efficient use of the limited resources of health and decision-making on investments in production.

**Objective statement of the article.** With the purpose of determination of features and tendencies of the Ukrainian population consumption of ND used for treating ICS the analysis of indicators in sales volume of the drugs mentioned in natural units and monetary value has been conducted.

**Presentation of the main material of the research.** Among factors forming the pharmaceutical market of Ukraine there are its structural changes and general dynamics (a budgetary funding dynamics of the healthcare devel-

opment is especially important); the presence and implementation of the government and international programs of health protection; development trends in the demographic situation in Ukraine; tendencies in changing the average cost of packing drugs of domestic and foreign production; the purchasing power of the population and the inflation impact on the drug sales volumes; tendencies of drug sales changes in groups [1, 5].

Based on the research results the Ukrainian pharmaceutical market of ND is almost 40% dependent on foreign producers and does not provide the needs of the population as an independent state in drugs in accordance with recommendations of the Ministry of Public Health (Fig. 1). An insignificant part of domestic products also draws attention in its cost measuring at the market of ND, which is about 35% (Fig. 2). Such a tendency, in our opinion, is caused by the fact that domestic industry is concentrated on the production of drugs in the lower price assortment.

The ND market of Ukraine mostly includes 4 pharmacological groups: A – “Alimentary tract and metabolism”, B – “Blood and blood forming organs”, C – “Cardiovascular system”, N – “Nervous system”. The research conducted showed that the Ukrainian ND market sales volume in 2014 was 1.89 billion Ukrainian Hryvnias (UAH) for 23 797 886 packages, it increased by 22.22% in monetary value compared to 2010 and significantly decreased (by 26.22%) in natural units.

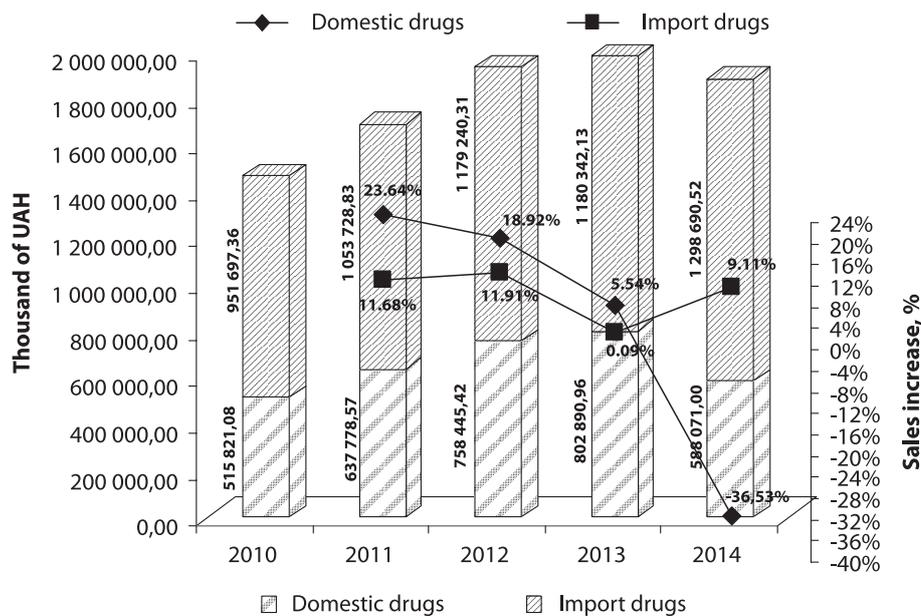


Fig. 2. The sales dynamics of the ND pharmaceutical market in monetary value in 2010–2014 (taking into account the growth of their sales rates)

It should be noted that in 2014 a part of domestic drugs in the total ND sales in natural units decreased by 28.45% compared to 2010. The specific gravity of sales rates of import drugs for the period studied demonstrates the similar tendency. So, the rates mentioned decreased by 22.77%.

A different trend is observed in monetary indicators. In 2010–2014 the ND market in monetary value demonstrated the increase of sales rates of domestic drugs by 12.29%, foreign drugs – by 26.72%.

However, in spite of the gradual increase of sales rates of domestic ND, unfortunately, the pharmaceutical market remains dependent on the import.

During analysis of the pharmacotherapeutic structure of the ND consumption it has been found that the most extensive cluster is “Nervous system”, which in 2014 was 35.93% of the sales rates of the group studied in natural units, and 30.12% – in monetary value (Table 1).

The next stage of our research was the ND sales analysis within the groups of ATC-classification.

Based on the results of the ND consumption analysis of the pharmacotherapeutic group A it has been found that every year the sales volume of drugs increases. According to the results of 2014 this index was 708.42 million UAH for 4 995 891 packages with the growth rates

of 24.43% in monetary value and insignificant decrease (by 4.29%) in natural units compared to 2010.

The similar positive tendency of the ND sales increase of the segment mentioned is observed both for drugs of domestic and foreign production. Thus, the number of packages of domestic drugs sold considerably increased in 2014 in comparison with the previous periods – from 414 452 in 2010 to 1 548 500 in 2014 (by 73.24%), import drugs decreased from 4 794 567 in 2010 to 3 447 391 in 2014 (by 39.08%).

According to the results of sales in 2014 in this segment there is increase of consumption in monetary units by 70.63% for domestic drugs and by 14.41% for import ones.

The values of the ND sales of the pharmacotherapeutic group A are illustrated in Fig. 3 and Fig. 4.

Generally, dynamics of the ND sales in the pharmacotherapeutic group A “Alimentary tract and metabolism” in natural units for all subgroups of the segment is positive. Most drugs used were *vitamin B<sub>1</sub> in combination with vitamin B<sub>6</sub> and/or vitamin B<sub>12</sub>*. Their assortment is greater in comparison with other ND subgroups. Thus, the number of the packages sold in this subgroup of drugs increased by 6.85% within the period studied.

According to the sales rates in monetary value *actovegin* is the leader of the given ND

Table 1

**DYNAMICS OF THE ND SALES IN PHARMACOTHERAPEUTIC GROUPS  
IN NATURAL UNITS AND MONETARY VALUE IN 2010-2014**

Year	Sales amount, mln. packages	Part in general sales of the group, %	Sales increase, %	Sales, mln. UAH	Part in general sales of the group, %	Sales increase, %
<b>A – "Alimentary tract and metabolism"</b>						
2010	5.21	17.34	19.92	465.11	36.48	15.10
2011	5.67	18.59	8.93	535.36	36.16	14.24
2012	6.05	20.18	6.61	611.60	36.00	14.06
2013	6.56	22.28	8.71	697.57	37.35	6.18
2014	5.00	20.99	-31.63	708.42	37.55	-4.55
<b>B – "Blood and blood forming organs"</b>						
2010	2.66	8.86	-13.23	1.84	1.00	-10.64
2011	3.05	9.99	14.59	2.16	1.02	17.33
2012	3.74	12.46	22.44	2.83	1.17	30.91
2013	2.22	7.52	-40.60	15.79	0.80	-30.12
2014	2.14	9.00	-3.60	19.20	1.02	17.77
<b>C – "Cardiovascular system"</b>						
2010	10.94	36.43	-7.13	56.22	30.62	16.01
2011	10.96	35.89	0.12	64.32	30.39	14.41
2012	9.57	31.93	-12.61	73.14	30.17	13.72
2013	10.02	33.93	4.60	62.05	31.29	6.13
2014	8.11	34.08	-23.49	46.95	24.88	-32.17
<b>N – "Nervous system"</b>						
2010	11.22	37.36	-3.52	58.56	31.90	16.38
2011	10.85	35.53	-3.37	68.63	32.43	17.19
2012	10.62	35.43	-2.05	79.18	32.66	15.37
2013	10.71	36.27	0.79	60.63	30.57	-4.20
2014	8.55	35.93	-25.22	68.97	36.55	12.09

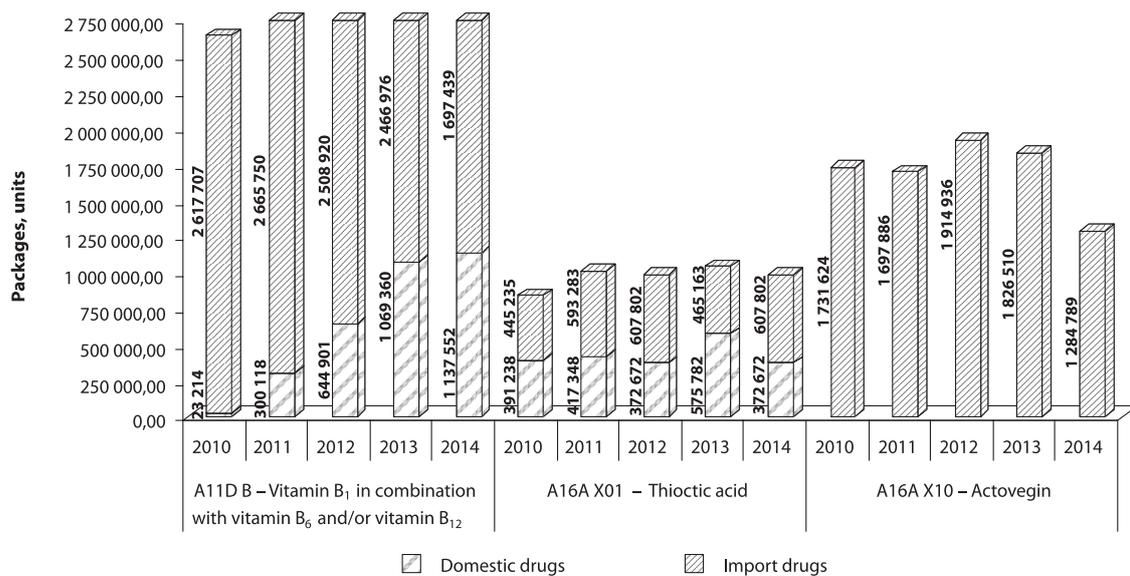


Fig. 3. Dynamics of the ND sales of the pharmacotherapeutic group A in monetary value in 2010-2014

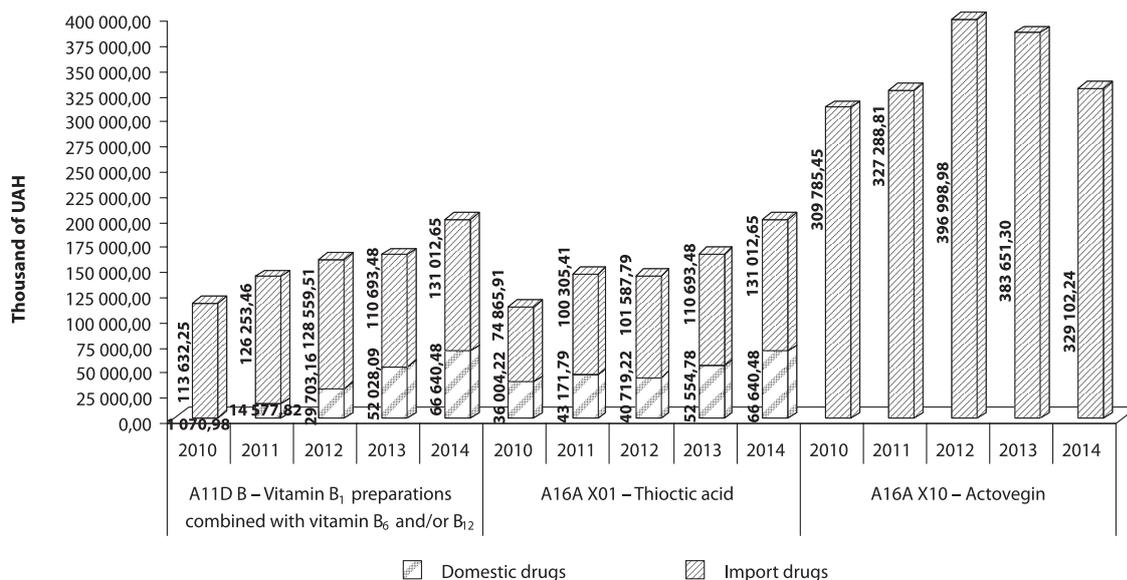


Fig. 4. Dynamics of the ND sales of the pharmacotherapeutic group A in natural units in 2010-2014

segment. Its consumption increased by 5.87% in 2014 compared to 2010.

It should be noted that in 2010-2014 at the pharmaceutical market of Ukraine the drug range for *actovegin* and *vitamin B<sub>1</sub> in combination with vitamin B<sub>6</sub> and / or vitamin B<sub>12</sub>* formed due to import drugs.

Analysis of the ND consumption in the pharmacotherapeutic group B “Blood and blood forming organs” has shown that import drugs are not presented in the ND nomenclature at the Ukrainian pharmaceutical market (Fig. 5, Fig. 6).

It has been found that this segment is characterized by small sales amounts both in monetary value and natural units compared to other ND groups.

Generally, for this group in 2014 the decrease in consumption in natural units and monetary

value was observed. For example, the sales of *magnesium sulphate* in 2014 totaled 19.20 million UAH in monetary value and 2 141 775 packages in natural units, decreased by 24.31% and 23.38%, respectively, compared to 2010.

The next stage of the analysis carried out was to investigate the sales of ND in the pharmacotherapeutic group C “Cardiovascular system”. It has been found that domestic drugs provide prevailing sales in natural units in this segment – almost 60%. In addition, there is the increase in sales of domestic drugs in monetary value by 39.89% in 2014 compared to 2010. It should be noted that the increase in sales of import drugs in monetary value for 2010-2014 was 60.49% (Table 2).

The analysis showed that in monetary value the growth rates over the period under study

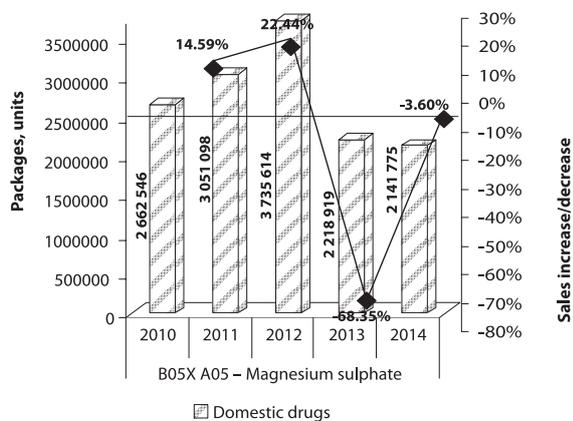


Fig. 5. Dynamics of the ND sales in the pharmacotherapeutic group B in natural units in 2010-2014

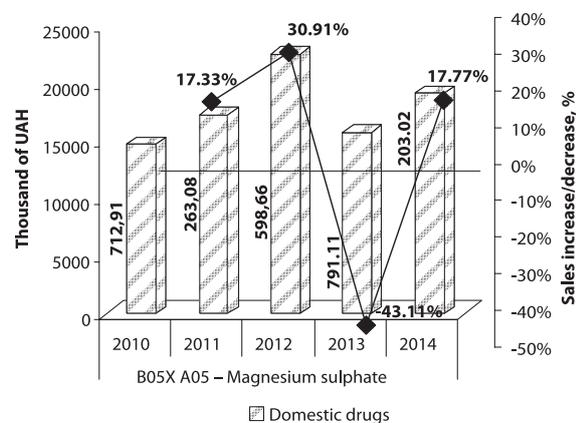


Fig. 6. Dynamics of the ND sales in the pharmacotherapeutic group B in monetary value in 2010-2014

Table 2

**DYNAMICS OF THE ND SALES IN PHARMACOTHERAPEUTIC SUBGROUPS  
IN NATURAL UNITS AND MONETARY VALUE IN 2010-2014**

Pharmacotherapeutic subgroup	Sales in packages, units		Sales growth, %	Sales in thousands of UAH		Sales growth, %	
	2010	2014		2010	2014		
<i>Inosine</i> (C01E B14)	DD*	3 007 600	2 013 528	-49.37	16 719.02	16 824.84	0.63
	ID**	30 956	8 262	-274.68	156.73	49.59	-216.05
	Total	3 038 556	2 021 791	-50.29	16 875.75	16 874.43	-0.008
<i>Mildronate</i> (C01E B20)	DD*	1 745 641	935 391	-86.62	230 798.57	49 108.37	-369.98
	ID**	42 579	888 587	95.21	1 986.12	120 974.80	98.36
	Total	1 788 220	1 823 978	1.96	232 784.68	170 083.17	-36.87
<i>Thiotriazolin</i> (C01E B23)	DD*	3 275 819	1 694 756	-93.29	101 777.00	149 293.95	31.83
	ID**	-	-	-	-	-	-
	Total	3 275 819	1 694 756	-93.29	101 777.00	149 293.95	31.83
<i>Pentoxifylline</i> (C04A D03)	DD*	1 599 375	1 789 227	10.61	17 928.49	41 876.78	57.19
	ID**	674 210	259 867	-159.44	30 107.21	22 398.56	-34.42
	Total	2 273 584	2 049 094	-10.96	48 035.70	64 275.34	25.27
<i>Nicergoline</i> (C04A E02)	DD*	64 586	124 980	48.32	1 483.97	8 335.28	82.20
	ID**	375 636	301 287	-24.68	39 215.95	50 748.85	22.72
	Total	440 222	426 267	-3.27	40 699.93	59 084.12	31.12
<i>Naftidrofuryl</i> (C04A X21)	DD*	-	-	-	-	-	-
	ID**	97 125	72 190	-34.54	4 541.17	5 537.95	17.20
	Total	97 125	72 190	-34.54	4 541.17	5 537.95	17.20
<i>Nimodipine</i> (C08C A06)	DD*	1 243	1 015	-22.46	62.64	67.47	7.16
	ID**	27 553	20 256	-36.02	4 572.22	4 244.52	-7.72
	Total	28 796	21 271	-35.38	4 634.87	4 311.99	-7.49

Notes: \* DD – domestic drugs; \*\* ID – Import drugs.

increased, however, there was a significant negative shift of the ND sales of this group in natural units. Thus, for domestic products there was decrease in sales by 47.80% in 2014 compared to 2010, for foreign drugs there was increase by 19.50% (Table 2).

The analysis has shown that the demand for ND of the pharmacotherapeutic group C, which includes seven subgroups, for the period of 2010-2014 in natural units is higher in subgroups of *inosine* and *pentoxifylline* (Table 2). However, there is a negative trend of decreasing sales of *inosine* and *pentoxifylline* over this period by 50.29% and 10.96%, respectively.

Annually NDs of *mildronate* subgroups are characterized by the positive sales dynamics in natural units, its sales indicators in 2010-2014 increased by 1.96%.

The subgroups of *nicergoline*, *naftidrofuryl* and *nimodipine* are characterized by small sales amounts compared to other ND subgroups in this segment.

The leading ND of the pharmacotherapeutic group C in terms of sales in monetary value each year of the period analyzed is *mildronate*. Its consumption decreased by 36.87% in 2014 compared to 2010 (Table 2).

The range of the pharmacotherapeutic group N “Nervous system” is presented by 9 INN: *piracetam*, *citicoline*, *vinpocetine*, *cortexin*, *cerebrolysin*, *ipidacrine*, *choline alfoscerate*, *beta-histidine* and *cinnarizine*. The ratio of sales of these drugs assessed in monetary and natural indicators are presented in Fig. 7 and Fig. 8, respectively.

As it is seen from these figures, the leaders in sales in monetary value are *citicoline*, *beta-histidine* and *cerebrolysin*, their proportion of marketing is 28.35%, 15.60% and 15.12% of the total market size for ND of the pharmacotherapeutic group N, respectively.

Demand for ND of the pharmacotherapeutic group N in natural units is higher in subgroups of *piracetam* (27.53%) and *cinnarizine* (22.93%),

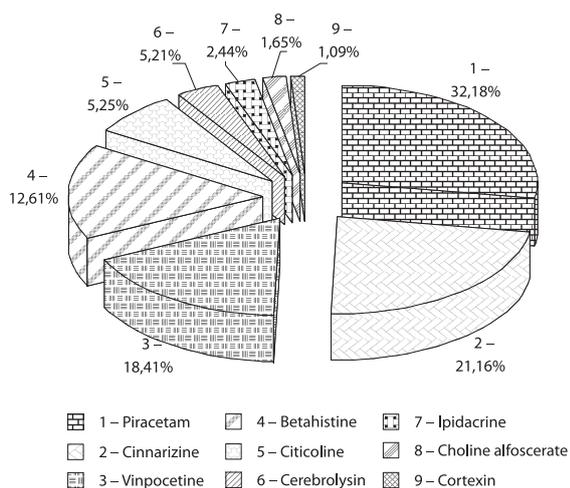


Fig. 7. The ND sales volume in the pharmacotherapeutic group N in natural units in 2014

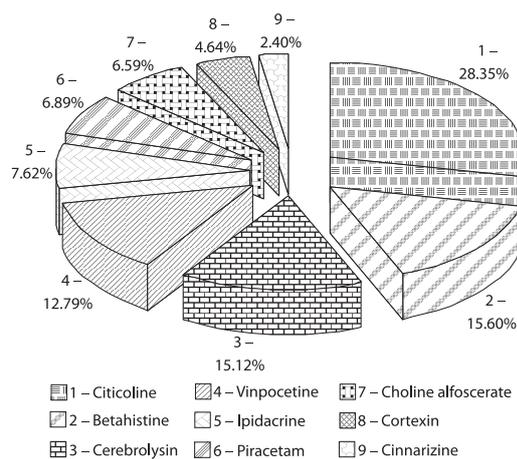


Fig. 8. The ND sales volume in the pharmacotherapeutic group N in monetary value in 2014

and it may be explained by the widest range of these drugs in Ukraine.

The next stage of the analysis was to study the dynamics of sales of the most promising ND in the pharmacotherapeutic group under research. The sales indicators of these drugs in this segment are presented in Fig. 9 and Fig. 10.

According to the results of the analysis it has been determined that ND under research had rather stable sales indicators in 2010-2014 in both natural units and monetary value (Fig. 9, Fig. 10). The leader of the ND segment by sales indicators both in monetary value and in natural units was *citicoline*, its consumption increased by 41.98% and 31.88%, respectively, in 2014 compared to 2010. It should be noted that the increase in sales rates of domestic drugs of the *citicoline* subgroup for the period

studied in natural units was 78.11%, import drugs – 2.67%. However, in monetary value the consumption of domestic drugs increased by 79.99%, while import drugs – by 25.45%.

For drugs of the *cerebrolysin* subgroup a positive trend in sales in monetary value was observed – 6.63%. At the same time the consumption of *cerebrolysin* in natural units decreased by 50.63% in 2014 compared to 2010. It should be noted that in 2010 and 2014 the drug range of the *cerebrolysin* subgroup at the Ukrainian pharmaceutical market was formed mainly due to import drugs. It has been also found that the consumption of import drugs in this segment in monetary value for the period of 2010-2014 is characterized by a slight increase by 6.84%. But in natural units the consumption of import drugs decreased by 36.87%. This happened primarily due to the expansion of the range of do-

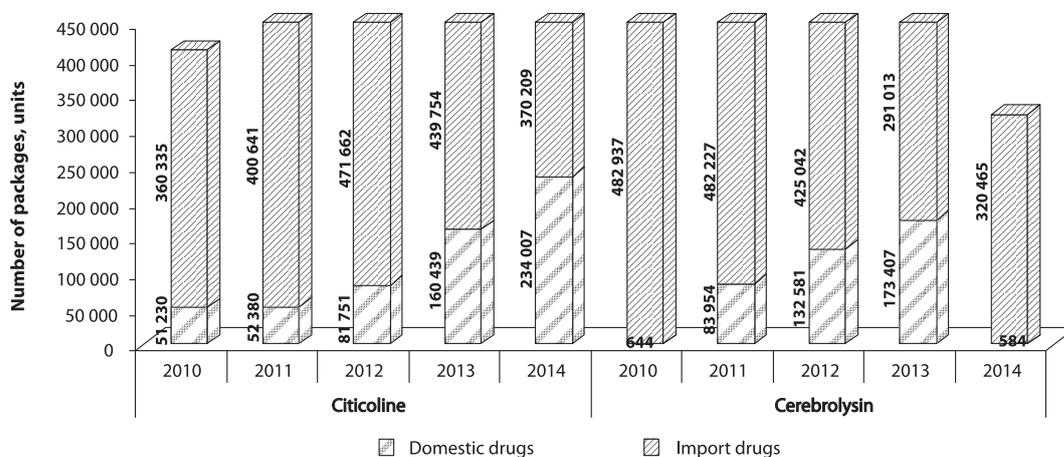


Fig. 9. Dynamics of the ND sales for the pharmacotherapeutic group N in natural units in 2010-2014

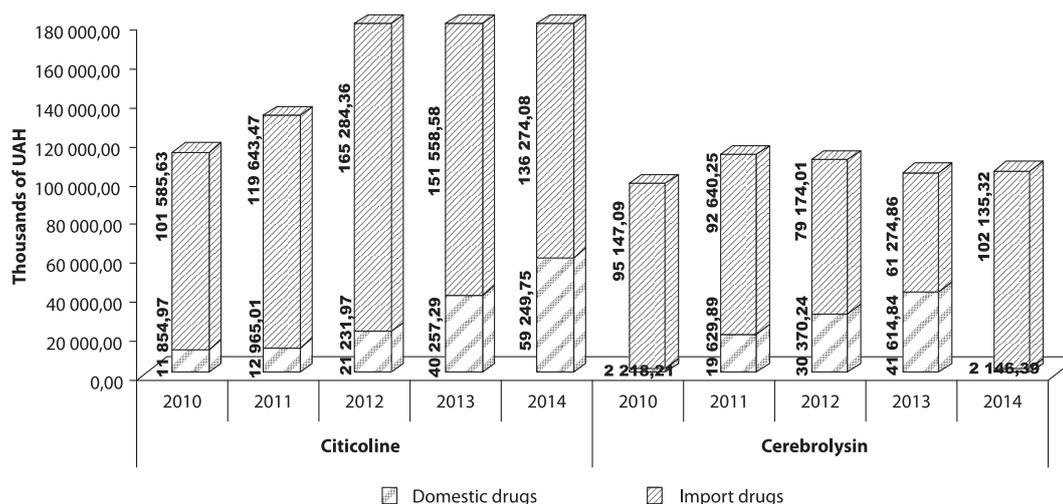


Fig. 10. Dynamics of the ND sales for the pharmacotherapeutic group N in monetary value in 2010-2014

mestic generic drugs by means of foreign medicines at the pharmaceutical market of Ukraine. Thus, these data indicate that the demand for ND of the *cerebrolysin* subgroup within the period studied has shown a stable dynamics, however, there is an increase in the drug consumption of the *citicoline* subgroup.

### Conclusions

The research has shown that the volume of the Ukrainian ND market in 2014 was 1.89 billion UAH for 23 797 886 packages, it increased compared to 2010 by 22.22% in monetary value and decreased by 62.22% in natural units.

The analysis of the ND consumption of the pharmacotherapeutic group A has revealed that drug sales increase every year. According to the results of 2014 this figure was 708.42 million UAH for 4 995 891 packages with the growth rates by 24.43% in monetary value and an insignificant decrease (by 4.29%) in natural units compared to 2010.

It has been found that the ND sales for the pharmacotherapeutic group B within 2014 totaled 19.20 million UAH in monetary value and 2 141 775 packages in natural units, and decreased by 24.31% and 23.38%, respectively, compared to 2010.

According to our data it has been determined that domestic products provide the prevailing sales in natural units – nearly 60% in the pharmacotherapeutic group C segment. In addition, there is the increase in sales of domestic drugs in monetary value by 39.89% in 2014 compared to 2010. It should be noted that the increase in sales of import drugs in mon-

etary value for 2010-2014 was 60.49%. However, significant negative changes of the ND sales dynamics of this group are observed. Thus, for domestic drugs there is the decrease in sales in natural units by 47.80% in 2014 compared to 2010, for foreign drugs – by 19.50%.

Ranking of ND of the pharmacotherapeutic group N presented at the pharmaceutical market of Ukraine indicates that the leaders by the sales volumes in monetary value are *citicoline*, *betahistine* and *cerebrolysin* subgroups, their the proportion of marketing in the total market size of this segment is 28.35%, 15.60% and 15.12%, respectively. However, the ND demand for this group in natural units is higher in subgroups of *piracetam* (27.53%) and *cin-narizine* (22.93%), and it can be explained by the widest range of these drugs in Ukraine.

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#### ИССЛЕДОВАНИЕ ТЕНДЕНЦИЙ РАЗВИТИЯ ФАРМАЦЕВТИЧЕСКОГО РЫНКА НЕЙРОПРОТЕКТОРНЫХ ПРЕПАРАТОВ В УКРАИНЕ

А. А. Котвицкая, И. А. Лобова

В статье исследованы основные тенденции развития фармацевтического рынка лекарственных средств нейропротекторного действия в Украине за последние пять лет. Также проведен анализ показателей объемов продаж лекарственных средств нейропротекторного действия в натуральном и денежном выражении. Важным аспектом работы является определение соотношения объемов потребления нейропротекторных лекарственных средств отечественного и иностранного производства в пределах каждой фармакотерапевтической группы препаратов нейропротекторного действия.

**Ключевые слова:** фармацевтический рынок Украины, нейропротекторные лекарственные средства, ишемический инсульт, объем продаж.

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#### ДОСЛІДЖЕННЯ ТЕНДЕНЦІЙ РОЗВИТКУ ФАРМАЦЕВТИЧНОГО РИНКУ НЕЙРОПРОТЕКТОРНИХ ПРЕПАРАТІВ В УКРАЇНІ

А. А. Котвицька, І. О. Лобова

У статті досліджено основні тенденції розвитку фармацевтичного ринку лікарських засобів нейропротекторної дії в Україні за останні п'ять років. Також проведено аналіз показників обсягів продажу лікарських засобів нейропротекторної дії в натуральному і грошовому вираженні. Важливим аспектом роботи є визначення співвідношення обсягів споживання НЛЗ вітчизняного та іноземного виробництва в межах кожної фармакотерапевтичної групи препаратів нейропротекторної дії.

**Ключові слова:** фармацевтичний ринок України, нейропротекторні лікарські засоби, ішемічний інсульт, обсяг продажів.