1. Introduction

One of the directions of research of the logistic system (LS) in developed countries is connected with the definition of the relationship of logistics and production costs, that is, the costs of warehouse and transport facilities, inventories, production, processing orders and other components of the company's LS, which depend on each other. Attempts to minimize the costs of a particular activity can lead to an increase in the total cost of logistics. For example, at the logistics stage, efforts have traditionally been aimed at minimizing costs for the purchase of substances and materials, at the stage of production – to minimize costs for the production of a series of drugs (medicines); at the stage of transportation – to increase the use of vehicles. The concept of logistics management involves an analysis of the innovations of any function, taking into account the total cost of the entire drug.

The urgency of studying and improving the management of logistics costs (LC) is due also to their significant share in the structure of the cost of goods. According to Michael R. Lynders, the share of LC in the value of goods is about 30 % in the food industry, 26–27 % in the chemical industry (including pharmaceuticals), 16 % in the manufacture of electronic and electrical products [1] . Interestingly, there is also data on the share of LC in the gross domestic product of different countries. For example, in the USA it is 11.4 %, in Japan it is 11.4 %, in the United Kingdom it is 11.5 %, in France 11.5 %, in Canada 11.9 %, in Spain 12.0 %, in Denmark – 13 %, in Germany – 13.5 %, in Mexico – 15.4 % [2]. According to the famous logistics specialist R. Ball, LC in developed countries are on average 12 % of GNP [3].

Today, often the desire to achieve the partial goals of individual units of the LS leads to an increase in the general LC, due to the lack of methodological and methodic research in the field of management and, accordingly, requires the creation of a modern mechanism. The condition for its creation is the acquisition of the SFG effect due to the coordination and optimization of costs throughout the LFL, the transi-

SUBSTANTIATION OF THE MECHANISM OF LOGISTIC EXPENDITURE MINIMIZATION BY SUBJECTS OF THE PHARMACEUTICAL INDUSTRY

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Abstract: Aim: to determine the factors of influence on the magnitude of logistics costs and developing measures to minimize them.

Materials and methods. The methods used in the study include the expert, systematic method of scientific knowledge, structural analysis, the method of abstract modeling. An expert method was conducted with the help of questionnaires of specialists of pharmaceutical companies, pharmacies and wholesale pharmaceutical companies. 118 respondents participated in the survey. The degree of consistency of expert opinions was determined with the help of the coefficient of concordance, which is 0.8374 (the normative value of the coefficient of concordance is 0.75), the Pearson criterion also exceeds the table value for the corresponding number of degrees of freedom, which testifies to the non-randomness of their judgments.

Results. The factors influencing the amount of logistics costs are determined. The internal factors of influence include the activities of the subject of the pharmaceutical industry, assortment structure and structure of the use of substances and materials, the magnitude of stocks, etc. External factors of influence are the level of prices for logistics services provided by outside organizations; rate of transport tax; environmental taxes etc.; competitors suppliers of substances and materials; consumers; intermediaries; legislative base, etc. The conducted questioning of specialists and taking into account the current experience of leading foreign pharmaceutical companies allowed to determine the main measures to minimize logistics costs for all parts of the logistics system – procurement, production, transportation, storage, distribution and recycling, and types of flows – material, financial, information, labor.

Conclusions. Based on the carried out research, the factors influencing the magnitude of logistics costs, which experts are divided into external and internal, are determined. The matrix of the components of LV savings is proposed, which takes into account the type of flow and the links of the logistic system. The constructed matrix allows to minimize the amount of LV, which helps to reduce the price of drugs for the end user.

Keywords: logistics costs, subjects of the pharmaceutical industry, factors of influence, logistic system, matrix of components of logistics cost savings, medicines, flows, pharmaceutical industry.

tion from the local management objectives of the LC to their management, taking into account the general objectives of LS; improvement of normative and informational support of this process. In addition, the need to develop a modern management mechanism of LC is associated with their significant impact on the size of enterprise revenue [1–11].

The aim of the study is to determine the factors influencing the magnitude of the logistics.

2. Materials and methods

The methods used in the study include the expert, systematic method of scientific knowledge and the method of abstract modeling.

The systemic method of scientific knowledge and structural analysis was used in the process of analyzing the current state of managing the logistics costs of the pharmaceutical industry. The method of abstract modeling was used in the process of conclusions preparation.

An expert method was conducted with the help of questionnaires of specialists of pharmaceutical companies, pharmacies and wholesale pharmaceutical companies. 118 respondents participated in the survey, their characteristics are shown in the **Table 1**.

Table 1
Characteristics of experts who participated in the survey

Characteristics	The direction of the survey – logistics costs
Number of experts	118
Employment period:	
– up to 5 years	18
– from 5 to 10 years	12
– from 10 to 20 years	70
– more than 20 years	18
Education:	
– advanced education	2
– higher education	116
Place of work:	
– ZOZ	-
– analytical laboratory	-
– university	2
– OFF	12
– pharmacy	22
– FP	82

The degree of consistency of expert opinions is not coincidental, so, the coefficient of concordance is 0.8374 (normative value – 0.75), the Pearson criterion exceeds the table value for the corresponding number of degrees of freedom.

3. Result

The analysis highlighted the complexity of LC, in connection with which there is a need to develop measures to minimize them. Implementation of the LC management system for pharmaceutical industry subjects (PIS) requires the establishment of feedback "pharmaceutical market – LC PIS", which in turn promotes the search for reserves to improve the effectiveness of the LFS and the level of satisfaction of drug consumers. The factors affecting the size of LC should be divided into internal (PIS activities, assortment structure and structure of the use of substances and materials, the size of stocks, etc.) and external (the price level for logistics services provided by outside organizations, the rate of transport tax, environmental taxes, etc., competitors; suppliers of substances and materials, consumers, intermediaries, legislative base, etc.). The histogram of the distribution of the ranks of the factors of influence on the value of LC, determined on the basis of our survey, is shown in **Fig. 1**, their classification – in **Fig. 2**.
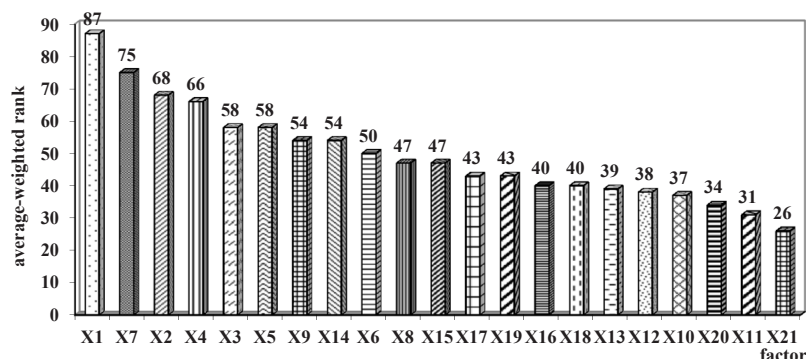

Fig. 1. Distribution histogram in terms of the significance of the factors affecting the magnitude of the logistics costs of the PIS: X1 – the scope of the PIS; X2 is the degree of complexity of the assortment structure of the PIS and the structure of the use of materials; X3 – production structure of PIS; X4 – the value of inventories of material resources (MR); X5 – level of novelty and equipment status; X6 – level of novelty of technologies; X7 – qualification of the personnel; X8 – organization of processes of physical movement of materials at the enterprise, etc.); X9 – level of prices for logistic services provided by third parties; X10 – rate of crediting of capital attracted for financing of logistic activity; X11 – competitors; X12 – suppliers; X13 – quantity of deliveries of the first medical device; X14 - the cost of the order of the first medical device
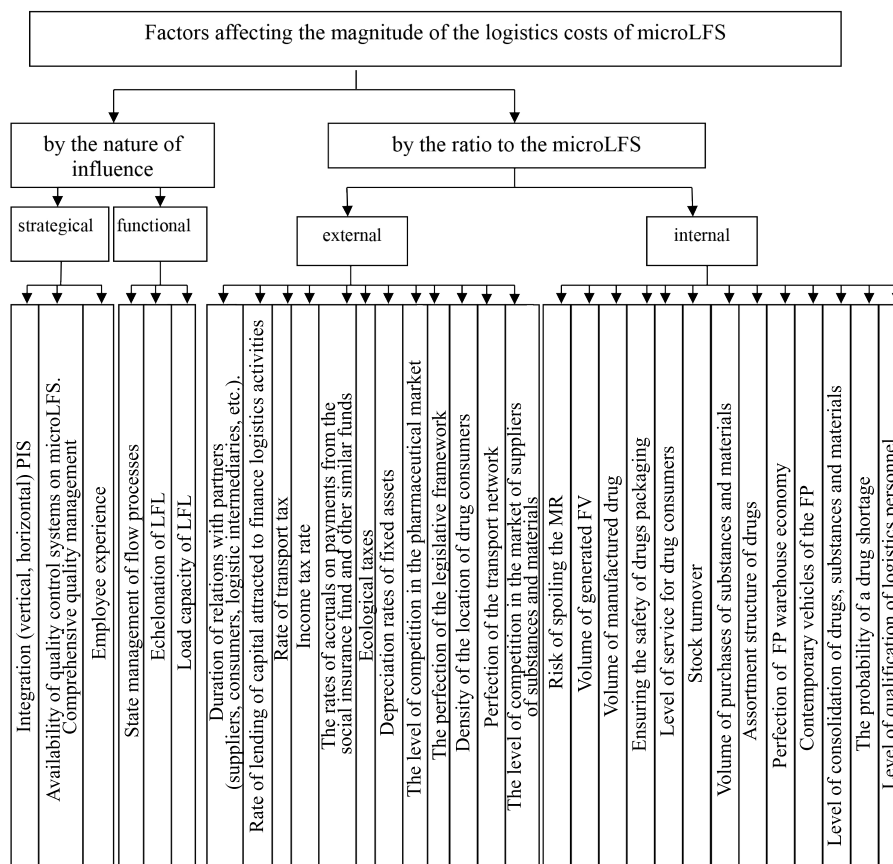

Fig. 2. Classification of factors of influence on the magnitude of the logistics costs of micro-LFS

An important point in LC management is the development of measures to minimize their magnitude. The results of the matrix analysis of components of economy of LC of different levels constructed on the basis of different levels are given in **Table 2**.

Table 2
The matrix of the components of the logistics cost savings in the pharmaceutical industry

Type of flows	Links of LFS					
	purchase	production	warehousing	distribution	transportation	recycling
Material	Savings due to optimization of procurement of drugs, substances	Savings due to optimization of production of drugs	Savings due to lower costs for the storage of drugs, substances and materials		Savings due to improved quality of transportation planning in conditions of uncertainty	Savings due to the creation of RLFCV
	Saving thanks to the optimization of the range of drugs		Saving thanks to optimizing the location of pharmaceutical compositions			
	Savings due to the selection of optimal batches of purchases		Savings due to optimization of MR stocks			
	Savings due to the selection of the best suppliers		Saving by reducing losses due to lack of stocks			
			Savings due to the optimal use of warehouse space through the integration of PSI actions	Savings due to the selection of priority drug markets		
	Savings due to the creation of CL					
	Saving due to the creation of regional pharmaceutical logistics warehouses					
	Saving by reducing losses, damage, confiscation and falsification of drugs					
	Saving due to MR balance according to GpP rules					
	Savings due to the use of outsourcing in pharmacy					
	Savings due to the reduction of all phases of the LFL life cycle (R&D, materials and materials supply, drug production, order processing, distribution, etc.)					
	Savings due to the use of different forms of integration of suppliers of substances and materials, pharmaceutical manufacturers and consumers of medicines, information organizations, intermediaries, etc.					
	Savings due to the creation of the FRK					
	Saving through the search and reduction of those types of activities (procedures, works, operations) that do not create added value by analyzing and reviewing the LFL					
	Savings due to the creation of industry stocks in the case of epidemics, natural disasters, etc.					
	Saving thanks to the creation of an organizational vertical flow control in the pharmaceutical industry					
Financial	Saving by reducing the immobilization of financial resources in stocks					
	Reducing costs caused by violations of the conditions of delivery of drugs, substances and materials					
	Savings due to reduced losses due to stock insurance				Saving by reducing losses due to environmental insurance	
	Savings due to reduced losses due to cargo insurance					
	Reduction of losses, damage, falsification and confiscation of drugs					
Informational	Reducing the time by combining the LFS units into a single IC and improving the coherence of their actions					
	Reduced time thanks to the introduction of Internet technologies and modern information and communication technologies for customer service					
	Reduce costs by optimizing supplier databases	Reducing costs by optimizing the database of drug manufacturers	Reduced costs by optimizing databases and storage conditions	Reducing costs by optimizing the database of drug consumers	Reduced costs by optimizing the database of transport organizations	Reduce costs by optimizing the recycling business database
Labor	Reduce time and costs due to the high quality of logistics workers					
	Savings due to improved customs clearance					
	Savings due to customer business development programs, workshops for dealers, etc.					
	Saving due to the improvement of LV accounting methods					

4. Discussion

On the basis of the study, it was determined that the value of LC is significantly influenced by both external and internal factors. To external factors experts include the environment PIS, namely, suppliers of substances and materials, competitors, consumers of medicines, intermediaries, third-party organizations; the level of prices for logistics services, the legislative base and others. Internal factors of influence are the scope of the PIS, the assortment structure and structure of the use of substances and materials, the magnitude of stocks, etc. At the same time, factors such as the scope of PIS activity, staff qualifications, the degree of complexity of the PIS assortment structure, and the structure of the use of materials, as well as the magnitude of stocks, need to be given special attention because they have the greatest impact on the magnitude of LC.

A prerequisite for the effective functioning of PIS is the economy of LC, for which a matrix of components of LC savings was created taking into account the type of flow (material, financial, information, labor) and the links of the logistics system (procurement, production, transportation, warehousing, distribution and recycling).

The proposed measures differ from existing ones taking into account all types of PIS activities and types of flows, as well as the peculiarities of functioning of both PIS and its suppliers, consumers and competitors. Thus, for example, B. P. Hromovik allocates expenses related to the purchase, sale, transportation and storage of drugs [5]. Due to the diversity of LC, the definition of approaches and methods for managing them is urgent today. M. Lewis, J. Calliton and J. Styl have taken the concept of total logistics costs [8], according to which the total costs include all the costs necessary to meet the needs of logistics. Within the framework of this concept, a strategy is made to minimize overall costs, aimed at creating LS with the lowest constant and variable costs. The disadvantage of this approach is the use of common LC as a key indicator in the formation of a logistics strategy, and for domestic business conditions - the inability of the current accounting and statistical reporting system to allocate components of LC, the existence of "double" accounting, the secrecy of financial information for partners and even for structural divisions inside PIS and others, lack of methods for calculating losses from logistic risks, etc. Thus, these measures will allow PIS not only to maximize the profits it receives, but also minimize the costs of transportation and storage of drugs, which will ultimately positively affect the price of medicines for the consumer.

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