

Research of Logistic Processes in the Medical Warehouse of the Armed Forces of Ukraine

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Abstract

Procurement of medical supplies of a certain range falls now within the powers of the Logistics Command of the Armed Forces of Ukraine, and that highlights the scientific substantiation of optimization methods for the functioning of medical warehouses subordinated to the Medical Forces Command of the Armed Forces of Ukraine as a top issue. This work aims to carry out a comparative analysis of a time tracking summary for existing warehousing logistic processes at the medical warehouse of the Armed Forces of Ukraine. Research materials comprised time tracking data of warehousing logistic processes in the Central Medical Warehouse of the Armed Forces of Ukraine and time tracking data of the above processes at the civil medical warehouse.

The methods of information search, systematization, time tracking, comparison, summarizing, mathematical-statistical, and graphic simulation methods were used during the work. Based on findings analysis, we determined the time consumption related to document review & approval process and waiting time, nonproductive time related to unloading, intra-warehouse transfer of medical supplies and medical equipment, and shipping with the outdated equipment, storage facilities, and handling equipment used in medical supply facilities of the Armed Forces of Ukraine. The research findings evidence the necessity to develop scientific and practical approaches to functional improvement of medical warehouses subordinated to the Medical Forces Command of the Armed Forces of Ukraine by way of implementation of the logistical concept, application of process technologies, renewal and modernization of materials handling equipment, introduction of state-of-art information technologies, in particular, Warehouse Management System.

Keywords: Medical supplies, Time tracking, Logistic processes, Warehouse logistics, Armed forces of Ukraine

INTRODUCTION

For the first time, Ukraine has chosen the course to European integration, and its intention to access NATO membership is captured in amendments to the Constitution of Ukraine and approved by the National Security Strategy of Ukraine and the Conception for the Development of Security and Defense Sector of Ukraine [1, 2]. Building a logistics system for medical supplies belongs to the responsibilities of each NATO member country taking part in integrated missions under the auspices of the Alliance. Procurement of medical supplies of a certain range falls now within the powers of the Logistics Command of the Armed Forces of Ukraine, and that highlights the scientific substantiation of optimization methods for the functioning of medical warehouses subordinated to the Medical Forces Command of the Armed Forces of Ukraine as a top issue. Management of logistic processes and operations directly related to transportation, cargo execution, warehousing, storage, and documentation of the transfer of medical supplies and medical equipment to the end-users coordinated by the management body (which defines demands and is involved in medical supplies and medical equipment purchase process) is a special task within the warehousing logistics system [3-5]. However, before improving the system we should understand the way it

operates now, evaluates its functioning to make further scientific-based optimizing decisions.

This work aims to carry out a comparative analysis of a time tracking summary for existing warehousing logistic processes in the medical warehouse of the Armed Forces of Ukraine.

MATERIALS AND METHODS

Research materials were time tracking data of logistic processes at the Central Medical Warehouse of the Armed Forces of Ukraine and time tracking data of the above processes of the civil medical warehouse. The methods of

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information search, systematization, time tracking, comparison, summarizing, mathematical-statistical, and graphic simulation methods were used during the work.

RESULTS AND DISCUSSION

The need for timely supplies for medical supply units of the Armed Forces of Ukraine with medical supplies and medical equipment requires from medical supply units to improve the efficiency of work organization, implementation of proper control over medical supplies and equipment storage, acceptance, and release [6, 7]. Such measures are directed at improving logistic processes in the operation of medical warehouses of the Armed Forces of Ukraine [8, 9].

To analyze the existing warehousing logistic processes at the medical warehouse of the Armed Forces of Ukraine, to identify bottlenecks and reasons for inefficient time consumption we conducted a multiple time tracking of these processes. The intra-warehousing logistic process at the Central Medical Warehouse was chosen as the subject of research since this medical warehouse is the basic element in the system of medical supply facilities of the Armed Forces of Ukraine, and thus, all warehousing logistic processes are performed there, as well as pilot tests of implementation of automated stock management of medical supplies and medical equipment are carried out there.

As regards the object of our comparison, this is the civil pharmaceutical company BaDM LLC being one of the leading companies within its sector among civil pharmaceutical companies of Ukraine. Pharmaceutical company BaDM LLC has modern ‘A’ category warehouse complexes, special-purpose machines at its disposal, it uses state-of-art technologies intended to arrange warehousing logistics and to handle goods. The unified system of work with pharmaceutical products at all stages of its storage – from reception to warehouse till release to retail sale is used at warehouses of BaDM LLC. All these enable to collect and pack customers’ orders on a timely basis. It should be noted that the pharmaceutical company BaDM LLC uses for transportation of pharmaceutical products (medical products and medical devices) only certificated professional equipment: insulated shipping containers recommended for professional use when transporting medical products and

medical immunobiological drugs; refrigerated transport vehicles subject to scheduled validation [10].

To carry out multiple time tracking and further comparison of findings, the following processes are selected among the basic warehousing logistic processes “as they are”:

Sub-process 1 – Reception of medical equipment (ME) and medical supplies (MS) / Reception of pharmaceutical products.

Sub-process 2 – Allocation of medical equipment (ME) and medical supplies (MS) to storage areas / Allocation of pharmaceutical products to storage areas.

Sub-process 3 – Storage of medical equipment (ME) and medical supplies (MS) / Storage of pharmaceutical products to storage areas.

Sub-process 4 – Picking of medical equipment (ME) and medical supplies (MS) per purchase orders / Order processing.

Sub-process 5 – Shipment of medical equipment (ME) and medical supplies (MS) / Shipment of pharmaceutical products.

These data are based on time tracking which was carried out for existing warehousing logistic processes at the civil medical warehouse within the framework of research [11] and summarized in **Table 1**. When comparing the time tracking results, the data of the above five warehousing logistic sub-processes in respect of the same volumes of medical products and medical devices were used. However, the time index for these sub-processes is not the same, being 2 working days at the Central Medical Warehouse and 1 working day at the medical warehouse of the civil pharmaceutical company BaDM LLC.

This comparison highlights the difference in the efficiency of time consumption during each process of warehousing logistics at the medical warehouse of the Armed Forces of Ukraine, and at the medical warehouse of the civil pharmaceutical company, to compare the amount of time and nonproductive time.

Table 1. Time Tracking Comparison for Existing Warehousing Logistic Processes between the Central Medical Warehouse of the Armed Forces of Ukraine and the Medical Warehouse of Civil Pharmaceutical Company BaDM LLC

No.	Sub-process/operation	Central Medical Warehouse of the Armed Forces of Ukraine (time consumption*, minutes)	Pharmacological company BaDM LLC (time consumption*, minutes)	Comparison of time difference, minutes
1	2	3	4	5
	1. Reception of medical equipment and medical supplies / Reception of pharmaceutical products			
1.1	Unloading of transport vehicles / Unloading of transport vehicles	60	30	+ 30

1.2	Visual control of goods / Visual control of goods	20	10	+ 10
1.3	Primary acceptance on quantity / Primary acceptance on quantity	20	20	0
1.4	Allocation of goods to reception area / Allocation of goods to the reception area	20	20	0
1.5	Acceptance on quantity / Acceptance on quantity	40	60	- 20
1.6	Acceptance on quality / Acceptance on quality	60	60	0
1.7	Documentation of goods and entry to records / Picking up pharmaceutical products on the stock record	50	20	+ 30
	Total	270	220	+50
2. Allocation of medical equipment and medical supplies to storage areas / Allocation of pharmaceutical products for to storage areas				
2.1	Preparation of depots for storage / Preparation of warehouses for medical products storage	10	20	+ 10
2.2	Allocation of medical equipment and medical supplies to storage areas / Allocation of medical products to storage areas	30	20	- 10
2.3	Handling of medical equipment and medical supplies in storage areas / Handling of medical products in storage areas	60	30	+ 30
	Total	100	70	+ 30
3. Storage of medical supplies and medical equipment / Storage of pharmaceutical products				
3.1	Microclimate control / Microclimate control	10	10	0
3.2	Stocks control / Stocks control	40	30	+ 10

Table 1. (continued)

1	2	3	4	5
3.3	Preservation and re-preservation of medical supplies and medical equipment / -	60	-	+60
3.4	Control over depot fire safety condition / -	60	-	+60
3.5	Control over depot technical condition / -	30	-	+30
	Total	200	40	+160
4. Picking of medical equipment and medical supplies per purchase orders / Order processing				
4.1	Taking medical equipment and medical supplies from storage areas / Taking pharmaceutical products from storage areas	45	45	0
4.2	Transfer to the picking station / Transportation to the picking area	45	10	+35
4.3	Picking of medical equipment and medical supplies / Picking of orders	40	40	0
4.4	Packaging of medical equipment and medical supplies / Packaging of orders	30	25	+ 5
4.5	Documents execution /-	25	15	+10
	Total	185	135	+ 50
5. Shipment of medical equipment and medical supplies / Shipment of pharmaceutical products				
5.1	Transfer of cargo units to the dispatch area / Transfer of the packed orders to the dispatch area	60	10	+ 50
5.2	Allocation in the dispatch area / Allocation in the dispatch area	20	10	+ 10
5.3	Documentation / -	30	15	+15
5.4	Loading to transport vehicles / Loading to transport vehicles	55	30	+ 25
	Total	165	65	+100
The total duration of the warehousing logistic process cycle at the Central Medical warehouse of the Armed Forces of Ukraine / Total duration of the warehousing logistic process cycle at the medical warehouse of the civil pharmaceutical company		920	530	+ 390

* – time for operation performance is averaged and calculated considering successive operations performed during the process within one cycle.

It should be noted that despite the average results of the evaluation of the warehousing logistic processes subject to research at the medical warehouse of the Armed Forces of Ukraine as to the time criteria, nonproductive time is quite significant making 47 % of the rest of processes and sub-processes performed during the intra-warehousing logistic process.

In the course of further research and analysis it was established that the most nonproductive time and expenditure of human physical labor are occurred in all warehousing logistic processes at the medical warehouse of the Armed Forces of Ukraine subject of research, namely: during operations directly related to mechanical means and storage of medical equipment and medical supplies: unloading of transport vehicles, movement of medical equipment and medical supplies to storage areas, transfer to the picking station, transfer of cargo units to the dispatch area, loading to transport vehicles, allocation of medical equipment and medical supplies to storage areas, storage of medical equipment and medical supplies.

The analysis shows that the work with the use of mechanical means and supplies storage takes a big percentage in logistic process at the medical warehouse of the Armed Forces of Ukraine. This influences efficiency, but, on the other hand, this is a point where nonproductive time may be reduced and human labor resources may be rationalized, which will have a generally positive impact on the warehousing logistic process as a whole.

It was established by comparative analysis of the summarized time tracking data for existing warehousing logistic processes at the Central Medical Warehouse of the Armed Forces of Ukraine and medical warehouse of pharmaceutical company BaDM LLC that nonproductive time for similar sub-processes and warehouse operations at the warehouse of BaDM LLC is significantly less. It stems from the fact that civil pharmaceutical warehouses use contemporary means of mechanization and storage of pharmaceutical products, in particular, handling equipment.

The differences in total time spent for similar processes, that are performed and registered in minutes at both sites compared, are shown in **Figure 1**.

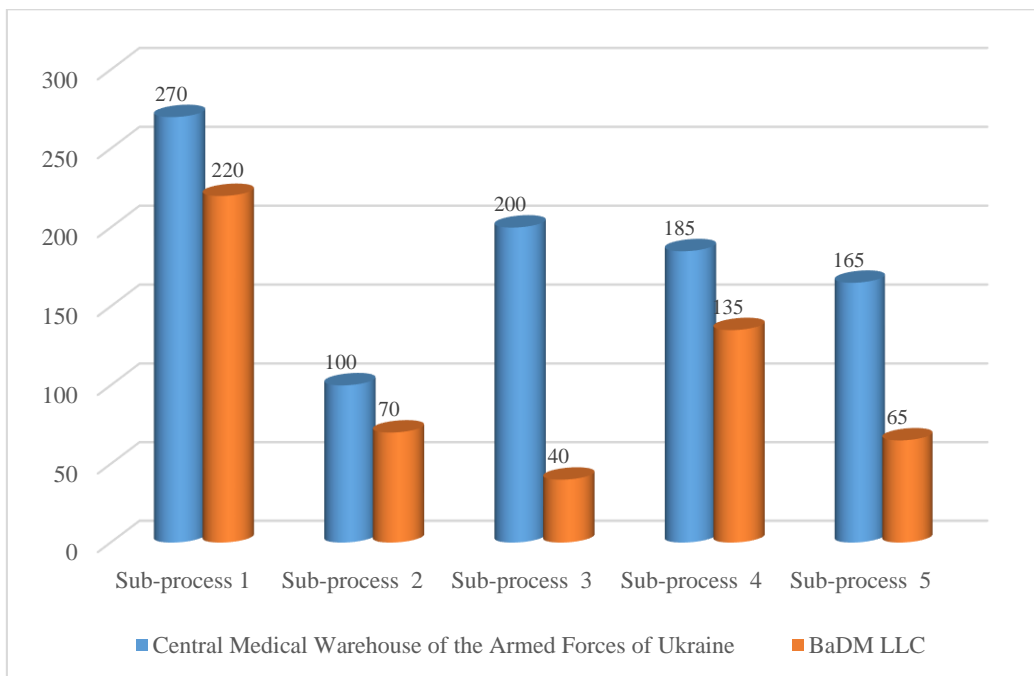


Figure 1. Comparative diagram of total time spent for similar sub-processes of both objects of research – Central Medical Warehouse of the Armed Forces of Ukraine and medical warehouse of pharmaceutical company BaDM LLC

Thus, time consumption is identified for document review & approval and waiting time, nonproductive time related to unloading, intra-warehouse transfer of medical supplies and medical equipment, and shipping with the outdated equipment, storage facilities, and handling equipment used in medical supply facilities of the Armed Forces of Ukraine. In addition, research evidence that both nonproductive time and

expenditure of human physical labor at the medical warehouse of the Armed Forces of Ukraine are observed in logistic sub-process related to storage of medical equipment and medical supplies.

In particular, attention should be paid to control over fire safety conditions of depots and control over depot technical

conditions at the medical warehouse of the Armed Forces of Ukraine that require to be automated.

Taking the above into consideration, warehousing logistic processes require improvements at medical warehouses of the Armed Forces of Ukraine using computer automation and mechanization of the above processes. At that, implementation of Warehouse Management System (WMS) will enable to automate all warehousing operations and significantly improve the management system of the medical warehouse of the Armed Forces of Ukraine. Consequently, technological warehousing logistic processes based on material and associated information flows will meet optimum parameters as to the speed and secure storage quality of medical equipment and medical supplies, as well as budget savings.

CONCLUSION

Comparative analysis of the summarized time tracking data for existing warehousing logistic processes at the medical warehouse of the Armed Forces of Ukraine identified time consumption related to document review & approval and waiting time, nonproductive time related to unloading, intra-warehouse transfer of medical supplies and medical equipment and shipping with the outdated equipment, storage facilities and handling equipment used in medical warehouses of the Armed Forces of Ukraine.

Consequently, the research findings evidence the necessity to develop scientific and practical approaches to functional improvement of medical warehouses subordinated to the Medical Forces Command of the Armed Forces of Ukraine by way of implementation of the logistical concept, application of process technologies, renewal and modernization of lifting and transporting warehouse equipment, the introduction of state-of-art information technologies, namely: Warehouse Management System.

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ETHICS STATEMENT: All measures accomplished in this scientific trial containing human supporters remained in similarity through the ethical principles of the institutional advisory group.

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