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IMPACT OF MEDICAL LOGISTICS ON THE QUALITY OF LIFE OF HEALTH CARE USERS

One of the logistics function is providing all the resources needed to carry out a process that seeks to meet the requirements of the interested parties. Inability to provide resources in the health care system as a result may have a waiting list, which can result in significantly impaired quality of life due to the fact that healthcare providers have to wait for the service for a longer period of time, which may correlate with deteriorating their health status. The optimization and development of the medical logistics system can influence the reduction of the waiting list, i.e. the allocation of all the resources needed to provide adequate health care to the users. Furthermore, medical logistics are essential when it comes to natural and other catastrophes in which it is necessary to provide a quality healthcare service to a disadvantaged society. Given this fact, the purpose of this research is to provide an overview of available works on medical logistics and to point out the inadequate number of research and papers dealing with this topic. The paper is based on a secondary research of relevant databases as well as on the subject of available scientific and professional papers.

Keywords: logistics, medical logistics, health care, quality of life, logistics and quality

1. Introduction

The quality of life of today's society is determined by a large number of factors, and some of these factors are the financial condition, i.e. the income and amount of money that an individual, but also the society as a whole have, availability of health care, family relationships, etc. (Martinez-Martin et al. 2012) Health care is one of the factors of quality of life and insufficient health care as well as long waiting lists can result in impairment of quality of life. On the other hand, the quality of health care as well as general health care

services is determined by the rate at which the requested service is provided, the length of stay of the patient in the hospital, mortality rate, patient satisfaction, etc. (MHSW, 2011)

The problems that facing the present health system are related to waiting lists which may be due to inefficiency and inefficiency of the system. Given the fact that the health system has limited resources, including diagnostic devices, the availability of competent medical staff, financial constraints and other types of restrictions, the health system is challenged to optimize existing processes and find the way how to use available

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resources in order to meet the user's requirements. Health organizations can respond to this challenge by constantly improving their processes by applying some of the methods of continuous improvement or optimization of the medical logistics system.

However, the optimization of the system of medical logistics is not only related to raising the quality of life, but also by reducing the costs that health organizations can have. Medical logistics support all healthcare processes, which means that it must provide all resources such as medical supplies, etc.

2. Literature overview

Landry and Philippe (2004) observe medical logistics as a mechanism by which the health system ensures regular maintenance, supply of medical aids and tools, waste disposal, cleaning and sterilization as well as other supporting activities related to the provision of support for the healthcare process. (Landry & Philippe, 2004) Furthermore, Pan and Pokharel (2013) look at the medical logistics through the aspect of managing the warehouse in a health organization as well as operations related to warehousing activities such as procurement and inventory management. (Pan & Pokharel, 2007) Algerian, Benzidia, Bourlakis (2018) observes the role of medical logistics in managing the supply chain in the health care system and emphasize the importance of the same in ensuring the flow of all resources as well as ensuring the flow of health care users. (Ageron, Benzidia, & Bourlakis, 2018) The importance of supply chain management as well as the importance of optimizing logistic activities in it are highlighted by Kwon, Kim, Martin (2016) that highlights the crucial importance of the supply chain in securing all the necessary resources needed to deliver quality service health care to users of the same. (Kwon, Kim, & Martin, 2016) Granlund and

Wiktorsson identify the challenges that today's healthcare system encounters in the aging of the population as well as the health problems arising from the way of life of today's society. They emphasize the need and importance of automating the activities of internal transport in health organizations. (Granlund & Wiktorsson, 2013) However, logistics is not only related to inward transport, but also related to transportation to a health organization. The location of the health organization is one of the parameters that research Ahmadi-Javid, Seyedi, Syam (2017) that emphasize that the accommodation of a health organization must be such as to ensure as simple and quick access to all users requiring urgent medical assistance as well as users of secondary, tertiary and quaternary medical assistance. (Ahmadi-Javid, Seyedi, & Syam, 2017) Available papers and research point to the importance of developing and optimizing medical logistics as well as the impact it has on the quality of health services provided to users. It is undoubtedly that the importance of medical logistics has been rising with the increase in the demands of stakeholders primarily associated with a reduction in the waiting list, as well as an increase in the quality of health care provided.

3. Definition

The significance of logistics for the functioning of society is evident from the logistic definition itself. Logistics is a set of activities that manage goods flows in the value chain to ensure fulfillment of stakeholder requirements. (Krpán, Furjan, & Maršanić, 2014) Accordingly, logistics aims to reducing inventory, optimizing the goods flow through the value chain, and reducing costs associated with executing stakeholder requirements. (Kozina & Darabuš, 2013) Medical logistics, on the other hand, provide resources such as diagnostic devices, medical devices, instruments, competent

medical staff as well as all other resources needed to deliver health care to users. (The United States Army, 2013)

When it comes to conceptual definition of logistics, it is necessary to define the supply chain that cannot perform the required tasks without the existence of an adequate logistic system. The supply chain in the health care context is made up of a number of actors that provide healthcare services to users, is a system that assures added value to the user, which implies improving its health status. (Aronsson, Abrahamsson, & Spens, 2011) Medical logistics and the supply chain in healthcare are aimed at ensuring the flow, reducing the waiting time of the user to provide healthcare services and timely provision of all the resources needed to meet the demands that healthcare user places on a healthcare organization as well as the health system as a whole.

4. Influence of Medical Logistics on the Health System

Medical logistics have to be looked at in a comprehensive way, which means identifying its potential impact on increasing the level of service quality delivered to the user. In the context of the Republic of Croatia, Ostojić, Bilas and Franc (2012) write that the health system faces over-indebtedness, too many hospital facilities whose capacity is not fully met as well as insufficiently well-used medical superstructure, which implies devices and equipment. (Ostojic, Bilas, & Franc, 2012) However, in addition to the challenges that the health system faces, it is necessary to mention the inefficiency of the system, as well as insufficient organization, the obsolescence of medical devices and appliances used, and insufficient and irrational use of existing equipment, which leads to waiting lists which damages quality life of health care users. (MZISS, 2012) In line with the identified challenges that the

health system faces and the lack of scientific and professional papers in the field of medical logistics, there is a demand for strengthening the research and the possibilities that medical logistics have in terms of increasing the efficiency, flow and ensuring the necessary resources to reduce the waiting list, on the other hand, increases the satisfaction of health service users.

The potential of medical logistics is great considering the fact and the need for optimization to increase the resource flow through the supply chain as well as the process of providing health care services. Medical logistics have a special application and importance in natural and other disasters, that is, emergency situations that require great efforts to provide the necessary resources for health care and customer service. Additionally, in emergency situations, medical logistics are also confronted with the challenges associated with securing warehouses and stored resources from possible alienation or damage to them. (VanVactor J., 2010) In this context, medical logistics must strategically consider planning given the fact that, when major disasters and catastrophic events occur, the availability of resources is significantly reduced, and the stresses along the supply chain increase, leading to a demand for an optimal, strategic would allow all sides affected by the disaster to meet their demands. (VanVactor J., 2012) The traditional supply chain in health care differs significantly from the supply chain that is created when natural disasters appears and in that context the importance of strategic planning is growing. (Syahrir & Vanany, 2015) As the demand increases with increasing environmental turbulence and often decreasing the quality of life, or increasing the number of medical conditions requiring treatment, there is an increasing need to increase the flexibility of the health care process and timely provision of related resources. Medical logistics are therefore forced to implement new systems and

principles such as the JIT system. The JIT system in the medical supply chain greatly increases the efficiency and effectiveness of the process, and the storage costs are reduced or completely canceled. However, in order for the health care organization to take over the JIT system, it is necessary to adjust it depending on the organization itself. (Gary Jarrett, 1998) A number of authors in their research emphasize the benefits that arise from the implementation of the JIT system in the health care logistics system as well as the supply chain as a whole. However, the authors also talk about the need to fundamentally change the set of supply chains as well as the overall logistical system in organizations, which means reengineering of the system. (Jarrett, 2006)

Given the importance of medical logistics, with regard to resource constraints, there is a need to introduce operational research in the medical logistics system that is a component of economic logistics when it comes to optimizing the traffic congestion route. However, operational research is not only applicable in the context of optimizing external transport, but also internal transport, which implies optimizing the route of movement. (Melo, 2012) Thus, logistics has an important and irreplaceable impact when it comes to providing all the resources needed for the normal running of the process. Efficiency of logistic processes can correlate the efficiency of all processes that logistics provides the necessary resources for normal functioning, ie meets the identified requests of interested parties. As an example of good practice of developing and strengthening the development of medical logistics as well as the creation of internal logistics centers within healthcare organizations, one should mention Germany, which in some of its health organizations has created a logistic system but also logistics centers located outside healthcare organizations. Which form of the organization's logistics system will depend on its needs as well as the size of the system

itself, ie the demands placed on it by interested parties, especially the users of the service. (Wibbeling, 2018) There is no doubt that medical logistics can have an impact on increasing the quality of medical services, ie health-related health care cures that are diagnosed with healthcare users. The application of medical logistics does not only relate to the provision of all necessary resources necessary for the process, but also to mapping, identifying all resource flows in health processes, identifying bottlenecks and defining ways to eliminate the bottlenecks in the process, and the process to improve. Likewise, through the identification of routes of medical staff, i.e. the routes to which healthcare users who are hospitalized in a hospital organization are transported to the place of performing a medical procedure, medical logistics can optimize and reduce the time needed for transport, thereby affecting the reduction in length process.

4.1 Supply Chain in the Health System

The supply chain ensures the supply of all the resources required for the normal running of the process. It may appear in extended variants and shortened variants. The fundamental difference in the variants is the number of stakeholders whose supply chain consists of. In addition, the supply chain can be divided in accordance with its sustainability on sustainable and unsustainable supply chains. Sustainable supply chains are supply chains that have a backlog system implemented, which will be more words in chapter 4.2 Given the fact that the healthcare system is actually a service delivery system, the supply chain in healthcare can be viewed from the aspect of service supply chain. The way in which such supply chains are characteristic is the importance of ensuring the flow of resources, which can affect the reduction of total costs or increase user service speed. (Aronsson, Abrahamsson, & Spens, 2011)

Furthermore, in the supply network of the health care system, due to cost reduction, it often accesses outsourcing of activities such as maintenance of information systems, accounting, manufacturing and logistics. However, by outsourcing the activities of an organization, it may lose control over what may adversely affect the service provided to the user. (Paltriccia & Tiacci, 2016)

The supply chain in the health care context consists of hospital institutions, pharmaceutical organizations, IE drug manufacturers, pharmacies, health centers, backlogs as well as other participants whose presence depends on the needs and type of healthcare processes. However, no matter what the health care process is, the supply chain and logistics have the role of providing the resources needed to process.

Furthermore, the modern supply chain faces challenges that are associated with the need for optimization of the supply network, including warehouses and related transport activities between producers, warehouses and hospital institutions. In addition, in the modern supply chain there are challenges associated with proper stock management and warehousing systems, maintenance and conclusion of contracts with trusted suppliers, definition of distribution and supply strategies as well as identification of the need for externalization of certain activities. Furthermore, there is also an inefficiency as well as the challenge of properly anticipating the required quantities of products. (Chandra & Kachhal, 2004) The mentioned inefficiency and poor supply chain optimization result in generating costs that have a total share of up to 30% of the total costs incurred by hospital organizations. Given this fact, the organization needs to approach optimizing the supply chain process through a different organization that can be determined by the needs of the health care organization. (Kazemzadeh, Sepehri, & Jahantigh, 2012)

It should be noted that the supply chain is experiencing some changes resulting from

the development of industry 4.0, which affects the digital supply chain transformation and transformation into a digital format that can reduce the overall running costs of the process.

4.2 Return Medical Logistics

Return logistics have undoubted importance when it comes to recovering used units, i.e. collection and disposal of medical waste. Once collected waste is recycled and non-recyclable material must be disposed of in a non-hazardous manner. The importance of recycling is particularly important because of the fact that demand for products and services is growing, and the amount of resources available for their production is decreasing.

In the context of health care, proper collection and storage of collecting waste is of crucial importance because such waste is in many cases dangerous to the health of people in its immediate vicinity. Particular attention should be paid to nuclear waste arising as a result of some medical procedures. Such waste must be properly stored and stored, and additional precautions should be taken when it is taken to reduce the risk of harm to any unwanted or malicious procedures of third parties. (Pereira, Silva, & Teixeira, 2012) It should also be emphasized that attention should be paid to the optimization of routes for medical waste collection in order to minimize the number of empty runs when collecting this type of waste. For route optimization, the organization can use a variety of computer-aided programs that can reduce the amount of time it takes to collect and waste waste, which directly implies a reduction in costs. (Hachicha, Mellouli, Khemakhem, & Chabchoub, 2014)

However, return logistics does not only

relate to the collection and disposal of medical waste, but also refers to the reimbursement of oversized quantities of ordering products as well as the reimbursement of wrongly ordered products. Furthermore, return logistics also refer to the withdrawal of products that are deemed not to conform to the requirements set by customers.

5. Conclusion

Medical Logistics has the task of providing the necessary resources to carry out healthcare processes in health organizations. Optimization of logistics processes, resulting in increased resource flow in the process as well as the supply chain, which can result in an increase in the quality of the service provided, or reduction of the waiting list. But medical logistics is not just about securing all the resources needed, but also managing and optimizing stocks available in the warehouses because of the fact that too much inventory can be a cost generator that can additionally burden healthcare organization.

Due to the increasing demands placed on the health system, new innovative solutions are emerging as a result of which there is additional strain on the supply chain and to meet the demands of the interested parties.

One of such innovations is the accommodation of health care users in their place of residence, which places on the logistics the requirement of timely provision of the necessary resources. (Gutierrez & Vidal, 2013) Using mathematical models can be significantly affected by the cost-related costs associated with the distribution of the necessary user care resources as well as the optimization of the amount of resources needed in the hospital's storage facilities. (Lapierre & Ruiz, 2007) Furthermore, there is the need for optimization and proper supply chain management because of the fact that a high share of costs stems from the activity, i.e. the processes taking place in the supply chain, as well as the fact that the inefficiency of the supply chain may have the consequence of less efficiency of health organizations. Industry 4.0 is changing understanding the supply chain as well as all logistic processes, and adapting the organization to such changes in the form of digital transformation and digitization of the supply chain becomes imperative.

Future researchers in this area are encouraged to focus on identifying mathematical models that will optimize logistic processes, which will enable the process improvement based on the simulations carried out.

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