

DIRECTIONS FOR THE IMPLEMENTATION OF TECHNOLOGICAL NEWS IN THE FIELD OF MEDICAL TRANSPORTS AS A FACTOR FOR REDUCING HARMFUL GAS EMISSIONS

DIRECȚII DE IMPLEMENTARE A NOUȚĂȚILOR TEHNOLOGICE ÎN DOMENIUL TRANSPORTURILOR MEDICALE CA FACTOR DE REDUCERE AL EMISIILOR DE GAZE NOCIVE

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Abstract

In the context of the knowledge society, technological innovations are required to be implemented in all areas of the economy, especially in areas consuming non-renewable resources and having negative effects on the environment. The problem is also very current for tourist areas. The article examines the possibilities for improving the modern management of medical vehicles, by optimizing the durations and transport conditions of patients and biological samples, thus reducing the volume of fuel consumed and the level of CO₂ emissions into the atmosphere and analyzes the connection between environmental pollution and large cities with a traffic congestion index. The conclusion is that an important direction of reducing harmful gases in the environment becomes the improvement of road management by implementing technical and mechanical elements in medical transport vehicles. At the same time, it must become a legal obligation for companies to obtain work permits in this field.

Key words: environmental protection, medical transports, management of medical logistics

JEL: I10, O32

1. Introduction

In the last decade, it has become clear that easily accessible natural hydrocarbon deposits are being depleted, and companies in the field now have to access deep natural deposits. As we know these resources are non-renewable, that is why we must do everything possible in the context of the sustainable development of human society so that future generations can benefit from these resources. The consumption of different types of fuels leads to CO₂ emissions, and this fact becomes a second problem of society which, combined with the depletion of hydrocarbon resources, shows us the importance with which we must deal with the current situation, a situation that affects our generation and future.

All European Union countries are affected by the increase in CO₂ levels caused in part and by emissions from the car transport sector (see Figure 1). It is necessary transition to an economy with a low-carbon emission of all society.

2. Medical logistics management

Medical logistics management differs from that of freight and passenger transport, this being a type of management that encompasses all three modes of work provider-customer: reactive, anticipatory and creative. Medical logistics management uses information, decision-making and organizational procedures, specific to the system as the management staff in this

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field must solve a wide range of problems, most often, each problem being solved by a specific method or technique.

Carrying out several studies of the opinions of scientists in the field proposed for research, the authors consider quite appropriate the following definition of logistics management: „ *The logistics management process is explained by the action of the management system on the managed system, as a result of the materialization of all planning, organization, command, coordination and control-evaluation activities exercised by the logistics manager, in order to establish and achieve specific objectives (transport, assistance , etc.)*” [1].

Figure 1: Europe an Parliament



Sursa: Agenția Europeană de Mediu
 Source: <https://www.europarl.europa.eu/news/ro/headlines/society/20190313STO31218/emisiile-de-co2-de-la-autovehicule-date-si-cifre-infografic>

It is necessary for logistics managers to be able to correctly diagnose the managed field and its components in order to have an adequate foundation in establishing the required decisions. Logistics managers hold managerial functions, are directly subordinated to other components of the logistics system, make management decisions, directly influence the actions and behavior of other people, whom they subordinate. A good manager must possess a set of qualities, knowledge, skills and abilities specific to the field of activity.

In conclusion, medical logistics management must be able to ensure an immediate response and to ensure the safety of the patient or biological samples at all times.

3. Overview of the current situation

Health services serve the interests of citizens and society as a whole, so the authorities need to understand their importance. Organizations providing medical transportation services have a common goal, which is to place the patient at the center of their concerns. The providers of this service act directly on the patients-consumers of the medical services, the beneficiary of the medical service purchased or used receiving benefits such as physical, mental and social comfort.

At the same time, they must act in order to reduce the volume of fuel consumed and CO2 emissions into the atmosphere by implementing technical and mechanical elements in medical transport vehicles.

The level of pollution from harmful gases and suspended dust from car traffic is higher than normal, studies by specialists from the Max Planck Institute in Mainz and the German

Center for Cardiovascular Research show that pollution kills about 790,000 people annually in Europe [2].

In the EU, this type of pollution causes around 400,000 premature deaths, and its external health-related costs amount to hundreds of billions of euros. People in urban areas are particularly at risk. Suspended particles, nitrogen dioxide and ground-level ozone are the air pollutants considered to be responsible for most of these premature deaths [3].

The most polluted cities in Europe are in Macedonia, Russia and Albania. At the opposite pole are cities belonging to the Nordic countries Finland, Iceland and Sweden. In the ranking of the most polluted cities in Europe, Bucharest ranks 9th, Sofia 15th, Kiev 22nd and Budapest 45th [4].

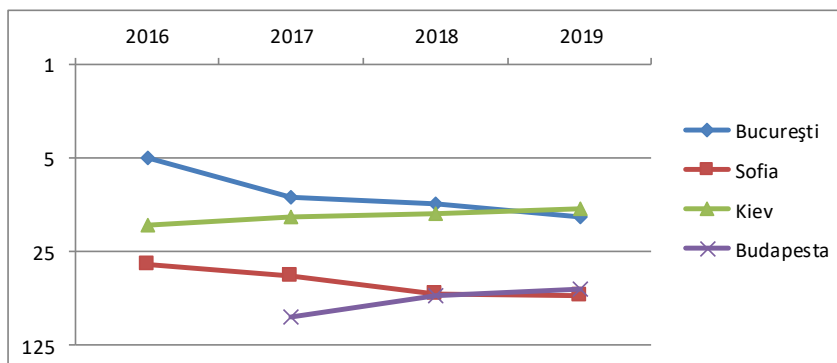
In the field of medical transport, car traffic inside cities is an important factor that must be taken into account. The level of car traffic is closely correlated with the Traffic Congestion Index, a measurable index. Large cities, such as: Bucharest, Cluj, Timisoara, have registered in recent years an increase in travel time in traffic. The same thing happens in all the big Eastern European cities.

According to the statistical analyzes performed by the company "TomTom" in the world ranking of 2017, the city of Bucharest was on the 10th place with Congestion Index 49%, the city of Kiev was on the 14th place with Congestion Index 44%, the city of Sofia was on the place 39 with the Congestion Index 35% and the city of Budapest was on the 79th place, with the Congestion Index 31%.

In 2018 the world order is maintained in the ranking, so Bucharest was on the 11th place with Congestion Index 49%, Kiev was on the 13th place with Congestion Index 46%, Sofia was on the 52nd place with Congestion Index 35 %, and Budapest ranked 54th with 35% Congestion Index.

In 2019, Kiev was on the 12th place with Congestion Index 53%, Bucharest was on the 14th place with Congestion Index 52%, Budapest was on the 48th place with Congestion Index 37% and Sofia on the 54th with Congestion Index 36% [5] (See Figure 2). For cities in the Republic of Moldova there are no statistical data on this index.

Figure 2. Ranking of Eastern European capitals according to the traffic congestion index, 2016 -2019



Source: TomTom Traffic INDEX, https://www.tomtom.com/en_gb/traffic-index/

The influence of car traffic on pollution levels can easily be seen, so economic authorities and entities need to take urgent action to reduce the amount of polluting emissions from cars.

According to „Ziarul Financiar” (ZF) at the end of 2018 [6], in Romania, the number of private medical laboratories reached over 2,000 units, increasing compared to 2017. Based on the data of the „National Institute of Statistics”, the analysis made by ZF shows that the city of Bucharest owns a quarter of this number. In 2019, 2,074 state laboratories were active. So, if the private medical system maintains the growth rate of the previous year of private laboratories, then the number of private laboratories will far exceed the number of the public medical system.

The conclusion is that the number of vehicles used in the field of medical transport is constantly growing, and the use and implementation of technical, mechanical and informational innovations in the field of medical transport logistics will benefit companies with activity in the medical field and environment.

In the current conditions of evolution in the technological and informatics fields, it is imperative to use the novelties of any field for the benefit of people, the effect of use being cumulative and beneficial for hospitals, for laboratories for medical analysis, for patients and, importantly, for authorities and environment.

Two of the new technologies I want to refer to are:

- 1) **“GPS Traking System”**, a technology that combines technology and informatics, and with the help of which the traffic position of vehicles is monitored.
- 2) **Engines with dual function:** petrol and LPG.

4. Arguing the advantages of implementing new technologies in the field of medical transport logistics

The "GPS Traking System" technology, a relatively new technology, is designed to monitor the position of vehicles on the route. This type of technology is helpful for drivers of medical vehicles, patients, hospitals and biological testing laboratories, because they always may know the position of the medical vehicle, and when it reaches its destination, doctors and nurses can urgently pick up the patient and in case transport of biological samples, they are also taken without delay, because the staff is notified 2-3 minutes before the arrival of the vehicle.

The operation of the “GPS Traking System” is based on the information received from the satellites through a device attached to the vehicle, the data update being done every 15 -20 seconds. The “GPS Traking System” technology helps to reduce the transport time due to the fact that the manager of the logistics department uses the data received before the decision to choose the vehicle he sends to the intervention and after this decision by changing the route in exceptional cases.

The decision to choose the vehicle belongs to the logistics coordinator who must take into account several factors such as: the distance between the vehicle and the place of destination; current traffic conditions; equipping the vehicle with medical equipment depending on the type of request.

The GPS monitoring system also has the options of video monitoring of the interior of the vehicle, remote stopping of the engine and blocking the opening of the doors voluntarily by the transported patients, in the case of type A1 and A2 ambulances [7; 8].

Figure 3. Example of GPS monitoring



Source: GPS Tracking System'' Technology

The benefit of using this technology is twofold: on the one hand, companies reduce fuel costs, by avoiding wasted time in traffic and thus the engine running time, on the other hand reduce CO₂ and dust emissions into the atmosphere from when the engine is running.

As we have shown before, in Romania the number of medical laboratories is constantly growing. Cars equipped with petrol-only engines are generally used to transport biological samples. In recent years, the technology of internal combustion engines has managed to progress in the sense that small cylindrical engines are now being manufactured that have a dual mode of operation: petrol and LPG.

For economic entities, the advantages of purchasing these types of vehicles are multiple and different. Comparing the value of fuel consumed per 100 km in each of the two types of fuel, a saving of 35% is observed when using LPG from the price difference compared to the price of gasoline, the level of CO₂ emissions measured in **g/km** when operating with LPG is 8-10% lower than when running on gasoline [9; 10] (see Table 1 and Table 2). We notice that we have financial benefits but also benefits for the environment.

Table 1. Petrol engine vehicles

Vehicul motorizare pe benzină	Distanța (Km)	Consum în mișcare normal	Consum funcționare staționară	Consum total normal	Consum mediu la 100 km	Valoare Euro /100km
B-78-JSG	2537,16	177,60	3,85	181,45	7%	6.56
B-83-NVY	3804,99	342,45	21,94	364,39	9,6%	9

In the tables you can see the differences between the values of consumption per 100 km traveled on vehicles with both types of engines, it is clear that those equipped with dual-engine engines are more cost-effective for the companies.

Table 2. Dual engine vehicles (petrol and LPG)

Vehicul	Distanța GPS (Km)	Consum în mișcare normal	Consum funcționare staționară	Consum total normal	Consum mediu la 100 km	Valoare Euro /100km
B-72-BDX	1510,61	105,74	6,20	111,94	7,4	4.62
B-73-HKF	2439,43	170,76	-	170,76	6,9	4.8
B-75-LRU	4774,80	405,86	2,12	407,98	8,5	5.3
B-76-JUZ	9204,40	644,31	1,97	646,28	7,1	4.9

Source: EvoGPS Monitoring program for Medcenter SRL

5. Conclusions

A first conclusion is that in the current conditions of sustainable development of human society, medical logistics must follow a medium and long term strategy. This strategy is part of the logistics manager's vision, depending on how the company adapts to the technological evolution of the company. The omission of the adoption of technical and IT innovations and their implementation in the field of medical transport may result in the disappearance of the company from the market.

A second conclusion is that it must become a legal obligation of companies to obtain activity permits in this field monitoring by "GPS Tracking System" of vehicles. This has become a necessity because the patient-provider relationship is particularly delicate.

A third conclusion is that public authorities must grant tax incentives such as exemptions or reductions of certain taxes due to the state of companies that use in medical transport vehicles equipped with dual-engine engines in order for them to be interested in purchasing this type of vehicle.

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