

SELECTED RESCUE PROBLEMS INCLUDING MEANS OF TRANSPORT DURING PANDEMIC OF THE COVID-19

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Abstract – The work concerns selected rescue problems, including the handling of the 112 emergency number during the Covid-19 pandemic in Poland. The 112 number is valid throughout the EU, it is used only to notify in emergency situations of threat to health, life, or property. As social practice shows, disruptions in its functioning, including unjustified reports, significantly increase the costs of its operation, and in extreme cases may lead to failure to provide assistance to those in need. The ongoing pandemic has left a significant mark on many aspects of life, including the operation of rescue systems responsible for the safety of citizens in the country. The co-author of the work during the service of the 112 emergency number noticed some problems and disadvantages related to the rescue operation in crisis management. This was the reason for presenting this issue in the form of a publication.

Selective problems of rescue in crisis management related to the ongoing pandemic were indicated. There are problems with the lack of strength and resources of the State Medical Rescue, the emergency notification process itself also requires improvement, as evidenced by the responses of the respondents - 112 operators.

Not all identified defects are presented in the publication. The list of problems indicated by the respondents is longer, not always related to the pandemic. Only appropriate changes in the management of the rescue system are able to improve the quality and efficiency of the system. The utilitarian solutions presented in this publication can serve this purpose.

Key words – emergency number, rescue problems, means of transport, pandemic

JEL Classification – I18, Z30

INTRODUCTION

112 is a single emergency number valid throughout the EU, it is used only to notify in emergency situations of threats to health, life or property, these are the following events: fires, road accidents, theft, burglaries, cases of violence, sudden fainting and loss of consciousness, serious injury and heavy bleeding, cases of electric shock, identification of a person wanted by the Police, other emergency threatening health, life or safety and public order [1-2].

The reason for taking up this issue is the personal experience of the co-author of the work on the operator service of the 112 emergency

number. The last two years have shown various problems of the rescue service in the area of crisis management, which is undoubtedly the Covid-19 pandemic and local dangers, verify the actual operational capabilities of organized forms of rescue [3]. The challenges caused by the advent of the black swan - a global epidemic have left a huge mark on the organization and functioning of the State Medical Rescue units and other groups related to the implementation of tasks aimed at stopping the spread of SARS CoV-2 virus. One of the most important elements in the process of initiating the response to crisis situations is the Emergency Notification System. This system initiates appropriate rescue actions and engages entities

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operating in it adequately to a given event [4]. Hence, it is the operators of the 112 emergency number responsible for the emergency notification process that are on the front line.

The work concerns a concept that is characterized by sustainable use of resources, high-quality social capital, high quality of life and intelligent public management. An example of the skillful management of public services is the implemented ICT System of Emergency Notification (Fig. 1). There are 17 PSAPs in Poland: 10 CPR with standard functionality, 6 CPR with increased functionality and nationwide in Radom.

Performing the tasks of the centers is supported by the ICT system. The administrator of the ICT system is the minister responsible for public administration (minister of administration and digitization). The system cooperates with the Police, the State Fire Service and dispatchers of emergency medical teams, in order to undertake rescue actions in connection with the received emergency notification, using the teleinformatic system and radio system for the needs of emergency numbers service. In 2011, the ordinance of the Ministry of Interior and Administration on the central point of the emergency notification center system and service central

points was adopted, which specified the organization and operation of the central point of the emergency notification center system and the central points of services established by law to provide assistance, using the emergency number "112" and emergency numbers alarms established for the Police, State Fire Service and the dispatcher of emergency medical teams. Pursuant to the ordinance of the Ministry of Interior and Administration, the Central Point of the Emergency Notification Center System was established, which provides support for the transmission of information and data inquiries sent from emergency notification centers and service units of the Location and Information Platform with the Central Database.

Central Point provides, among others handling the transfer to the Location and Information Platform with the Central Database of inquiries for information and data from the emergency notification IT system, supporting the handling of emergency reports and IT systems of service units.

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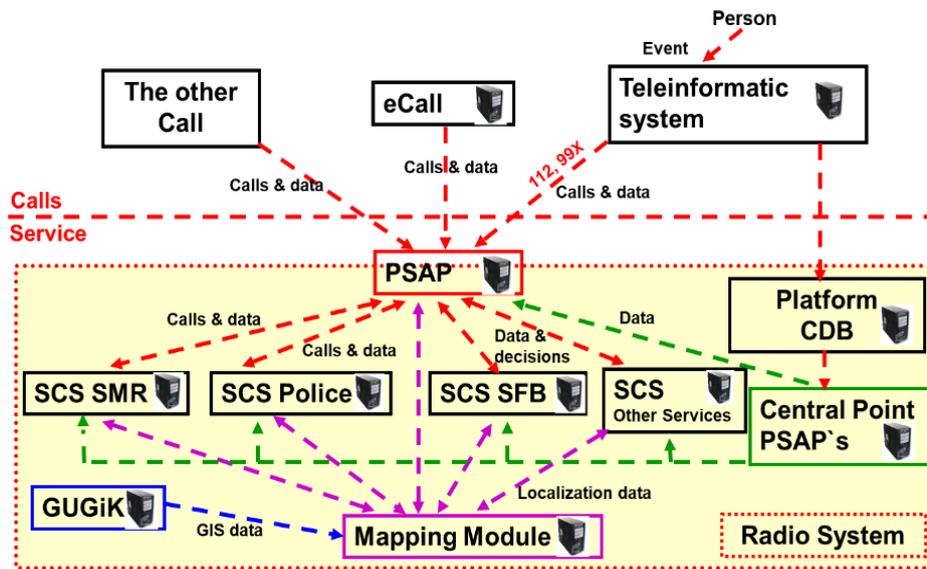


Fig. 1. ICT System of Emergency Notification in Poland [5]

Legend:

Platform CBD - Location and Information Platform with Central Database,

SCS - Support Command System,

SMR - State Medical Rescue (in Polish PRM),

SFB - State Fire Brigade

GUGIK - the Main Office of Geodesy and Cartography.

1. RESEARCH PROBLEM AND METHODS

The aim of the article is to identify rescue problems in crisis management resulting from factors related to the ongoing Covid-19 pandemic in Poland. The utilitarian solutions are to improve the functioning of the rescue service and, more broadly, the crisis management system itself.

In order to solve the research problem of the paper: How is functioning rescue including the handling of the 112 emergency number during the Covid-19 pandemic, qualitative and quantitative research methods were used:

- system analysis, enabling the presentation of the functions and elements of systemic rescue,
- an analogy that allowed to establish common features when investigating events during the functioning of the rescue service in Poland,
- statistical method, allowed for the acquisition, presentation and analysis of data describing incidents of rescue system,
- the analytical method, allowed for the consideration of the organization of services,
- a comparative method, on the basis of which basic mechanisms of safety implementation in the field of systemic rescue,
- empirical methods: diagnostic survey was carried out to collect the data based on an anonymous questionnaire prepared for the purposes of the study.

A diagnostic survey was based on an expert sample. It was carried out using a questionnaire on a group of 46 operators of the 112 emergency number working in Emergency Notification Centres in Lublin, Łódź, Radom and Warsaw [n = 46]. In addition, after used, inter alia, cause and scenario analysis. The respondents came from important Polish cities that aspire to be called a smart city. The implementation of the smart city model contributes to greater innovation and improvement in the provision of public services. New technologies can identify critical points and notify about possible threats, assisting in the rescue or evacuation process, they can accelerate the time of arrival to emergencies by 20–35%. They make it possible to reduce the number of false alarms. The Covid-19 pandemic itself changed the subjective perception of security, and reevaluated the lives of many people. It led to the emphasis on the importance of the rescue system and innovative solutions aimed at saving human life and health.

2. MEANS OF TRANSPORT

The rescue system, in particular in the time of the Covid-19 pandemic, is based on organization, management, decision-making, and the use of resources to implement organizational measures to save human life and health. The main elements of the system are three services: Ambulance Service, Police and Fire Department.

An integral part of the rescue system is the State Medical Rescue (PRM). The aim of the PRM system is to provide assistance to every person in need who is in a state of sudden health emergency. The administrator of the PRM system unit must ensure that the system is ready for operation. The units of the PRM system providing services only in the event of a state of emergency are: medical rescue teams, including air medical rescue teams and hospital emergency departments [6]. Therefore, it is a universal system that provides health and life protection to everyone who needs such help. To perform these tasks, departing teams are used, which are divided into:

- basic team "P" - it consists of at least two people who can perform medical rescue operations, this team must include a paramedic or a system nurse,
- specialist team "S" - its ranks include at least three people qualified to perform medical rescue activities, including a system doctor. The common opinion is that transport ambulances are used to fulfill the statutory obligations of the State Medical Rescue. In fact, trips to life and health emergency are carried out by basic, specialist and, if necessary, neonatological teams, ie "ambulances" directly for the youngest. Transport teams deal with inter-hospital and private sector cooperation, and are not managed by PRM dispatchers.

In addition, within the Polish standard PN-EN 1789: 2008 "Motor vehicles and their equipment - road ambulances", three main types of vehicles can be distinguished. It is the official specification that specifies requirements for the construction, equipment and other detailed components of the vehicle, called an ambulance. These are the following types:

- type A: ambulance for transporting patients - this is a type of ambulance, the design of which is to be sufficient only for the transport of patients whose life is not endangered. Additionally, there are also A1 type ambulances, which are designed for one patient, and A2, which can transport more patients;

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- type B: emergency ambulance - type that has been constructed and equipped for the transport, basic treatment and monitoring of patients;
- type C: this is the most advanced type of ambulance. The Type C Ambulance is a mobile intensive care unit. It has been designed and equipped for transport, advanced treatment and patient monitoring [7].

In 2020, 1,581 departing teams provided medical assistance under the State Medical Rescue system, 4 less than in the previous year. They made about 2.76 million trips to the scene. On average, there were 72 EMU departures per 1,000 population. The gender and age structure of people who received services at the scene of the accident did not change significantly. Still, help was most often provided to men (50.1%), and people aged 18–64 accounted for approximately 46.9% of the total number of people treated by emergency medical teams. In 2020, helicopter crews carried out a total of 10,933 missions (7.5% less than the year before), including 9,636 accident and emergency flights and 1,297 interhospital transports. The crews of the Airplane Transport Team completed 366 missions [8].

The medical rescue team is equipped with a means of sanitary transport that meets the technical and quality features specified in Polish standards transposing European harmonized standards. Each of the types of the above-mentioned teams includes a driver, in the event that none of the members of the emergency medical teams meets the conditions referred to in Art. 106 sec. 1 of the Act on vehicle drivers [9].

In Poland, ambulances are classified into 3 groups that fulfill different roles. These are A1 (eg Ford Transit Connect) and A2 vehicles (e.g. VW T6 Furgon) used for transporting patients who are not expected to be in sudden life threat. They differ both in size and, of course, in equipment, to put it simply. Next are Type B ambulances (eg T6 high roof), high roof which is used by the primary emergency medical team. They are equipped with equipment for basic treatment and monitoring of patients. The last type of ambulance, marked with the letter "C" (eg Mercedes-Benz Sprinter, Fiat Ducato), is used as intensive care, advanced treatment and patient monitoring units - they are involved in the most serious life-threatening cases.

According to the announcement of the Provincial Ambulance Service in Poznań regarding the contract for new ambulances, the offer must meet the rules set out in the PN EN 1789 + A2: 2015 standard. The ambulance service vehicle intended for life and health-saving trips must have a partially glazed van

with a permissible total weight of up to 3.5 tons, anti-corrosive, with thermal and acoustic insulation covering walls and ceilings, preventing condensation of water vapor. Other required parameters include the possibility of transporting 4 people + 1 person on a stretcher, an ambulance adapted to a minimum of three-person medical rescue team and one patient on a stretcher. In addition, an automatic gearbox, a Euro VI or 6 engine and no speed limiter on the vehicle are required. The purchase of this type of ambulance is closely related to the project in the field of activities related to the prevention, prevention and combating of COVID-19 and other infectious diseases under the Infrastructure and Environment Operational Program for 2014-2020. The priority axis of the program is to strengthen the strategic infrastructure of health protection entitled "Purchase of ambulances with specialist medical equipment and personal protective equipment in connection with the implementation of activities related to the prevention, counteracting and combating" COVID-19 "and other infectious diseases" [9].

Regarding the calls for threats to life and health carried out by the Polish Medical Air Rescue, their forces and resources include, among others, 17 EC135 P2 + helicopters, 10 EC135 P3 helicopters, three Tecnam P2008JC Mk II planes, two Learjet 75 Libert planes, two Robinson helicopters R44 Raven II and Piaggio P.180 Avanti and Piaggio P.180 Avanti II aircraft. Despite the passage of years, the EC 135 P2 + helicopter has been the most frequently used unit for over two decades, it has been modernized over the years, and the technical parameters have also changed. Currently, its maximum flight speed while maintaining the permissible total weight of 2,950 kg is 254 km/h. Moreover, the maximum range (with a total weight of 2,950 kg, without fuel reserve, model atmosphere for sea level altitude) is as much as 608 km. The next version of the helicopter has even greater possibilities - the P3, which, with a higher permissible total weight of 2,980 kg, is able to cover as much as 630 km in the airspace in extremely exemplary conditions [10]. We could see how important the range of the Polish Medical Air Rescue helicopters is during the peak waves of COVID-19 cases, when the number of calls made by the forces and funds of the LPR even increased several times.

On the other hand, the largest fleet of transport units is in the hands of the Polish Police, these are not only motor vehicles, but also motor boats and other means of wheeled transport. Currently, the Polish Police uses 21584 pieces of transport equipment, including [11]:

- passenger cars - 14,082 items,
- off-road passenger cars - 714 items,
- vans - 4 258 items,
- trucks - 66 items,
- buses - 96 pcs,
- specialized cars - 451 items,
- motor boats - 323 units,
- motorcycles - 1,008 items,
- trailers - 483 items,
- other transport equipment - 103 pcs.

In turn, the main brands and models in the field of passenger cars are:

- Kia (Cee'd, Venga) - 5 732 items,
- Opel (Astra, Vectra, Corsa, Insignia, Mokka) - 2 785 items,
- Fiat (Stilo, Bravo, Palio) - 1,044 pcs.,
- Skoda (Octavia, Fabia, Superb, Rapid) - 968 pcs,
- Hyundai (i30, i20, Elantra) - 589 pcs.

From the available official data of the Polish Police, it appears that the most frequently used vehicles are, among others, Kia Ceed SW and Fiat Ducato, when it comes to vans adapted to the transport of detained persons. Work is currently underway in the EU procedure format, including an open tender for the supply of 100 vehicles for the Polish Police with video recorders in the RD-VIDEO version of the police. The terms of the contract presented in the appendix have changed, now the Police require that the cars accelerate from 0 to 100 km/h in no more than 6 seconds, which is a change compared to the previous years and at the same time a difficulty for potential producers of police cars. Moreover, the technical conditions for

the drive system state that the maximum speed must not be less than 250 km/h [12].

One should also remember about the resources of the State Fire Service, which has fire trucks, i.e. vehicles used for fire fighting and / or rescue according to PN-EN 1846-1 standard. On the basis of the PN-EN 1846-1: 200 standard, three classes of motor vehicles can be distinguished, taking into account the maximum real weight:

- light class (L): $2\text{ t} < \text{MMR} \leq 7.5\text{ t}$,
- middle class (M): $7.5\text{ t} < \text{MMR} \leq 14\text{ t}$,
- heavy class (S): $\text{MMR} > 14\text{ t}$.

Types of motor vehicles used by the State Fire Service:

- Fire truck: is a truck used for firefighting and / or rescue.
- Fire-fighting vehicle: it is a vehicle adapted to transport people and technical means intended for independent fire-fighting operation.
- Special car: it is a car adapted to transport people and equipment needed to perform special tasks during rescue operations.
- Rescue and fire-fighting vehicle: it is a combination of a fire-fighting vehicle and a special vehicle.
- Removable container: it is a special-purpose container that can be placed on and removed from a suitable vehicle.
- Trailer: is a road vehicle without its own power source, with a specific purpose, used for the transport of people and goods, adapted to be towed by another vehicle.
- A floating motor vehicle: a vehicle that is capable of traveling on land and on water.



Fig. 2. Helicopter EC 135 SP-HXB [10]

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Depending on the vehicle application, a distinction can be made between rescue and firefighting vehicles, vehicles with a mechanical ladder and / or a hydraulic lift, technical rescue vehicles, chemical rescue equipment vehicles, emergency medical, command, passenger transport and supply vehicles. Nevertheless, the basic firefighting equipment of a rescue and firefighting vehicle is [13]:

- fire engine pump with a venting device,
- rapid attack line,
- water tank,
- foam concentrate tank,
- foam-generating agent dispenser,
- water-foam cannon (optional),
- sprinkler system (optional).

In addition, it is possible to divide rescue and firefighting vehicles depending on the ability to move on certain types of surfaces. The first category includes motor vehicles capable of traveling on hard surface roads, they are defined as city vehicles. Off-road vehicles, on the other hand, are motor vehicles capable of traveling on all hard-surface roads and to a certain limited extent outside these roads. On the other hand, all-terrain vehicles are those that travel on any type of road.

In conclusion, although the vast majority of the Ambulance Service performs tasks related to the Covid-19 pandemic, the forces and resources of the Police and the State Fire Service are also used for this purpose. This is related to the overburdening of the State Medical Rescue with the number of calls to health and life-threatening conditions. Hence, PSP vehicles with equipment and personnel were relatively often used to provide medical assistance when there was no available ambulance that could efficiently fulfill the call.

Nowadays, rescue is coherent with transport issues, to a greater extent through the e-Call system. It is a system used in vehicles across the EU which automatically dials the free 112 emergency number in the event of a serious accident. The eCall system can also be triggered manually by pressing the appropriate button [14].

E-Call notifications are received by operators of emergency numbers through a telephone call established by IVS. The e-Call module can be activated automatically by sensors in the vehicle or manually by the driver and passengers in the event of a road accident or other emergency event. After receiving an e-Call, the operator of emergency numbers tries to establish a conversation with people in the vehicle [15]. E-Call is a pan-European system of rapid notification of accidents. It is related to the "eSafety" initiative, which is part of the complementary

strategy of the European Commission aimed at maintaining road safety and improving the efficiency of transport in Europe. As a result, the functionality and scope of information collected within the emergency notification system have changed. Therefore, the relevant European Standard came into use, which specifies the "Minimum Data Range" (DGP) that will be transferred between the vehicle and CPR in the event of a road accident or emergency using the "e-Call" system. This standard does not define communication media protocols and e-Call delivery methods [16].

The Minimum Data Set is transferred to the emergency number operator only when the connection is established by activating the e-Call module. Such a connection can be made manually by a human or is sent automatically as a result of a collision of the vehicle with another or an obstacle, e.g. a tree, a ditch. Sending or downloading data is possible only during the duration of a given connection. The data that is sent in MSD include the unique number from which the e-Call was generated, type of call (manual or automatic), geographical coordinates of the vehicle, direction of movement in which the vehicle was moving, time of the event, vehicle technical data, number of fastened passengers seat belts and the VIN number of the vehicle. VIN - Vehicle Identification Number, is the name of the chassis that consists of a complex set of characters assigned to the vehicle by the manufacturer for the purpose of identification.

The report on the functioning of the SPR shows that all e-Call notifications, even if complete information about the event has not been obtained, are qualified as valid. Of course, with the exception of those where information is clearly provided that the aid is unnecessary. It follows that any lack of information results in rescue actions being taken anyway, which is a problem for this system.

This, in turn, triggers a chain of rescue operations. Vehicles participating in the rescue operation must arrive at the scene of the accident as soon as possible, while maintaining their own safety standards. Three-color traffic lights, at intersections included in the central city traffic control system, make it possible to use it for the passage of an emergency vehicle by rescue vehicles [17-18]. One of the solutions using traffic light control at intersections is a project by Siemens AG Infrastructure & Cities Sector Mobility and Logistics Division Road and City Mobility, which relies on traffic control in a road system with traffic-controlled intersections to create a free passage for the car rescue [19]. Only such a solution would ensure optimal functioning of rescue

services and would shorten the time of reaching the place of a specific road incident, thus influencing to some extent the available forces and resources for further, future actions. The implementation of this solution would be the epitome of the smart city concept.

The report on the functioning of the Emergency Notification System shows that all e-Call notifications, even if complete information about the event has not been obtained, are qualified as valid. Of course, with the exception of those where information is clearly and clearly provided that the aid is unnecessary. It follows that any lack of information results in rescue actions being taken anyway, which is a problem for this system.

3. DATA STATISTICS

The concept of rescue is both unambiguous and broad in reasoning. According to communis opinio, the word to save means: help someone in danger, in a difficult situation, in a life-threatening situation; protect from loss, misfortune, death, disease, trouble.

It may mean: rushing to help in emergencies that threaten the health and life of people, in all states of functioning of the state, various forms of activity aimed at saving people in danger [24] and things [25], or the total of means and methods saving

human life. A. Skrabacz placed rescue as an element of ensuring public safety. He claims that rescue is included in the field of general safety and is one of the elements of national security.

Rescue in a purely intuitive sense means helping a person in danger that threatens his life or health. Rescue in the subjective sense is all specialized services whose main task is to help people in life and health threatening situations. Summarizing the considerations made so far, it should be stated that rescue includes all methods and means of saving human life and property [26]. Rescue is important element of crises management. In the United States, it relates more to the management itself than the direction of security. Traditional crisis management models work on the principle of identifying and solving problems arising from improper operations that have been previously undertaken [27].

A crisis situation means an event or development of events that directly threaten the interests of the United States, its territory, its citizens and its military forces, and the development of these events occurs so quickly that it forces the authorities to quickly make decisions about the possible use of US military forces. If the situation is classified as a crisis situation, it means that the highest state authorities automatically activate the military anti-crisis planning system.

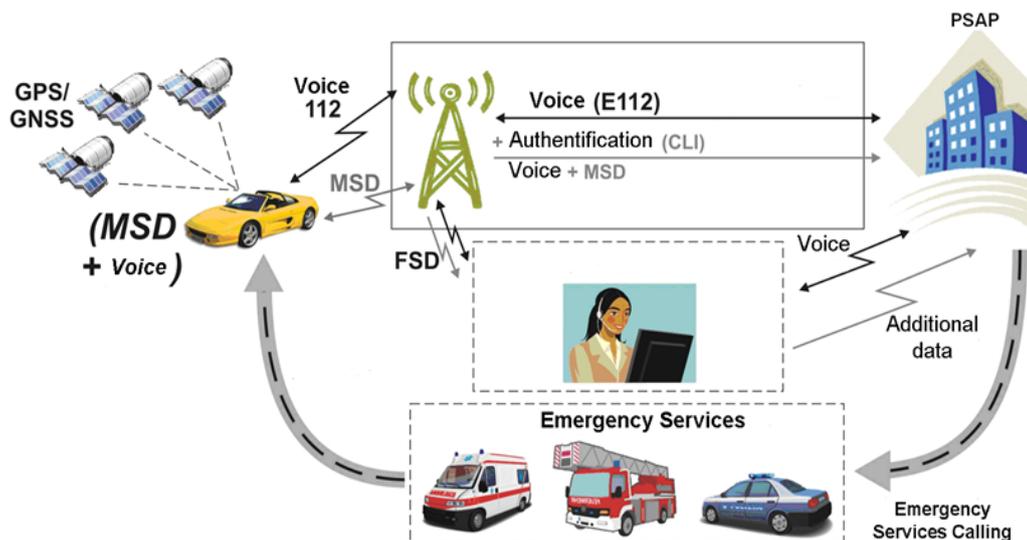


Fig. 3. Scheme of the e-call system operation [20]

Legend:

PSAP – Public Safety Answering Point (Emergency Notification Center - CPR),

MSD - Minimum Set of Data,

FSD - Full Set of Data.

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In Poland, crisis management is defined as the activity of public administration bodies that is an element of national security management, which consists in preventing crisis situations, preparing to take control over them through planned actions, reacting in the event of crisis situations, removing their effects and restoring resources and critical infrastructure. There are four phases in crisis management: prevention, preparation, reaction and recovery. Alerting and activating the rescue systems takes place during the reaction phase. Information is crucial for rescue in crisis management. Information support for crisis management is a process, a set of information activities, which leads to the support of information management, decision-making on its basis and the formulation of cognitive processes [28]. The purpose of the information support is to use the information itself for the information needs of crisis management [29]. The information needs of the rescue services mainly concern: the location and condition of the injured, as well as the location, quantity and readiness of the potential. They are the sine qua non of the smooth functioning of the entire system. In order to realize how diverse the information needs can be on the example of the rescue subsystem - the Emergency Notification System, one should notice different categories of reports arriving at the emergency number. Specifying the issue in the scope of Covid-19 related events, it may be, for example, a suspected coronavirus disease, the fact of leaving the place of isolation or quarantine, or failure to comply with the order to cover the mouth and nose in public places.

In Poland, operators of the 112 emergency number also receive incoming calls to emergency numbers 997 (former Police Emergency Service) and 998 (where in the past, calls were sent to the Command Station of State Fire Service). It is their responsibility to collect all information necessary for the efficient management of a given crisis situation. The ongoing pandemic highlighted the problems of rescue, which, however, can be solved to a great extent [30].

In 2019, Emergency Notification Center (CPR) in the country received a total of 22 274 931 emergency reports, of which 8 605 313 (39% of all) were false, malicious or unjustified reports [31]. Last year, the percentage of unfounded reports decreased by more than 3%. However, it is still a huge number of reports, which is why the Ministry of Interior and Administration and the services are calling for not blocking the 112 emergency number, which is to save life and health. In 2019, in 6 673 215 cases (31% of all), the callers cancelled the call before the call was received by the emergency number operator,

i.e. within the first few seconds. The emergency and auxiliary services received information from the CPR about 6 198 400 (31% of the events, of which 3 550 269 emergency events were reported to the Police, 262 816 to the State Fire Service, 2 425 201 to State Medical Rescue, and 481 112 to other services). Nationally, it is an average of over 1.8 million calls per month and 60 000 calls each day. CPR provided the Police, Fire Service, medical dispatching rooms and auxiliary entities with information on over 6 million incidents. The data show that most calls were registered in the summer months - in June, July and August. The largest number of emergency calls was registered in centres in Katowice (over 2.6 million reports) and in Poznań (over 2.1 million reports). The average waiting time for answering a call in CPR was 11 seconds.

On March 13 in 2020, the government of the Republic of Poland announced an epidemic threat throughout the country in connection with the spread of the SARS-CoV-2 coronavirus and the increase in the incidence of the Covid-19 disease caused by it. Therefore, it became impossible to conduct training for emergency number operators in the training center in Radom. The Act of April 16, 2020 on special support instruments in connection with the spread of the SARS-CoV-2 virus (Journal of Laws of 2020, items 568 and 695) introduced changes to the Act on the Emergency Notification System. The validity of the already issued certificates was extended, and the task of training and examining emergency number operators until the epidemic was resolved was entrusted to emergency notification centers using their own human resources and equipment. In this difficult and unusual situation, all CPR organize trainings and examinations for candidates for emergency number operators. Thanks to their involvement, 122 people have already been trained and a total of 117 people have taken the exam. 112 people successfully passed the exam and obtained the emergency number operator certificate.

In 2020, a total of 21 391 864 incoming calls were recorded in the CPR [32]. Of which, as many as 8 182 982 (38.25%) were unjustified calls, and the number of canceled calls was almost 28%. The number of legitimate connections amounted to 7 285 782 (34.06%). Out of the total number of reports, 3 485 922 were transferred to the Police, 2 701 413 to the State Medical Rescue, 262 464 to the State Fire Service, and 591 594 to other services. The average waiting time for accepting a report from the operator of the 112 emergency number is about 9.8 seconds, so as you can see, the reaction of the relevant services may be almost immediate.

Table 1. Structure of the study group

Variable	Characteristic	Percentage
Sex	Female	65.2 %
	Man	34.8 %
Education	Medium	15.2 %
	High	73.9 %
	Postgraduate	10.9%
Centre	Lublin	28.3 %
	Łódź	13 %
	Radom	32.6 %
	Warszawa	26.1 %
Work experience in CPR	below 1 year	6.5 %
	Between 1 and 4 year	26.1 %
	Above 4 year	67.4 %

The system remains unchanged during a pandemic. As a standard, it deals with the receipt of reports on threats to human life and health. The state of the pandemic is just such a case, only on a larger scale. The rigors of the pandemic do not affect the way CPR works. On the other hand, the pandemic condition increased the number of received notifications. CPR employees ask if the patient has any symptoms and if he/she is in quarantine. If the reporting person informs about symptoms, reports suspected coronavirus infection or is in quarantine, CPR informs the services directed to the place of intervention, i.e. ambulance, police, fire brigade. The point is that officers should be able to protect themselves during the intervention.

4. OWN EMPIRICAL RESEARCHES RESULTS

The study, based on an expert sample, was conducted in 2021. As part of the record, the respondents were asked to answer the question about their age, education, center in which they are employed and length of service.

The vast majority of employees of Emergency Notification Centers are people with higher education. The questionnaire is a valuable element of work also due to the length of service of the respondents, most of them have been working on the emergency line for over 4 years.

In addition to empirical research, the work was edited on the basis of own experience acquired while working in the rescue system and the current scientific achievements, which were subjected to critical analysis and synthesis. Unfortunately, the number of available items indicates a deficit of studies on the functioning of rescue services in the area of crisis management. In other countries, similar systems responsible for universal security are often part of the critical infrastructure. This makes it much more difficult to obtain reliable and

comprehensive information about their functioning. In addition, the aim of the work is to provide predictions for the future and to outline the spheres that are to be treated as a priority. Therefore, a scenario analysis was used. The number of teams at the disposal of the State Medical Rescue in 2020 was 1585 of which 73 percent were "P" teams, i.e. trips carried out without the participation of a system doctor. In the period before the pandemic, about 3 400 000 trips to health or life-threatening conditions were carried out each year. Most often it was sudden cardiac arrest, chest pain, dyspnoea, trauma, traffic accidents, and suspected stroke. The period of the coronavirus pandemic changed the functioning of the rescue system. The analysis of trips of medical emergency teams on the basis of the available data from March 15, 2020 to May 15, 2020, leads to the conclusion that the number of trips has decreased. The range of reasons for calling for help has also declined. These data were collected thanks to the statistics of the Command Support System of the State Medical Rescue.

This system is subordinate to the Ministry of Health. In addition, in 2018 there were 550 815 interventions by the Ambulance Service, in 2019 there were 527 838, while in 2020, during the coronavirus pandemic, already 400 878. This means a decrease by over 20 percent. Due to reduced traffic on the roads, there has been a reduction in registered traffic accidents by half and in injuries by around 30 percent. Fainting disappeared by 40 percent. Calls due to chest pain by more than 15 percent, and because of shortness of breath by 20 percent. Only the number of trips of emergency medical teams in connection with a suspected stroke remained at a similar level in the context of the past [33]. Although the total number of interventions may have decreased due to a specific pandemic of

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fear and the postponement or failure to call the emergency medical team to life and health threats, the number of reports related to suspected coronavirus disease has increased significantly. It happened that these were emergency reports. They are understood as oral or written information about an event that has occurred or is to take place, which is forwarded to the persons on duty of individual rescue and law enforcement entities in order to arrange the appropriate units of the Police, State Fire Service and medical rescue teams to the scene of the event [Nov 2020]. In 2020, Emergency Notification Centers received 267 555 reports of coronavirus. These reports, although mostly non-alarm ones, had to be handled due to the extraordinary situation that occurred in 2020. In many cases, handling such reports consisted of providing the number of the National Health Fund hotline dedicated to this issue [34].

On the other hand, due to the order to disinfect the ambulances, after each patient with a positive test for coronavirus, the time needed to fulfill calls by the National Medical Rescue units was significantly extended. More and more often, isolated medical events have started to occur, i.e. events that cannot be immediately ordered by a free medical rescue team, or when the estimated time of arrival does not give hope for saving human life and health. Apart from emergency medical teams, this type of notification may also be attended by a rescuer who is an officer of the State Fire Service, who has the right to provide assistance, inter alia, in the field of: cardiopulmonary resuscitation, has the right to use passive oxygen therapy or stop external hemorrhages and dress wounds [30]. Then the medical dispatcher may decide to transfer the event for implementation to the territorially competent Control Post of the State Fire Service. This is done through the Command Support System of the State Medical Rescue. However, taking into account the current epidemiological situation, the submission of the report by the medical dispatcher of the State Medical Rescue through the Command Support System to the State Fire Service does not mean immediate dispatch of any unit. The form with the event goes to the fire officer on duty at the Management Position, and only he can order a free unit for a given isolated medical event. If a citizen who sees a given situation first dials the 112 emergency number instead of 999, the entire process of notifying emergency services will be extended. This is a problem from a crisis management point of view. Due to the pandemic, the number of isolated

medical events undertaken by State Fire Brigade units for implementation increased. This type of event may also concern a report related to people in isolation, and therefore posing an epidemiological threat. The table below shows an example of what the process of assigning forces and resources to an isolated medical event may look like in the time of a pandemic, in the case when there are no free forces and resources of State Medical Rescue capable of providing help and a citizen makes a call to the emergency number 112 (Scenario 1), or the emergency number of the Ambulance Service 999 (Scenario 2).

The table shows how the emergency notification process looks like in the current system. In the event of an unfortunate coincidence, such as lack of free forces and resources; i.e. emergency medical teams and when faced with a life-threatening event such as sudden cardiac arrest, the process is relatively long. Often in literature and in public space there is a term of five golden minutes in the chain of survival. In fact, there may be times when five minutes is not enough to call an ambulance. This is due to systemic conditions, including the operator nature of the 112 emergency number to State Medical rescue forces and resources. The limitation in this case are organizational and financial issues. However, subsidized health services, the rescue system and, more broadly, the security itself is a necessary and necessary challenge in the face of the pandemic and, at the same time, the aging Polish society.

Where do the limitations in the availability of emergency medical teams during a pandemic actually come from? How do they relate to Covid-19? The reasons for this include: longer time to travel to the event, longer waiting time for intervention when a patient is infected with coronavirus, longer waiting time for intervention even when there is no suspicion of developing Covid-19, disinfection time for emergency medical teams after leaving for each positive patient, the mere waiting for disinfection of the vehicle, when it is not always possible immediately, additional procedures with patients with a positive result. The procedure related to the antigen test is an exemplification of the new procedure related to the additional waiting time. The result is not known to paramedics and the patient immediately. It takes a minimum of several minutes, which has an impact on the holistic execution time of calls.

Another problem that has been identified as a result of the consequences of the Covid 19 pandemic is the information asymmetry faced by operators of the 112 emergency number in the performance of their official duties.

Table 2. The emergency notification process in the event of a lack of State Medical Rescue forces and resources - generating an isolated medical event

Scenario 1	Scenario 2
Sudden cardiac arrest in Rembertów, Warsaw. The witness of the event makes a call to the emergency number 112.	Sudden cardiac arrest in Rembertów, Warsaw. The witness of the event makes a call to the emergency number 999.
The 112 operator accepts the report, transfers the form, i.e. the report form, along with an interview with the applicant via the IT System of Emergency Notification Centers to a free medical dispatcher of State Medical Rescue in Warsaw. In the absence of a free medical dispatcher in the Warsaw dispatcher, the switch to the first free dispatcher in the whole country takes place. The system works on the principle of mutual substitutability of centers.	The medical dispatcher collects the address and medical history. Due to the increase in the incidence of coronavirus, a situation arises in which there is simply no free emergency medical team. As a result, he submits the application to the Management Position of State Fire Service.
The medical dispatcher confirms the address and begins collecting a medical history. Due to the increase in the incidence of coronavirus, a situation arises in which there is simply no free emergency medical team. As a result, he submits the application to Management Position of the State Fire Service.	The fire officer on Management Position of the State Fire Service reads the report and has a free crew for an isolated medical event.
The fire officer on Management Position of the State Fire Service reads the report and has a free crew for an isolated medical event.	

Despite the inclusion of the 997 emergency number service among the tasks of Emergency Notification Centers, operators of 112 who have been receiving calls to 997 all over Poland for 3 years do not have the same organizational knowledge as those on duty 997. Common databases, such as the National Police Information System or the National Criminal Information Center. The operators of the 112 emergency number do not have access to them, nor do they have access to the databases of people who have been quarantined or isolated. This results in a lack of information and the inability to take appropriate actions at the operator service level, e.g. when the person to whom the insulation was applied is outside the house. In a situation where the operators of Emergency Notification Centers would be able to access such a selective base, they could catch people who made calls far from the indicated place of isolation. This is not possible at the moment. On the other hand, taking into account the growing waves of disease, the introduction of such a solution seems to be the optimal solution from the point of view of sanitary and epidemiological safety.

To the question: Do you think that the information integration of the rescue system in Poland (CPR numbers 997, 998, 999) is the right decision, most of the respondents replied that it was not.

The operators of the 112 emergency number

themselves evaluate the current process of integrating emergency numbers with no confidence. In the open answers included in the questionnaire, the surveys indicate many flaws of the system and the fact that they often work with a lack of information. The table below presents the most frequently reported problems by the respondents - operators of the 112 emergency number.

**Fig. 4. Assessment of the advisability of using emergency numbers 997, 998, 999 by CPR**

According to the CPR employees responsible for everyday safety, the system has many shortcomings. The ongoing pandemic has revealed and highlighted new as well as unresolved problems. Table 3 is presented utilitarian system solutions which, if implemented, would constitute a positive element. It is necessary to refine the system, which was confirmed by the respondents themselves in the study quoted in this publication.

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Table 3. Problems reported by respondents together with an original proposal to solve them

Reported problems	System solutions
Lack of information from the services on the reason for not intervening or incorrectly informing the notifier of the status; for example "The application is not accepted but is in fact being processed".	Introducing a field for information in the CPR ICT system: for example "Intervention assigned, crew / team on the way". "Intervention not assigned, waiting for available crew / team."
Ignorance of own systems by officers and dispatchers.	Training in the field of ICT, in particular for new employees of the services.
Too few dispatchers compared to the spike in pandemic reports to State medical Rescue.	Making the profession of paramedic or system nurse more attractive by increasing the prestige and terms of employment in a given position.
There is no information about the approximate time of arrival of services at the scene.	Marking the position of the Police, emergency medical team or State Fire Service units on the map along with the estimated time of arrival based on the algorithm.

CONCLUSIONS

Based on the data collected from Emergency Notification Centres, it appears that the number of notifications to the 112 emergency number decreased in 2020 compared to 2019. This is due to the fact that other numbers were also launched, at which it was possible to obtain competent information. However, it is worth noting that the number of reports in the medical category has increased, which is normal in a pandemic time.

The system remains unchanged during a pandemic. As a standard, it deals with the receipt of reports on threats to human life and health. The state of the pandemic is just such a case, only on a larger scale. The rigors of the pandemic do not affect the way CPR works.

CPR employees ask if the patient has any symptoms and if he / she is in quarantine. If the reporting person informs about his symptoms, reports suspected coronavirus infection or is in quarantine, CPR informs the services directed to the place of intervention, i.e. ambulance, police, fire brigade. The point is that officers should be able to protect themselves during the intervention. Valid reports to the emergency number constitute about 34%, the remaining reports are unfounded or cancelled. As social practice shows, disruptions in the operation of the emergency number, consisting in reports that do not concern emergency situations, significantly increase the costs of its operation, and in extreme cases may lead to failure to provide assistance to those in need due to the blocking of emergency numbers.

Not all identified defects are presented in the publication. The list of problems indicated by the respondents is longer, not always related to the pandemic. Problems identified with both the

emergency notification process, the dispatch process and the pandemic crisis management itself. These aspects of the business are ineffective. This is evidenced by the increasing commuting times to medical events, the more and more frequent lack of resources and the growing mortality rate of Polish society. Only proper, well-thought-out changes in the management of the rescue system are able to improve the quality and efficiency of the system.

WYBRANE PROBLEMY RATOWNICTWA Z UWZGLĘDNIENIEM ŚRODKÓW TRANSPORTU PODCZAS PANDEMII COVID-19

Praca dotyczy wybranych problemów ratownictwa, w tym obsługi numeru alarmowego 112 podczas pandemii Covid-19. Numer 112 obowiązuje na terenie całej UE, służy wyłącznie do powiadamiania w nagłych sytuacjach zagrożenia zdrowia, życia lub mienia. Jak pokazuje praktyka społeczna, zakłócenia w jego funkcjonowaniu, w tym zgłoszenia niezasadne, znacząco podnoszą koszty jego działania, a w skrajnych przypadkach mogą doprowadzić do nieudzielenia pomocy osobom jej potrzebującym. Trwająca pandemia odcisnęła znaczące piętno na wielu aspektach życia, w tym na działalności systemów ratownictwa, odpowiedzialnych za bezpieczeństwo obywateli w państwie. Współautor pracy podczas pełnienia obsługi numeru alarmowego 112 dostrzegł pewne problemy i wady związane z działalnością ratownictwa w zarządzaniu kryzysowym. To stało się przyczyną zaprezentowania niniejszego zagadnienia w formie publikacji. W pracy zastosowano metody teoretyczne: analizę systemową, analogię, metodę statystyczną, analityczną i porównawczą. Ponadto wykorzystano badanie empiryczne - sondaż diagnostyczny w oparciu o próbę ekspercką. Zostało ono przeprowadzone za pomocą kwestionariusza ankiety. Przeprowadzono je na grupie 46 operatorów numeru alarmowego 112 pracujących w Centrach Powiadamiania Ratunkowego w Lublinie, Łodzi, Radomiu oraz Warszawie [n=46]. Wskazano selektywne problemy ratownictwa w zarządzaniu kryzysowym związane z trwającą pandemią. Występują problemy z brakiem sił i środków Państwowego Ratownictwa Medycznego, sam proces powiadamiania ratunkowego również wymaga poprawy, czego dowodem są odpowiedzi

respondentów - operatorów 112. W publikacji nie zaprezentowano wszystkich stwierdzonych wad. Lista problemów wskazanych przez respondentów jest dłuższa, nie zawsze ma związek z pandemią. Jedynie właściwe zmiany w zarządzaniu systemem ratownictwa są w stanie poprawić jakość i sprawność systemu. Utylitarne rozwiązania zaprezentowane w tej publikacji mogą temu posłużyć.

Słowa kluczowe: numer alarmowy, problemy ratownictwa, środki transportu, pandemia

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