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## **APPLICATION OF ANTI-EPIDEMIOLOGICAL MEASURES AND COVID-AUTOMAT IN PUBLIC WATER TRANSPORT**

**Summary.** The COVID-19 pandemic has caused the reduction of services, including transport services. Companies operating in public water passenger transport were not prepared for the implementation of restrictions because, in some countries, the general procedures for the safe operation of regular public water passenger transport were not known. The main contribution of this paper is to discuss the implementation of the current system of safe operation of regular public water transport services in the Netherlands and Spain to a generally applicable model for transport companies. This article links these measures with the general plan for the release and tightening of measures of the Ministry of Health of the Slovak Republic known as COVID-AUTOMAT.

### **1. INTRODUCTION**

The COVID-19 pandemic has brought new challenges to the safety and health of the population. Measures have gradually been taken to protect people's health and lives in all countries, but they have often not been uniform. Similarly, in determining the severity of the epidemiological situation, a common framework for monitoring and evaluating information has not been presented based on which measures would be taken. The common indicator of many measures has been a fundamental reduction in mobility, which has been reflected in a reduction in the number of passengers using public transport. However, in many countries, air and public water passenger transport are the only ways for people to move between regions. These modes of transportation allow regular connections between islands or between islands and the mainland. Public water passenger transport also contributes to the transport of passengers on rivers and lakes as part of inland waterway transport. Therefore, it is in the best interest of the public to restore regular connections or set up security measures for the operation of public water passenger transport.

### **2. LITERATURE REVIEW**

The spread of COVID-19 and the measures taken to reduce its impact are currently widely discussed in many professional studies. From the point of view of water transport, the contributions concerning passenger ships and cruise ships and their safe operation are presented. For example, the paper by Radic et al. [11] addressed the impact of the spread of COVID-19 on cruise tourism. They also stressed the need for major passenger transport companies to work closely with local institutions

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and act according to their recommendations and regulations. Another very important area is passenger behaviour and the provision of selected services. This issue was addressed in a paper by Radic et al. [6], which addressed the behaviour of the travelling public in the context of serving meals on board—in particular, the impact of the risk associated with COVID-19 on female passenger behaviour. Wang et al. [12] focused on safety and health in an interesting way and set out an effective method for ensuring the safety of persons carried by vessels. The carriers of this information are red, yellow, and green QR codes. These QR codes are presented in this article as a possible source of information on the infectivity of individuals. Another very important topic is informing crew members about possible cases and risks. The level of knowledge of crew members was dealt with by Battineni et al. [10], who emphasized that various forms of training and informing crew members help to effectively prevent the spread of diseases on board. According to this article, information and education should focus mainly on epidemiological measures, waste management, and the possibility of using the body of medicine. Finally, it is necessary to mention the interconnection of water transport and the mobility of the population. According to Musa et al. [5], the population mobility factor has a significant impact on many indicators of the spread of COVID-19. The article mainly expresses the connection between mobility and effective reproductive number.

### **3. CURRENT STATE OF THE PROBLEM SOLVED ABROAD**

Public water passenger transport is involved in both inland and maritime transport. Integration into an inland waterway or maritime transport may affect the measures taken due to the overall capacity of the vessels. Maritime vessels operating public waterways generally have a higher capacity and may be characterized by longer passenger stays indoors. Some examples are the regular connections between Denmark, the Faroe Islands, and Iceland; between the Spanish city of Cadiz and the Canary Islands; and between Valencia and the Balearic Islands. Regular inland public passenger water transport is provided by high-speed boats and hydrobuses. This mode of transport is used in many countries and is widely developed in Europe, especially in the Netherlands [1-3].

For the reasons mentioned above, this contribution sets out the basic anti-epidemiological measures taken in the field of public waterway passenger transport in Spain and the Netherlands.

#### **3.1. Anti-epidemiological measures in public water passenger transport in the Netherlands**

The operation of hydrobuses on waterways in the Netherlands has been affected by the spread of a pandemic. Since May 2020, passengers have had to have a drape, respirator, or other suitable upper respiratory protection, both while boarding and while on board. In the case of children, this obligation applies from the age of 12. Passengers who refuse to comply with this measure are not permitted to board. It is also mandatory to keep a distance of at least 1.5 meters from other passengers during embarkation. The cash payment option has been abolished for the payment of fares and has been replaced by ATM payments, which can be made on board or online via a web application or website. The obligation of regular hand disinfection also applies, and, in cases of sneezing, passengers are to use a handkerchief or other suitable fabric. This passenger can buy a ticket preferentially, and use the option of preferential purchase of a ticket. WaterBus also adjusted its timetables—the holiday regime was used, and the kiosk was closed [1, 2].

#### **3.2. Anti-epidemiological measures in public water passenger transport in Spain**

The Spanish carrier Balearia was the first shipping company in the world to receive the Global Safe Site Covid-19 certificate, awarded by Bureau Veritas. To obtain this certificate, a company must introduce measures to prevent the spread of COVID-19 diseases, as well as a system of regular training of employees regarding this issue. Finally, the transport company undergoes a rigorous audit, based on which Bureau Veritas decides whether to award the international certificate Global Safe Site

Covid-19. For this reason, this contribution cites the measures of this maritime carrier as an example of anti-epidemiological measures in public maritime passenger transport [3].

Balearia's measures impose an obligation on all passengers to wear protective gloves, respirators, or other appropriate upper respiratory protection. The check-in process is a fully contactless, it uses the application WhatsApp to reserve free seats on the vessel. and used application WhatsApp and reservation of free seats on the vessel. Disinfection stands are available to passengers during embarkation and disembarkation, as well as on the vessel during the journey. During embarkation, passengers are required to be two meters apart. Each passenger is measured before boarding. This transport company introduced additional partitions between the seats to limit physical contact between passengers. Balearia regularly disinfects the interior of the vessel and has established separate sanitary protocols for disinfection of the interior of the terminal. Owing to this protocol, the company's passenger terminals in Dénia and Valencia are reaching a new level of excellence [3].

## **4. RESULTS OF THE WORK**

### **4.1. Application of the COVID-automat and recommended measures for regular public water passenger transport**

According to the Ministry of Health of the Slovak Republic, COVID AUTOMAT is a monitoring and signalling system used in the territory of the Slovak Republic. Its aims are to provide information about the spread of COVID-19 and issue early warnings. The main advantage of this machine is the ability to accurately predict individual measures. This setting makes it possible to find a suitable intersection between the economic activity of a population and the protection of public health. Within this system, several indicators are monitored, such as the average number of new cases in the last seven days, the total number of hospitalized people, the effective reproductive number, and the number of hospitalized people per 100,000 inhabitants. Within the COVID automaton valid for the territory of the Slovak Republic, the limits are set exactly in integer expression. The significance of this contribution is that it helps find a universal means for meeting the needs of public water passenger transport. For this reason, the COVID values provided by the machine are converted into percentages for this contribution so that they can be used in other countries or geographical areas [4]. Based on the selected indicators, it is possible to assign a given country or territory the appropriate alert level. On the basis of inclusion in the appropriate level of warning or vigilance, public authorities may appropriately restrict the operation of regular public waterway passenger transport.

#### **4.1.1. Influence of movement restriction on effective reproduction number**

One of the main restrictions adopted in transport is the limitation of the operation and capacity of means of transport. These restrictions are intended to reduce the overall mobility of the population. As Musa et al. [5] showed, the measures taken to reduce mobility have an impact on the effective reproduction number. According to their results, the overall trend of the effective reproduction number corresponded to the course of the pandemic and the measures taken to reduce the mobility of the population. This research from Malaysia also confirms that the individual phases and measures of mobility restriction had a direct impact on the effective reproductive number; thus, it is possible for the value of the effective reproductive number to be used as a key factor when assessing population mobility restrictions [5].

### **4.2. Anti-epidemiological procedures before embarkation**

#### **4.2.1. General measures**

The list of general measures consists of the disinfection of all interiors of the vessel, with a special focus on passenger cabins, contact areas, interiors of the vessel, and special areas with high numbers

of passengers (restaurants, services, and shops for passengers). Recommendations to set aside a separate sanitary day. Preparation and control of safety labels on anti-epidemiological measures (airway cover, disinfection, distance, health monitoring). Preparation of questionnaires for passengers regarding their current health status (electronically or in paper form). Preparation and inspection of temperature measuring devices (infrared cameras, non-contact thermometers). Allocation of crew members to control these measures during embarkation/disembarkation and navigation. Evaluation of questionnaires and information on negative tests or vaccination results sent by passengers before embarkation. Preparation of protective anti-epidemiological devices for crew and passengers. Preparation of sufficient capacity for continuous testing of crew and passengers during the voyage (for multi-day voyages). Preparation and control of a plan in case a contagious infectious disease spreads on board. It is also recommended to install partitions between groups of seats to ensure adequate spacing between passengers or to block some of the seats or rows to ensure checkerboard seating. In the event of a worsened epidemiological situation, the closure of certain services on board shall follow with the epidemiological measures on land. Monitoring the epidemiological situation and local regulations and reassessing the operation of the voyage. Provision and control of means to provide information to passengers of the transport company and port authorities. Separate from the crew, a competent person/persons responsible for monitoring compliance with anti-epidemiological measures, which also serves as a form of contact in case of symptoms of the disease during the voyage [6].

Table 1

COVID-automat (% of inhabitants living in the territory). Source: The Ministry of Health of the Slovak republic – adjustment by authors

	Monitoring	Level of alert 1	Level of alert 2	Level of warning 1	Level of warning 2	Level of warning 3	Level of warning 4
Average number of new cases per 7 days				0.016 % – 0.024 %	0.024 % - 0.048 %	0.048 % – 0.08 %	>0.08 %
The number of hospitalized patients				> 0.03 %	0.04 % - 0.05 %	0.05 % – 0.06 %	> 0.06 %
Reproduction number				> 1.05	1.05 – 1.10	1.1 – 1.15	>1.15
Number of hospitalized patients per 100,000 inhabitants	<3	3-5	5-10	10-20	20-40	40-60	> 60
Weight 7 days incidence	<40	40-80	80-120	120-240	240-800	800-1600	> 1600

#### 4.2.2. Pre-boarding anti-epidemiological procedures: Crew members

Vaccinated crew members - use of protective anti-epidemiological equipment - recommended respirator FFP2 or other suitable protection with an overlap of the upper respiratory tract. Regular monitoring of health, observation of symptoms - headaches, muscle fatigue, fever, cough. In case of

symptoms, crew members should isolate themselves and contact the doctor, all close contacts, and the person in charge on the vessel. Regular hand hygiene and use of disinfectant [7].

Table 2

COVID-automat - suggested measures, adjustment by authors

Monitoring	Level of alert 1	Level of alert 2	Level of warning 1	Level of warning 2	Level of warning 3	Level of warning 4
Operation with anti-epidemiologic measures	Operation with anti-epidemiologic measures and lower capacity	Operation with anti-epidemiologic measures and lower capacity	Operation with anti-epidemiologic measures and lower capacity	Operation with anti-epidemiologic measures and lower capacity	Operation with strict anti-epidemiologic measures in necessary extent and lower capacity	Operation with strict anti-epidemiologic measures only in necessary extent and lower capacity

Non-vaccinated crew members - Consider the need for direct physical contact with passengers, use of protective anti-epidemiological agents - recommended respirator FFP2, or other appropriate protection with an overlap of the upper respiratory tract. Regular hand hygiene and use of disinfectant. Regular monitoring of health, observation of symptoms - headaches, muscle fatigue, fever, cough. Completion of antigen or the polymerase chain reaction (PCR) testing for the presence of SARS-COV2 or its mutations at least once every 3 days (in case of overcoming the disease, the possibility of interrupting testing for a maximum of three months). In the event of symptoms or a positive test result, remain in isolation and contact the doctor, all close contacts and the contact person on board. Consider vaccination according to current vaccine availability [8].

**4.2.3. Pre-boarding anti-epidemiological procedures: Passengers**

Vaccinated passengers - regular monitoring of health, observation of symptoms - headaches, muscle fatigue, fever, cough. In case of symptoms, cancel the planned trip or consider the necessity of the trip - a recommendation to stay in home isolation and contact your doctor. Completion of a questionnaire on the state of health before boarding the vessel (approx. max. 12 hours before boarding), preparation of protective anti-epidemiological means - recommended respirator FFP2 or other suitable protection with an overlap of the upper respiratory tract. Preparation of proof of vaccination before embarkation. In the event of a high-risk epidemiological situation, consider the need to travel on the vessel. Regularly monitor and comply with local authority regulations regarding travel.

Unvaccinated passengers - regular monitoring of health, observation of symptoms - headaches, muscle fatigue, fever, cough. In case of symptoms, cancel the planned route or consider the necessity of the trip, stay isolated at home, contact your doctor - a recommendation to pass antigen or PCR testing to detect the presence of SARS-COV2 or its mutations. Completion of a questionnaire on the state of health in the time before boarding the vessel (approx. max. 12 hours before boarding), preparation of protective anti-epidemiological means - recommended respirator FFP2, or other suitable protection with an overlap of the upper respiratory tract. Completion of antigen or PCR testing for the presence of SARS-COV2 or its mutations (24 hours before embarkation), in case of regular travel (at least once every seven days). In case of overcoming the disease, the possibility of interrupting testing for a period of max. three months. In case of a positive result - do not participate in the transport, stay isolated at home and contact your general practitioner and all people contacted in the last 14 days. In the case of a negative result, prepare a document proving the negative result of the test by which

the passenger can prove they pass the boarding check. In the event of a high-risk epidemiological situation, consider the need to travel on the vessel. Regularly monitor and comply with local authority regulations regarding travel [9].

#### **4.3. Anti-epidemiological procedures during embarkation of crew members/port workers**

When boarding passengers, it is recommended to check that all passengers comply with basic anti-epidemiological measures. In particular, observance of distances during embarkation (it is recommended that passengers board the vessel one at a time), control of passengers' body temperature, hand hygiene (disinfection) and covering of the upper respiratory tract with a suitable protective device (recommendation to use FFP2 respirator). When checking travel documents, the use of an electronic form is recommended (e.g., QR code readers, chip cards, turnstiles). Consider placing a physical barrier between the passenger and the crew member (e.g., a plexiglass wall).

Vaccinated crew members/port workers - use protective equipment during contact with passengers during embarkation (upper airway cover - FFP2 respirator recommendation, hand disinfection), maintain the necessary distance between crew members and passengers (min. 1.5-2 meters). Perform body temperature control (e.g., non-contact thermometers, infrared cameras) of passengers boarding the vessel. Perform a negative test certificate or vaccination certificate check. Control of passengers for anti-epidemiological measures. Continuously check the number of passengers on board and terminate the boarding process if safe capacity is reached.

Non-vaccinated crew members/port workers - consider the need for direct contact with passengers. Use protective equipment during contact with passengers during embarkation (upper airway cover - FFP2 respirator recommendation, hand disinfection), maintain the necessary distances between crew members and passengers (min. 1.5-2 meters). Perform body temperature control (e.g., non-contact thermometers, infrared cameras) of passengers boarding the vessel. Perform a negative test certificate or vaccination certificate check. Control of passengers for anti-epidemiological measures. Continuously check the number of passengers on board and terminate the boarding process if safe capacity is reached [10].

#### **4.4. Anti-epidemiological procedures during the voyage: Crew members**

It is recommended that crew members control the behaviour of passengers, mainly through compliance with restrictions during the voyage. If the voyage will take a long time (two or more days), it is recommended to check the temperature of passengers and regularly address passengers by questionnaires about their current health state. Serving meals on board (during long voyages) is recommended only in necessary cases and strictly in packages or via direct delivery to passengers' cabins. Generally, it is not recommended to serve meals and drinks in restaurants and bars. Also, it is recommended to ban the meal consumption outside passengers' cabins and totally ban meal consumption on short voyages. Additional services (e.g., wellness, stores, ...) could be strictly opened or closed according to local measures. Evacuation training should be realized by videos or presentations to prevent the accumulation of passengers in one place. If necessary, it is recommended to test all passengers and crew members during long voyages. In the case of signs of respiratory illness or a positive test result during a voyage, a competent crew member should isolate the person and inform the master, who should then ensure that the competent authorities will be informed and impose restrictions on board in accordance with regulations and recommendations. If a massive occurrence of the disease is detected on the vessel during a multi-day voyage, it is recommended to follow the safety protocol [11].

#### **4.5. Anti-epidemiological procedures during the voyage: Passengers**

Passengers should observe basic measures during the voyage - covering the upper airways with a mask or respirator with a level of protection min. FFP2, regular hand disinfection and social distance. It is also recommended that passengers on board should not gather in large groups. Consumption of

food and beverages is not recommended (except for on long cruises). Smoking is also not recommended. Passengers should follow the crew's announcements from loudspeakers or in the ship's newspaper, they should monitor their health during long voyages and they should make truthful reports on questionnaires. In case of any signs of respiratory illness, the passenger should stay in isolation (in his/her cabin) and contact an authorized crew member. Generally, it is necessary for each passenger to use common sense and social responsibility [12, 13].

## 5. DISCUSSION

Maritime and inland water passenger transport face one of the greatest challenges in their history. The safe transport of persons, which prevents the transmission of communicable diseases during embarkation and voyages, is the most important issue for the rapid resumption of regular passenger water transport.

One effective tool for resuming regular passenger transport could be a single epidemiological risk assessment system, which should be interlinked with important measures to prevent the spread of communicable diseases during passenger transport by water. The conditions for the operation of public passenger water transport at the time of the spread of the contagious disease should always align with local regulations and recommendations. The transport sector can implement these local authority regulations into an individual risk assessment system; however, this system should not contradict the general regulations of local authorities.

An example of a suitable interpretation of a national measure for a specific sector is the presented COVID automat. The assessment system is strictly based on the nationwide risk assessment system that is valid in the territory of the Slovak Republic. It assesses risk areas and assigns them to the appropriate level of epidemiological risk based on the categories. Each of these levels represents recommendations to the carrier regarding how he/she should operate regular public passenger water transport. This system is complemented by the general measures offered based on the conditions of the practical operation of public passenger water transport in coastal areas, as well as on inland waterways. The measures clearly indicate that the wearing of protective equipment (drapes or respirators) has the greatest support. In this respect, it should be recalled that this protection is only effective if it covers the upper respiratory tract properly. Therefore, attention should be drawn to their proper wearing. The regular disinfection of hands and touch surfaces is also a suitable measure for protecting against viruses. These two measures, together with sufficient spacing, form the basis of all measures, not only in water transport but also in everyday life.

There are many ways by which individual companies should implement these basic requirements. From the available methods, these measures can be applied in the form of protocols or regulations. However, the resulting effect will become apparent only when these rules are formulated and explained clearly and intelligibly. Therefore, the proposed measures related to the carriage of passengers by public water transport will be effective only if regular and clear communication with passengers is emphasized.

Cross-border passenger transport is often involved in water transport. This could make regulations and measures ineffective due to language barriers. Therefore, it is appropriate to formulate the basic measures on board, as well as during embarkation and disembarkation, as simply as possible in pictorial form through QR codes that could be located on the instructions given to passengers.

Finally, it should be mentioned that it is always and, in all circumstances, necessary to appeal to common sense and the individual responsibility of each of us. Further research in this area could focus on the impact of individual passenger behaviour on the effectiveness of the measures taken.

The COVID-19 pandemic does not represent the first time humans have faced this type of threat. Other examples include the outbreaks of SARS, MERS, and the Great Influenza (the Spanish flu). The migration of human beings and passenger transport speed up the spread of illnesses. It is believed that humans will soon face a similar or stronger disease that could affect the world. Therefore, it is necessary to prepare a list of regulations that could stop the spread of diseases (e.g., reducing or stopping mobility, wearing protective devices, or improving hygiene).

Viruses and bacteria have been living on the Earth for millions of years longer than humans. Despite the development of antibiotics and vaccines, humans are behind their evolution.

## 6. CONCLUSIONS

Uniform epidemiological measures and their application are necessary for the even resumption of regular public passenger water transport. The necessity of this type of transport is a basic feature of selected geographical areas. Therefore, it is necessary to clearly define the epidemiological risk assessment system and measures to ensure the safe operation of public passenger water transport.

The implementations of the measures in this article are based primarily on the current measures. In the Slovak Republic, the currently valid uniform system of epidemiological risk assessment at the regional and national levels is known as COVID-automat. The sectoral application of this system would help to speed up the recovery of public passenger water transport. The combination of the operation of this mode of transport with generally accepted and applied measures will help to maintain a balance between the economic and health consequences of the pandemic now and in the future.

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