
Suggestions on Health and Safety Measures and Epidemic Prevention and Control Measures on Luxury Cruise Ships

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Abstract: In recent decades, there have been a number of large-scale infectious diseases on large cruise ships, which has had a huge negative impact on the development of the cruise industry. A large number of passengers and crew members did not receive timely and adequate medical treatment, resulting in illness aggravation and even death. This paper investigates the weaknesses of luxury cruise in the field of public health and epidemic prevention in the law through the analysis of luxury cruise public health events. In the daily operation of large cruise ships, there are also some health and safety loopholes that are not taken seriously. Some shortages of the epidemic prevention and security risks are found in the field of personnel composition, the health security check during boarding, frequent flow of personnel and medical conditions aboard luxury cruise. There are some suggestions on perfecting the existing legal standard system, improving public health management, speeding up the ventilation system upgrade, improving the ability of medical, etc. The above deficiencies are found and summarized in this paper. It analyzes two cases during the COVID-19 outbreak, and gives suggestions on the prevention and control of the epidemic in the case of outbreaks of infectious diseases on luxury cruise ships. It is hoped that under the cooperation and efforts of various parties, a complete epidemic prevention system and emergency response plan will be established, which will help improve the epidemic prevention and control and response capacity of cruise ships.

Keywords: Luxury Cruise Ships, Health and Safety Supervision, Epidemic Prevention and Control

1. Introduction

In recent decades, as a new and expensive way of tourism, luxury cruise ships are favored by more and more tourists. However, the emergence of novel corona virus (hereinafter referred to as "COVID-19") has brought a huge impact to the luxury cruise industry around the world, revealing a blind spot that few people pay attention to: the public health and epidemic prevention work on luxury cruise ships is not perfect. For example, in 2009, more than 300 tourists on "Pacific Dawn" cruise ship were sick and were refused to dock at ports in several countries. According to the statistics, between the years 2002-2019, a total of 66,000 US people have been infected with norovirus on cruise ships. In 2010, the cluster of H1N1 influenza spread on the Fuji Maru cruise ship. Since 2009, Pneumonia, influenza A, norovirus,

suspected malaria and other infectious diseases were repeatedly detected on luxury cruise ships at the Tianjin port in China. COVID-19 outbreaks on several cruise ships in 2020 [1]. For example, there are 712 confirmed cases and 13 dead on the Diamond Princess cruise ship [2, 3].

The imperfect health and epidemic prevention work on luxury cruise ships not only affects the travel experience of tourists, but also fails to protect the health, safety and rights and interests of tourists. At the same time, it will also bring huge economic and reputation loss to the cruise operation company. Therefore, it is of great significance to improve the epidemic prevention and control of cruise ships and reduce public health risks.

2. The Lack of Law of Public Health Problems and Attribution on Luxury Cruise Ships

2.1. Imperfect Legal System

In most coastal countries in the world, the laws on ships and ports rarely involve public health safety and emergency response strategies on ships. The laws on public health lack clear provisions in the ship field. There are even fewer legal provisions on luxury cruise ships.

For example, regarding the law of ships and ports, *The Ship Sanitary Procedures* of the United States puts forward some health and safety requirements, which are reflected in the ship design and construction stage, but they are still not clear and detailed enough in the ship operation stage. China's *Administrative Measures for Entry-Exit Cruises* only gives guiding opinions on cruise quarantine, but fails to give clear requirements for specific quarantine methods in the quarantine process. *The Ship Health Regulations* of the International Health Organization mainly focuses on the biological invasion or the spread of bacteria or viruses brought by ships to ports. As a unique legal framework in the field of global health security and response to the global public health crisis, the *International Health Regulations* lacks explicit arrangements in the special field of luxury cruise ships. There is a *Ship Epidemic Prevention and Safety Guidelines*, but it is only issued by the Classification Society, not enforced by the government or the official law [4].

2.2. Unclear Place of Attribution

The epidemic prevention and control of cruise ships or the emergency treatment after the occurrence of infectious diseases involves multiple entities [5], including the flag country, the country where the port is located, the nationality country where the crew and passengers belong, and the country where the cruise company is located. And in most cases, these subjects are not the same country. Therefore, there are prone to disputes and contradictions in the layout and distribution of rescue tasks, the assumption of responsibilities, and the distribution of management rights, and then delay the progress of rescue. For example, in 2009, more than 300 tourists on board the Pacific Dawn were ill, and the ship has since been denied docking, receiving and treating by ports in several countries. During the COVID-19 pandemic, a number of luxury cruise ships have been rejected by coastal countries or ports. Human life is precious, and no political or diplomatic factor should be a barrier for medical assistance.

3. The Deficiencies and Safety Risks of Luxury Cruise Ships in Epidemic Prevention and Control

3.1. Large Number of People

On a luxury cruise ship, there are large numbers of tourists,

crew and service personnel, usually to several thousands of people, forming a mobile town at sea. In the course of navigation, if infectious diseases appear on the luxury cruise ship and fail to be timely and properly handled, the whole ship will become a secluded island on the sea, a hotbed of pathogen reproduction and transmission [6].

In addition, according to the long-term statistics, 10 percent of passengers carry children, and passengers over 60 account for about 28 percent of passengers. Children and the elderly have relatively weak resistance and immunity, and the risk of infectious diseases is relatively high.

3.2. Personnel Management Difficulties

In general, crew and service personnel account for less than 50 percent of the thousands of people on a luxury cruise, and the largest group being tourists. These tourists come from different countries or regions, from multiple social classes [7]. Some of them have communication barriers in different languages. Cruise management personnel are difficult to form an effective organization or management for passengers. When an epidemic occurs on the ship, panic and anxiety among tourists make it more difficult to organize and manage tourists.

3.3. Inadequate Health and Safety Testing at Boarding Time

Before a luxury cruise ship, visitors usually board for half a day or several hours. Time constraints, the large number of passengers boarding, and the limited boarding area lead to the simplification of the health and safety detection process when boarding ships. Passengers may undergo a simple temperature measurement and disinfection in the boarding area. Health quarantine is rarely performed on passenger luggage, just in the aid to simplify procedures and protect passenger privacy. The same is true of food, fresh water and so on. This leaves behind a safety hazard.

3.4. Frequent Movement of Personnel

The internal personnel density is high, the space is relatively narrow, and the pathogen is easily transmitted through aerosols and droplets, resulting in the outbreak of infectious diseases [8]. There is often a variety of entertainment places in luxury cruise ships, including atrium, restaurants, cinemas, opera houses, swimming pools, libraries, shops and other public places, which will receive a large number of tourists. It is easy to cause the spread and spread of pathogens because of frequent flow of people [9].

3.5. The Medical Conditions on the Cruise Ship Are Limited

Luxury cruise ships are usually equipped with an infirmary to provide basic medical services for passengers. However, due to the limited supply of medical equipment, the limited reserve of drugs and medical devices, and the professional level and professional field of medical personnel are uneven, once a health emergency occurs, the medical capacity on the

cruise ship is difficult to meet the needs of prevention and treatment. In the case of highly infectious diseases and passengers can not get effective treatment, the mass infection event is easy to occur.

4. Suggestions on Epidemic Prevention and Control on Luxury Cruise Ships

4.1. Improve the Existing Legal and Normative System

4.1.1. Improve the Health and Epidemic Prevention Standards for Cruise Ships

In the design and construction stage of cruise ships, *Ship Epidemic Prevention and Safety Guide* can effectively give reasonable suggestions and requirements, making up for the lack of health and epidemic prevention regulations in the process of cruise ship construction [10]. However, *Ship Epidemic Prevention and Safety Guide* is a guide document issued by the Classification Society, not a legal provision issued by the government. Therefore, in order to improve the health and epidemic prevention standards on cruise ships from the perspective of design and construction, the state also needs to formulate relevant standards, enforce them and strengthen supervision.

4.1.2. Improve the Cruise Ship Emergency Management Standards

The uniqueness of luxury cruise ships makes it different from other types of ships. Emergency management standards or norms for luxury cruise ships should be formulated at the national level to ensure that luxury cruise ships have laws to follow and cope with the outbreak of the epidemic.

4.1.3. Improve the International Norms of Cruise Rescue Under the Epidemic Situation

It is of great significance to improve the international rescue standards for cruise ships under the epidemic situation and form an international cooperation and relief mechanism [11]. Many entities, such as the flag country, the country of the port, the country of the nationality of the crew and the passengers, the country where the cruise company is located, and the country based on humanitarian voluntary relief, participate in the rescue work in an orderly manner and reasonably allocate the rescue responsibilities and obligations.

4.2. Good Public Health Management

Clean and disinfect the air conditioning filter regularly to ensure indoor air circulation operation; implement daily window ventilation and strengthen air circulation, which is important and effective. Public areas should be disinfected daily, and closed areas such as crew cabins and warehouses should be disinfected regularly. Special personnel should be responsible for them and recorded in the ship's epidemic prevention work record book.

4.3. Speed up the Upgrading of the Ventilation System

For reasons such as saving energy consumption and

reducing emissions, the ventilation and air conditioning system of luxury cruise ships generally adopts the operation mechanism of "fresh air" and "return air" mixed with "air supply", which may lead to some infectious diseases pathogens causing human infection through airborne transmission, and there is a risk of cross-infection. In recent years, the newly built luxury cruise ships generally choose all-fresh air air conditioning: the fresh air is transported to each room separately, and the return air is not connected with each other, so as to avoid the transmission of pathogens in each cabin. The fresh air inlet and return air outlet are staggered to avoid the intersection of fresh air and dirty air.

The new ventilation system technology is mature, and can effectively avoid cross-infection. Some luxury cruise ships that are still using older ventilation systems should accelerate the upgrades to the ventilation system.

4.4. Prevent the Epidemic Well

It is of great value to appropriately increase the reserve of sanitary and epidemic prevention materials on cruise ships, such as alcohol, disinfectant, masks, protective clothing, conventional antibiotics, etc. In order to provide material protection for passengers and crew. Breath machine and other professional medical facilities are also need. There should be enough temperature detection equipment and configure the temperature detection equipment for AI large passenger flow in appropriate locations to find people with abnormal temperature on the ship in time.

4.5. Improve the Level of the Medical Room on a Luxury Cruise Ship

Some medical staff on cruise ships lack the knowledge and ability to prevent and control infectious diseases, and there have been cruise ship doctors diagnosed tuberculosis patients as "hemoptysis and wait to be investigated" case [12]. It is of great significance to strengthen the training of infectious diseases for medical staff on luxury cruise ships to improve their ability to prevent, identify and respond to infectious diseases. Staff on cruise ships can also contact the epidemic prevention and control center through the shore base for telemedicine guidance, and make good observation and treatment under the advice of experts. Cruise operators can also cooperate with professional medical institutions to hire doctors accompanying the ship to solve the problem of insufficient number and level of medical staff accompanying the ship. For details, please refer to the "Xuelong 2" polar research icebreaker on the first Antarctic voyage, Shanghai Oriental Hospital was responsible for the ship medical care [3].

There are also requirements to improve the allocation of medical facilities in the clinics on luxury cruise ships, and improve the level of epidemic prevention, control and treatment. For example, the Viking Star cruise ship is equipped with a PCR accounting and testing laboratory. The medical areas on the "Quantum of the Sea" cruise ship is divided and transformed which divides the medical area into

general medical areas for routine patients and controlled medical areas for infectious disease patients.

5. Some Recommendations for the Outbreak of Infectious Disease on Luxury Cruise Ships

5.1. Coordinate with Passengers and Cooperate Actively

Once the outbreak of infectious disease occurs on a luxury cruise ship, it is far from enough only the efforts of the crew and service personnel, but also the active cooperation of the majority of passengers, which requires the operator and service personnel to properly and effectively communicate and mobilize with the passengers. In 2020, the COVID-19 outbreak on the Diamond Princess cruise ship [13], the operator failed to effectively communicate with the passengers in the first time [14], which led to a state of panic on the ship, and failed to actively and effectively cooperate with the epidemic prevention measures. In the same year, "Costa-Selena" cruise ship completed a series of work [15] such as isolation of fever patients, sample detection, virus elimination, passengers exit and evacuation of passengers within one day, which could not be separated from the close cooperation and active participation of all passengers.

The cooperation of passengers includes but is not limited to the following points: (1) actively comply with the epidemic prevention system and participate in it; (2) cooperate with the temperature detection and sample measurement, and cannot conceal the condition or hide infected persons; (3) cooperate with the operator or medical staff, consciously isolate, do not stay in public places or other areas with transmission risk; (4) maintain a positive and optimistic attitude [16].

5.2. Maintain the Normal Operation of the Basic Services on the Cruise Ship

When an outbreak occurs on a luxury cruise ship, some entertainment and leisure functions can be suspended or closed, but the basic services on the cruise ship must operate normally. First, passengers must be provided with regularly food and fresh water. During the COVID-19 period, the Diamond Princess cruise ship failed to provide sufficient food to passengers, which intensified the panic of passengers, leading to the reduced immunity of some passengers due to food shortage, and some passengers have responded negatively to the epidemic prevention measures on board. Secondly, workers should adhere to the daily disinfection work and increase the frequency of disinfection. To maintain the normal operation of the medical treatment and anti-epidemic capacity of the infirmary on the cruise ship, if necessary, the helicopter or other ways could be used to deliver samples to professional medical institutions, transport epidemic prevention materials or professional medical personnel to ships.

5.3. The Ship and Shore Linkage Work Well as Soon and Well as Possible

In case of a serious infectious disease on the cruise ship, it is necessary to contact the nearby country or region, the flag country, the port country, the country of the nationality of the crew and the passengers as soon as possible, and look for the allowed port while reporting the epidemic. On the one hand, with the help of local medical and health resources, it could be quick to conduct sample testing, properly settle uninfected passengers and so on. On the other hand, if some people need to be quarantined on a cruise ship due to the severity of the epidemic, it is also of great help to use the strength of the port and the local government to ensure adequate food and medical supplies such as daily necessities and fresh water.

5.4. Epidemic Prevention and Control on Cruise Ships

Once a serious infectious disease outbreak occurs on a luxury cruise ship, the role of the staff on the cruise ship is absolutely irreplaceable. They will undertake the responsibility to maintain the normal operation of basic services, disinfect the whole cruise ship and some high-risk areas, control corridors, staircases and other places, dissuade passengers from non-essential activities in public areas. At the same time, they should pay attention to their own physical and mental health while taking good care of passengers.

6. Conclusion

In the sudden public health safety incidents on luxury cruise ships, the life and health of passengers must be guaranteed. There are still many shortcomings in the current international regulations to be improved, and countries have failed to cooperate on the prevention and control of the epidemic by providing medical care and material assistance. Only by forming effective international cooperation, improving the configuration of relevant epidemic prevention facilities on luxury cruise ships, coordinating the active cooperation of tourists, and forming efficient cooperation and joint response, can the lives and health of passengers and crew be guaranteed and the ability of the cruise industry to resist the risks of the epidemic be improved.

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