

Perspective

Real-world experience on cruise ships in the Canary Islands highlights that safe travel is possible

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Background

The coronavirus disease 2019 (COVID-19) pandemic has a severe impact on cruise activity (1). The Canary Islands received 2.5 million cruise passengers in 2019 (2). After the initial international lockdowns, in November 2020 some cruise companies restarted their activities in the Canary Islands, where COVID-19 incidence was substantially lower than in other European regions. The public health authorities of the Canary Islands developed a rigorous protocol to reduce the risk of outbreaks on cruises that restarted activities in the archipelago. Effective response to COVID-19 cases on board requires predefined plans at ports and on ships, trained staff and coordinated efforts between ships and local authorities (3). The European Maritime Safety Agency (4), CDC (5), Health Ministry and Maritime Authorities in Spain (6,7) published guides and recommendations for cruise ships for COVID-19 prevention and management of cases.

The Canary Islands was one of the first regions to restart cruise activities after the lockdowns and the European region with the highest number of passengers and crew mobilized. We aim to describe our real-world experience with COVID-19 outbreaks detected on cruises between November 2020 and May 2021.

Method

Canary Islands COVID-19 preventive protocol for cruises, and management of COVID-19 outbreaks between November 2020 and May 2021 are described.

Results

COVID preventive protocol is described in Table 1. The port authority must coordinate the implantation of port measures. The plan must be audited by a Certifying Agency.

The shipping company must provide the following information to the health authorities: Itinerary (stopover dates in each port); ship capacity; on-board medical resources (healthcare staff and equipment); pre-boarding, on-board and disembarking prevention protocol (as described in Table 1) and protocol for the management of COVID-19 cases and close contact detected on board.

On-board medical service performs epidemiological study and identification of close contacts. Close contacts are classified according to European Centre for Disease Prevention and Control (ECDC) and regional health service definition (a person who has been in the same place as a COVID-19 case at <2 m for >15 min during a 24-h period even if it is not consecutive, within a period of time ranging from 2 days before to 10 days after the onset of symptoms or diagnosis if asymptomatic). Suspected cases and close contacts are tested on board and, if necessary, confirmed on land. Cases are notified to the Canary health authorities with an encrypted notification form completed by the ship's doctor, together with the epidemiological report, and the prevention and control measures established. An external prearranged medical service at the port of disembarkation is informed. Cases and close contacts are safely disembarked and transferred to the medical service on land or to the accommodation facilities arranged for this purpose by the shipping company. The external prearranged medical service monitors the

Table 1. Recommendations in COVID-19 prevention protocol

Limiting total number of on-board people <75% of the ship capacity
Reducing interaction between groups of passengers and crew (different meal times, embarkation and disembarkation and participation in the ship's activities, crew cabins for ≤2 members)
Health questionnaire including exposure to COVID-19 case in last 14-days or COVID-19 symptoms. Any passenger or crew who has symptoms compatible with COVID-19, has a positive acute infection diagnostic test (<72 h) or is a close contact of a case is not allowed to board.
COVID-19 vaccination of crew and passengers is recommended, according to availability*
Pre-boarding negative COVID-19 test (one negative PCR 72 h before boarding or one negative antigen test on same boarding day for passengers, and both negative test for crew).
Compulsory 10 days quarantine with negative PCR at the end of quarantine period, for crew
Negative antigen test for passengers 48 h before the return to their country of origin (compulsory for international flights)
Periodic antigen test screening on board (some companies made it weekly for crew, and on third and fourth day of trip for passengers)
Daily temperature and symptom screening on the passengers and crew
The use of a mask (for both passengers and crew) is required indoors, in those spaces of shared use (on board and excursions), except when eating, drinking or during the stay in the cabins.
Physical distancing (at least 1,5 m between individuals) to be maintained during boarding, in waiting areas and transport stations
Frequent handwashing with soap or alcohol-based liquids
Deep cleaning of ship after every roundtrip
Well-maintained heating, ventilation and air conditioning systems.
Isolation space on board for cases and close contacts (1% of the maximum capacity, or 5% if disembarkation is not feasible in <24 h)
Confirmed or suspected cases are immediately isolated in a designated single and well-ventilated cabin until earliest possible disembarkation
Accommodation and health assistance prearranged on land for cases and close contacts (covering all needs during isolation or quarantine)

* COVID-19 vaccination available in Europe from last days of 2020 December

isolation of the cases (until 3 days after the resolution of fever and symptoms with a minimum period of 10 days from the onset of symptoms or diagnosis) and the quarantine of close contacts (for 10 days after the last contact with a negative polymerase chain reaction (PCR) if not diagnosed previously as a case). Regional health authorities are informed of their evolution. The insurance company covers all expenses for cases and close contacts.

From November 2020 to May 2021, five European flag ships, with a total of 103 500 passengers and 3228 crew, navigated on 80 itineraries between different Canary Islands, with routes lasting 7 or 14 days, without leaving the national borders ([Supplementary Table 1](#)).

Description of outbreaks on cruise ships

Two COVID-19 outbreaks were detected and notified to the Canary public health authorities on two ships, namely 'cruise number 1' and 'cruise number 2'.

The first case was diagnosed on 28 January 2021 and the last case was diagnosed on 12 May 2021. A total of 20 cases (19 passengers and one crew member) and 96 close contacts (68 passengers from among 63 709 passengers and 28 crew members out of 1420) were identified during the 7 months of navigation. Fifty-five percent of cases were men and the average age of the confirmed cases among the passengers was 46,1 years (in the range 6–70 years) and 28 in the crew. All confirmed cases among the passengers were European (German) and the only crew case was Indonesian. Two cases were hospitalized, one of them in the intensive care unit. All cases were alive at epidemiological discharge. None of the cases was vaccinated. Detailed information about cases is described in [Supplementary tables 2–3](#). Information about demography or vaccination status of the rest of the passengers and the crew was not available to

the authors, except that all passengers came from and returned to a European country (mainly Germany), and that there was no age restriction.

Management of suspected and confirmed cases and close contacts followed the previously described protocol. Epidemiological detailed investigation suggests that at least six of the COVID-19 cases embarked during the incubation period although they had negative test prior to embarkation. Five cases were infected sharing a cabin with an undetected case. Four cases were infected due to close relation with an undetected case. Two cases were infected in an on-board restaurant (sharing a table or in a nearby seat close to an undetected case). Two cases were infected sharing an open bar for smokers. The only infected staff was the cabin cleaner of an undetected case. Except for two passengers who developed symptoms during the trip, the rest of the cases were asymptomatic at diagnostic and were detected during routine screening prior to disembarkation, or during close contact screening once a case was diagnosed. All cases and close contacts were disembarked and isolated or quarantined on land.

Discussion

Cruise activity could be safer if a strict preventive protocol is applied and permanent communication is established between on-board medical service, shipping company, and local port and public health authorities. In the Canary Islands, during 7 months of cruise activity and with >100 000 passengers, only 19 passengers and one crew member were infected. In the analysed period (between the epidemiological weeks 45/2020 to 23/2021) Delta was not the main variant of concern in the European Union. In the Delta and Omicron-era, an increased incidence of COVID-19 has been reported on cruise ships worldwide (8).

Although vaccination was not widely available at the analysed period and by the end of May 2021, <20% of EU cit-

ized were fully vaccinated, the green passport for vaccinated passengers on cruise would be an additional relevant preventive measure, and several international cruise companies require all crew and passengers be vaccinated. But the absence of evidence on the complete protection attributable to vaccination highlights the fact that non-pharmacological interventions should continue to be maintained, since the 'bundle' application of pharmacological and non-pharmacological interventions is more effective than any one single measure.

Interestingly, as no official recommendation about periodicity of on-board screening was made, different policies were used by shipping companies. Some cruise ships screened on the third day after embarkation, while others screened every fifth or 15th day. In all cases, the last screening was carried out the day before the cruise ended, since only those passengers with a negative test could take a return flight to their original point of departure. The pre-disembarkation screening was one of the main ways to detect COVID-19 cases on board, as the majority of cases were asymptomatic.

In short duration cruises, some COVID-19 cases could be detected once the trip is finished. Nevertheless, the epidemiological investigation in the present study was very detailed, more than in other contexts. And close contacts were identified, quarantined and medically supervised during 10 days. Secondary attack rate between the identified close contacts during quarantine was only 3% (Supplementary Table 2). These data give us some certainty that dissemination of virus had been diminished to the maximum.

CDC recently recommends getting tested 3 to 5 days after going on a cruise and self-monitoring for COVID-19 symptoms for 14 days afterwards (9).

Increasing evidence shows the crucial importance of adequate ventilation to reduce the risk of coronavirus transmission (10). On board there are closed spaces in which non-cohabitating people meet and interact, sometimes without using the mask (restaurants, bars, theatres, gyms). It is strongly recommended that most activities take place outdoors. But if it is not possible, the recent WHO 'Roadmap to improve and ensure good indoor ventilation in the context of COVID-19' (11) recommends a minimum ventilation rate of 10 l/s/person to dilute pollutants, allow adequate ventilation before another group occupies the same space, maintaining and cleaning the heating and air conditioning, avoiding recirculation. If no other strategies can be adopted, using filters on air return or air purifiers with particle filters are recommended. Good indoor ventilation is also particularly important in the cabins where COVID-19 cases or close contact are isolated or quarantined on board. All these cabins must be outward-facing, with practicable and wide portholes and an adequate ventilation rate, private toilet with an air extractor, running continuously at high speed. The indoor air of these cabins should not be reused and should be eliminated directly outward, away from air intake vents and people.

When a case was detected on board, the medical service carried out a comprehensive epidemiological investigation. It was facilitated by the existence of detailed records of activities (table and chair location in restaurants, excursions, etc.), pre-assigned staff to specific on-board services (massage, cabin cleaning, etc.), and the existence of closed television circuit. Medical staff reviews these registries during the risk period (48-h prior

to positive result of index case) and look for risk situation that fulfils the definition of 'close contact' (<2 m, >15 min, no preventive measures as mask). These measures should be maintained, as 21% of confirmed cases were casual contacts of a case at on-board food and beverage venues.

Only European flag cruise ships, with passengers arriving directly from a European airport were allowed to travel to the Canary Islands during study period. All cruise companies were German except one which was Portuguese. Ninety-five percent of COVID-19 cases detected were from Germany, where weekly cumulative COVID-19 incidence in study period was 5–26 cases/100 000 inhabitants. Although information regarding the nationality of the 100 000 passengers was not available, due to European Union travel restrictions all passengers from foreign countries were required to present a negative diagnostic test prior to arrive at a Spanish airport.

Cruise route between the Canary Islands is short (100–200 km), which facilitates the rapid disembarkation of cases and contacts, and has given good results in the management of outbreaks of COVID-19. Early evacuation of all COVID-19 cases (passengers and crew) and close contacts has been mentioned as a key measure to avoid secondary cases on board (12). In our experience, it is not necessary to prearrange a minimum of hospital beds and non-hospital accommodation on land, as long as preventive measures (mainly: vaccination, universal mask wearing, ventilation and regular screening) are rigorously maintained.

In conclusion, with coordinated work and communication between cruise medical staff, port agency and port and public health authorities, >100 000 cruise passengers were safely mobilized with few COVID-19 cases and no significantly large outbreaks. Non-pharmacological measures, periodic screening, exhaustive epidemiological investigation and early disembarkation of cases and close contacts with prearranged medical supervision were key measures in the pre-Delta and pre-Omicron era.

Supplementary Material

Supplementary material is available at *JTMEDI* online.

Author statements

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Author contributions

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References

1. March D, Metcalfe K, Tintore J, Godley BJ. Tracking the global reduction of marine traffic during the COVID-19 pandemic. *Nat Commun* 2021; 12:2415.
2. <https://www.statista.com/statistics/385445/number-of-passengers-of-the-cruise-industry-worldwide/> (accessed 28 December 2021)
3. Mouchtouri VA, Dirksen-Fischer M, Hadjichristodoulou C. Health measures to travellers and cruise ships in response to COVID-19. *J Travel Med* 2020; 27:taaa043.
4. European Maritime Safety Agency. COVID-19: EU guidance for cruise ship operations <http://www.emsa.europa.eu/publications/inventories/item/4273-covid-19-eu-guidance-for-cruise-ship-operations.html> (accessed 28 December 2021).
5. Center for Disease Control. COVID-19 orders for cruise ships. <https://www.cdc.gov/quarantine/cruise/index.html> (accessed 28 December 2021).
6. Ministerio de Sanidad. *Medidas sanitarias para el restablecimiento de los cruceros internacionales*. Actualizado a 18 de mayo de 2021. https://www.mitma.gob.es/recursos_mfom/paginabasica/recursos/medidas_sanitarias_para_el_restablecimiento_de_cruceros_internacionales.pdf (accessed 28 December 2021).
7. Resolución de 27 de mayo de 2021, de la Dirección General de la Marina Mercante, por la que se adoptan medidas sanitarias para los buques de pasaje tipo crucero. <https://www.boe.es/boe/dias/2021/05/29/pdfs/BOE-A-2021-8973.pdf> (accessed 28 December 2021).
8. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention. Temporary extension & modification of framework for conditional sailing order. Available at <https://www.cdc.gov/quarantine/cruise/pdf/CDC-CSO-Extension-10-25-21-p.pdf> (accessed 28 December 2021).
9. Centers for Disease Control and Prevention. Covid-19 and cruise ship travel. <https://wwwnc.cdc.gov/travel/notices/covid-3/coronavirus-cruise-ship> (accessed 28 December 2021).
10. Wang CC, Prather KA, Sznitman J *et al*. Airborne transmission of respiratory viruses. *Science* 2021; 373:eabd9149.
11. Roadmap to improve and ensure good indoor ventilation in the context of COVID-19. Geneva: World Health Organization; 2021.
12. Rocklöv J, Sjödin H, Wilder-Smith A. COVID-19 outbreak on the diamond princess cruise ship: estimating the epidemic potential and effectiveness of public health countermeasures. *J Travel Med* 2020; pii: taaa030.