



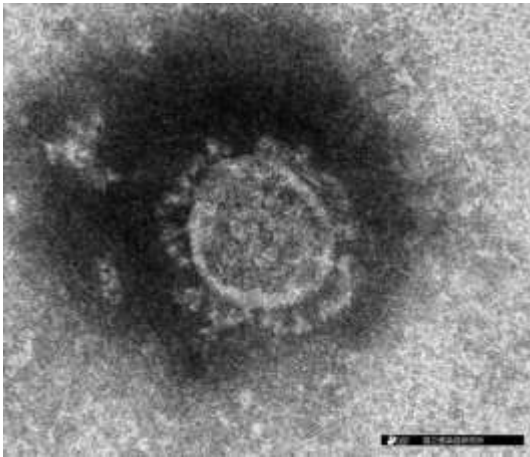
# COVID-19 OUTBREAK ON THE DIAMOND PRINCESS CRUISE SHIP

~ What is the difference with a **hospital ship**? ~

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**Initial Investigation of Transmission of COVID-19 Among Crew Members  
During Quarantine of a Cruise Ship — Yokohama, Japan, February 2020**

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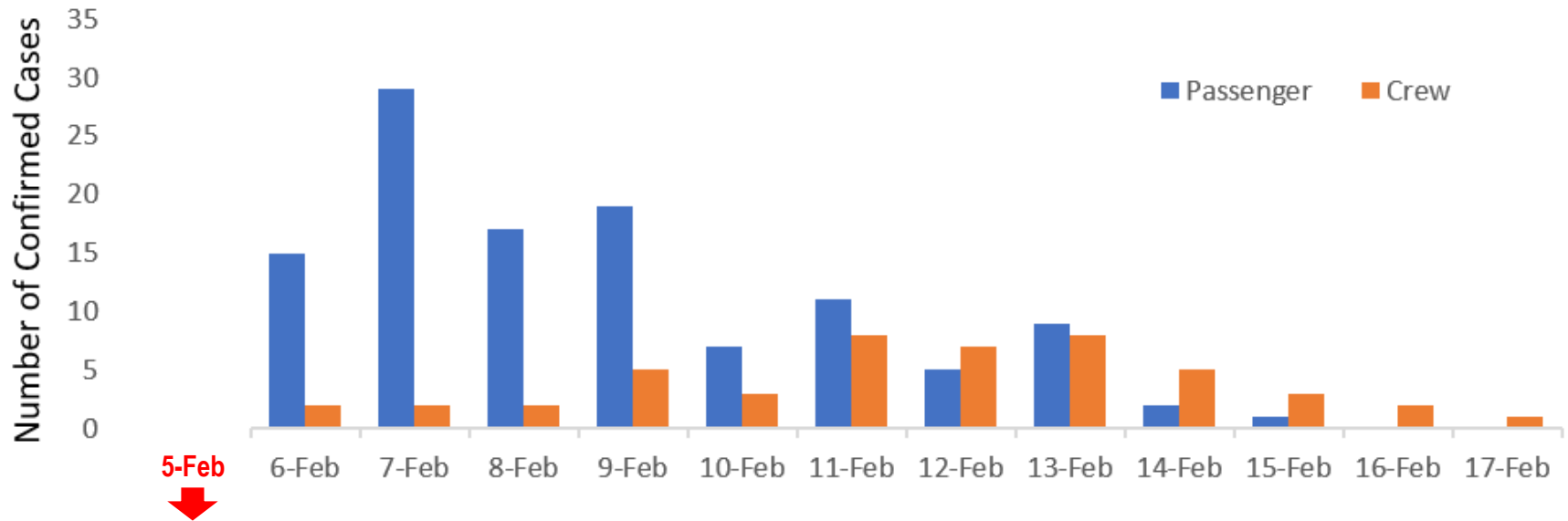
An outbreak of coronavirus disease 2019 (COVID-19) among passengers and crew on a cruise ship led to quarantine of approximately 3,700 passengers and crew that began on February 3, 2020, and lasted for nearly 4 weeks at the Port of Yokohama, Japan. By the end of quarantine, a total of 619 passengers and 20 crew had been infected by the coronavirus.

## Problem-1. **Incompleteness of the isolation**



As the cruise line docked Yokohama port in Japan and medical officials were on board to screen some passengers in their rooms, many other were still mingling freely, eating buffets and attending theater performances.

## Confirmed COVID-19 Cases, by date of onset, Diamond Princess, 6 - 20 February 2020 (n=163)



### Start of the quarantine

(~19-Feb)

2666 passengers, 1045 crew

Based on the number of confirmed cases by onset date, there is clear evidence that substantial transmission of COVID-19 had been occurring prior to implementation of quarantine on 5 February.

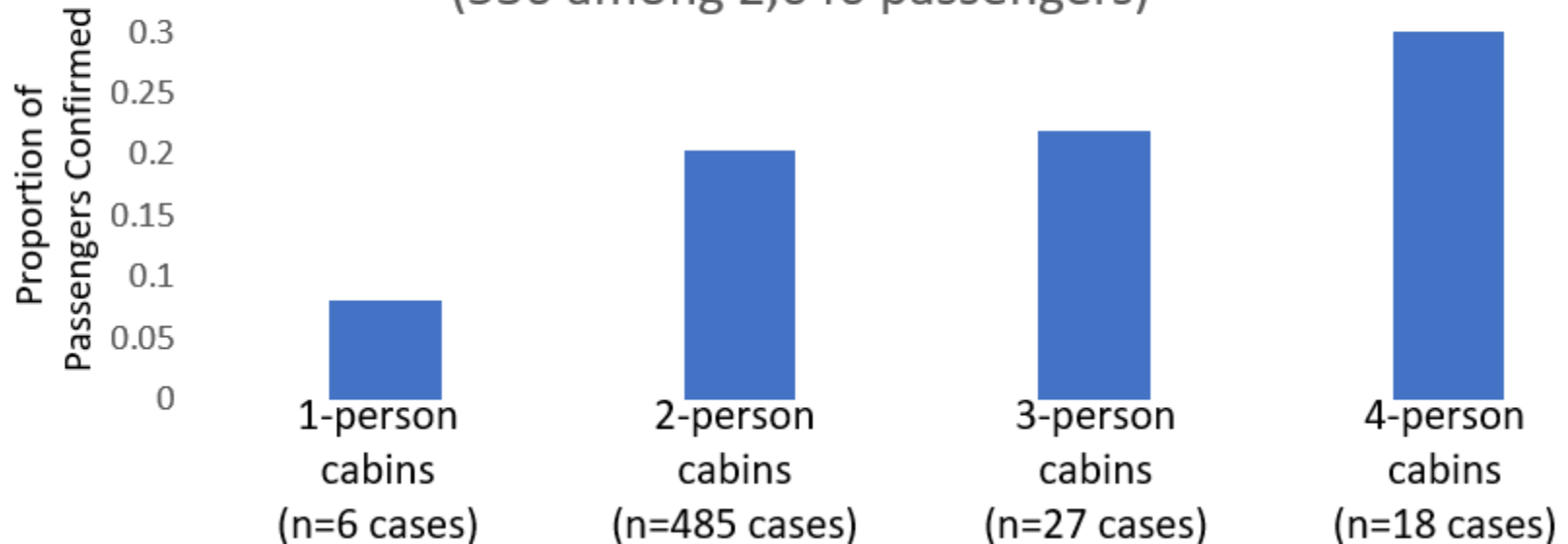
Transmission toward the end of the quarantine period, appears to have occurred mostly among crew or within passenger cabins.

## Problem-2. **Difficulty of zoning**



For the inboard design that focused on entertainment characteristics and livability, the cruise ship originally has a structure not to be suitable for zoning. Besides, it was not able to move ill persons to other rooms for the no vacancies in the ship. They could not help staying in 2-4 person cabins until leaving the ship.

## Proportion of COVID-19 Cases Among Passengers, by Cabin Occupancy, Diamond Princess, 5 - 19 February 2020 (536 among 2,646 passengers)



81% of cases among confirmed passengers or crew with reported onset dates occurred in crew or passengers from cabins with a previously confirmed case. Due to the nature of the cruise ship, individual isolation of all those aboard was not possible. Sharing of cabins was necessary.



### Problem-3. **Insufficient ability for the infection control of the crew**



The crew members, who were the ones most exposed to infections, were not given proper protections. They did not sleep in separate rooms, and they worked in close ranges and eat at tables of 14 for meals. Even officials responsible for screening passengers and crew members were infected. Many of them did not wear protective gears and had no experience in dealing with epidemic.

TABLE. Coronavirus disease 2019 (COVID-19) cases and fever status among crew members aboard a cruise ship (N = 1,068) — Yokohama, Japan, February 2020

Characteristic	No. of crew members	No. (%) febrile at the time of survey		No. (%) confirmed cases <sup>†,§</sup>
		Feb 3	Feb 9*	
Type of work				
Food service	245	0 (—)	20 (8)	15 (6)
Housekeeping	176	0 (—)	0 (—)	1 (1) <sup>¶</sup>
Galley	135	0 (—)	3 (2)	0 (—)
Beverage service	61	0 (—)	2 (3)	2 (3)
Deck	57	1 (2)	2 (4)	0 (—)
Steward	53	0 (—)	1 (2)	1 (2)
Guest service	40	1 (3)	1 (3)	0 (—)
Gift shop	28	1 (4)	0 (—)	0 (—)
Production cast	27	0 (—)	1 (4)	0 (—)
Arts	5	0 (—)	1 (20)	0 (—)
Others	241	0 (—)	0 (—)	1 (—)
Total	1,068	3 (0.3)	31 (3)	20 (2)

COVID-19 was likely transmitted first from passengers to crew members and subsequently spread among the crew, especially among food service workers. 15 of the 20 confirmed cases in crew members occurred among food service workers.

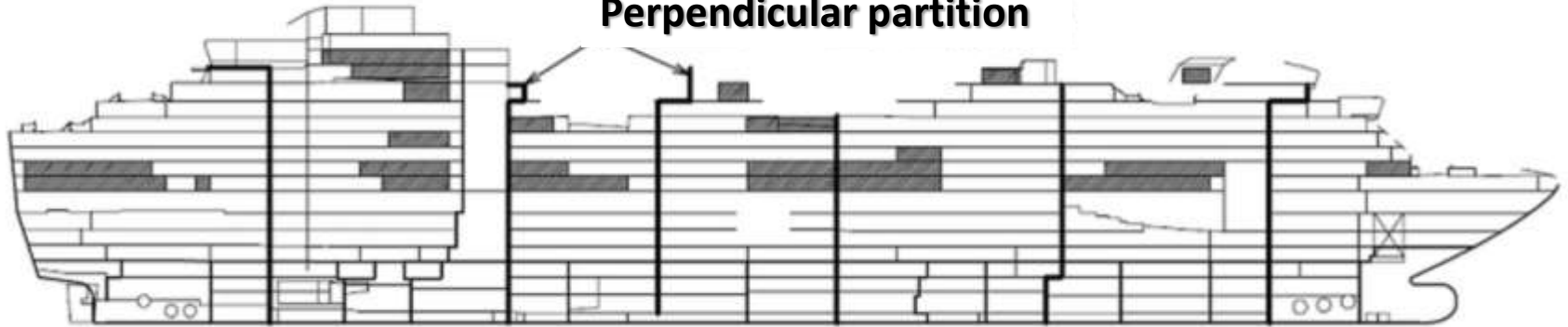


**The point** that we should assume **a lesson**  
on preparing for **a hospital ship** :

1. The design that **strategic, applicable zoning** is available for
- 2. Separable air-conditioning** system
- 3. Thorough Education and training** of the infection control for all crew



### Perpendicular partition

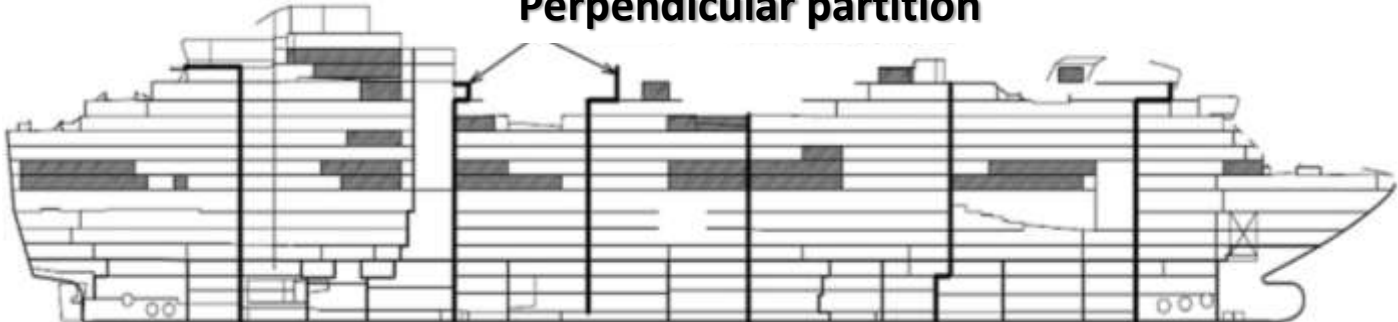


As for the passenger ship more than 36, the hull, a mast, a deckhouse is divided a passenger volume in the main perpendicular area within 40m in length by fire prevention structure. A lot of fire prevention doors are installed in the passage, and, in the case of the fire, they are closed automatically and leaves a fire in one **fire prevention division**. In addition, the fire prevention partition becoming this adjacent border with the division is designed so that it is to a **watertight subdivision** and the equivalence borderline under the partition deck.

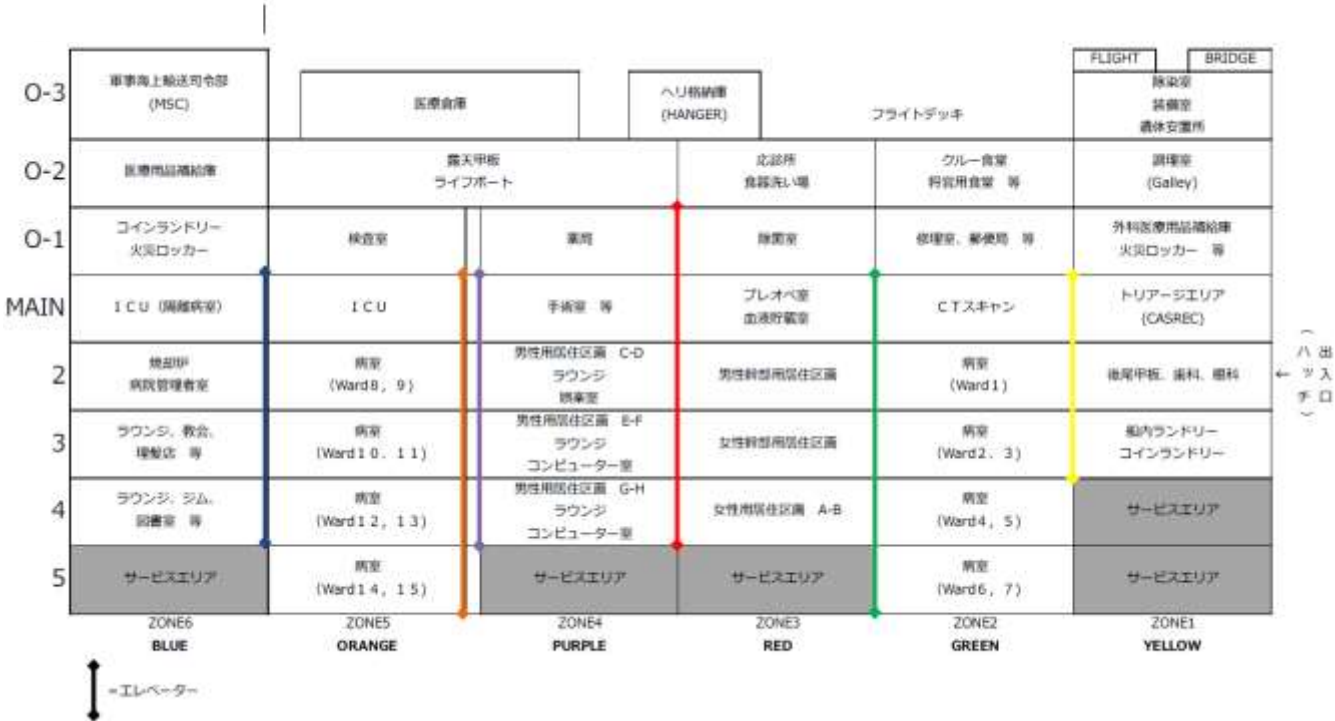
# Diamond Princess



# Perpendicular partition



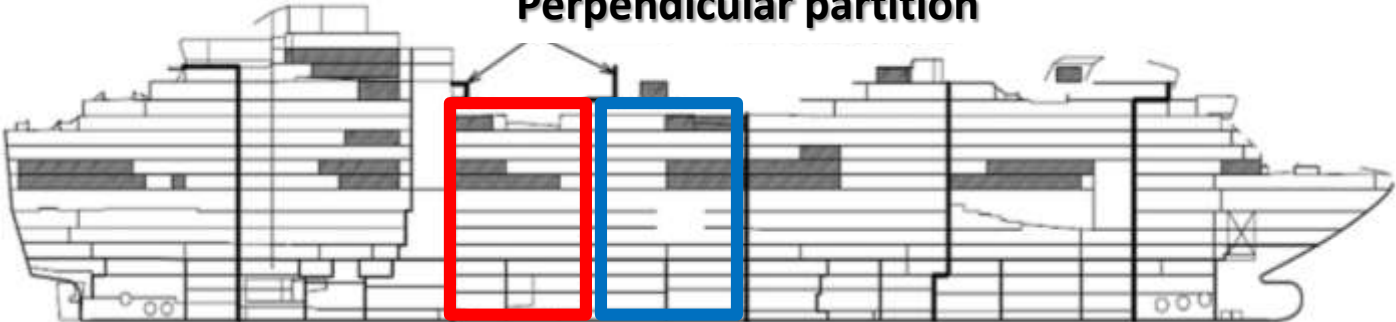
# USNS Mercy, T-AH-19



# Diamond Princess



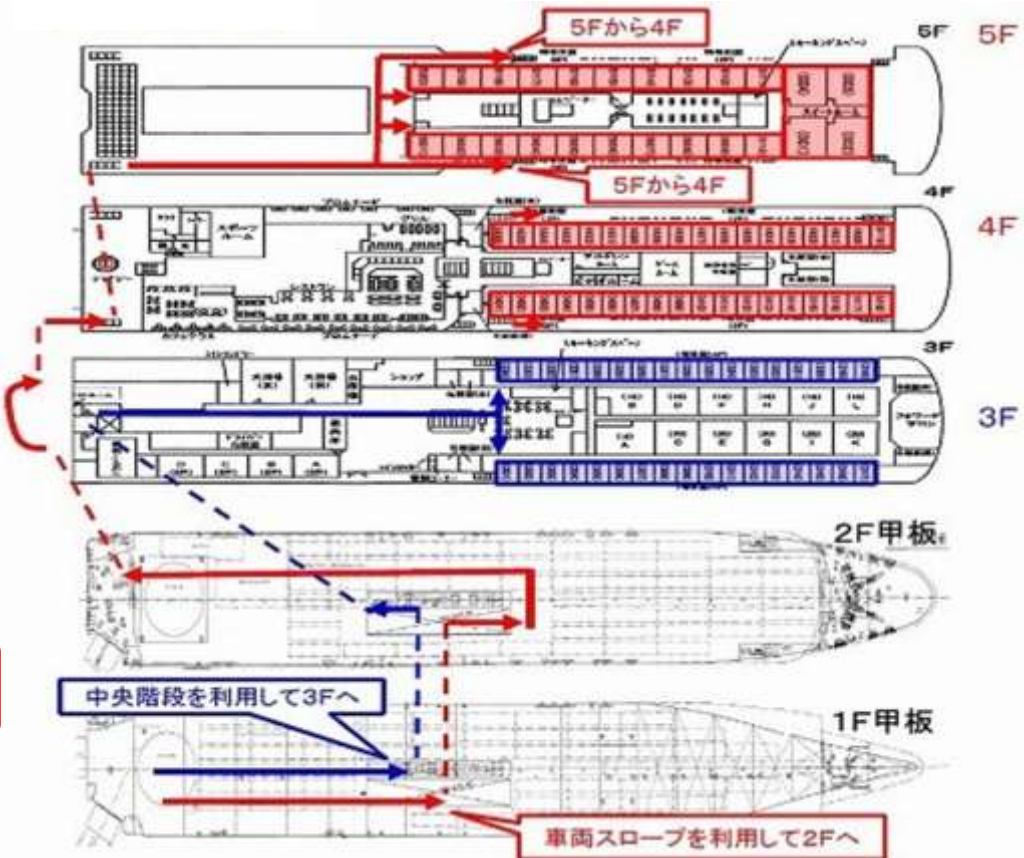
## Perpendicular partition



**Vertical zoning**

# Hakuo\*

\*Chartered by SDF



**Horizontal zoning**

**The point** that we should assume a lesson  
on preparing for a **hospital ship** (once again) :

**“medical”** needs to learn a **“ship”**,  
and the **“ship”** needs to learn **“medical”** .