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The profile of patients hospitalized with COVID-19 under the Quarantine Act in a designated hospital near an international airport in Japan

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Abstract: The Japanese Government has implemented quarantine measures in response to the COVID-19 pandemic. Individuals testing positive at the airport's quarantine office were lodged either in a designated hotel or hospital under the Quarantine Act. The aim of this study is to describe the management of patients with COVID-19 admitted under the Quarantine Act and to evaluate its impact on medical resources. Data were retrospectively collected, including demographics, comorbidities, status at admission, clinical condition, treatment, outcomes, status at discharge, duration of hospitalization, and the cost of hospitalization for all patients hospitalized with COVID-19 at this facility under the Quarantine Act between January 2020 and April 2021. A total of 48 patients (39 males, 9 females; median age: 38.5 years) with COVID-19, half (52.1%) of which were Japanese, were hospitalized under the Quarantine Act. The majority (87.5%) of the patients lived or planned to stay outside of Chiba Prefecture. The most frequent time of admission was 9 PM–1 AM. Hypoxia on admission was observed in 10 (20.8%) patients and oxygen therapy was provided to 8 (16.7%). One patient died due to respiratory failure. The median duration of hospitalization was 11 days. The total cost of hospitalization was 82,705,289 yen (approximately $760,000), which was covered by public funds. Patients hospitalized with COVID-19 under the Quarantine Act were younger and less severely ill than inpatients with COVID-19 from among the general population in Japan (according to a COVID-19 registry), but consumed a significant amount of medical resources at this hospital. An efficient system to manage patients with COVID-19 in designated hotels should be created and indications for hospitalization should be determined.

***Keywords*:** COVID-19, quarantine office, international airport, Chiba Prefecture

The Japanese Government has implemented quarantine measures in response to the COVID-19 pandemic. After COVID-19 was designated a quarantinable infectious disease in Japan on January 28, 2020 (*1*), quarantine officers started testing international travelers for symptomatic and suspected cases of COVID-19. On March 9, 2020, entry restrictions were tightened, and quarantine measures were strengthened to include testing of asymptomatic travelers and isolation for travelers who test positive (*2*).

As of May 1, 2021, all international travelers must submit a certificate of negative test result of pre-entry COVID-19 test conducted within 72 hours prior to departing from the country/region where they were staying and undergo a quantitative antigen test or nucleic acid amplification test upon arrival. In addition, those who have stayed in countries/regions with community transmission of SARS-CoV-2 variants of concern in the previous 14 days are required to self-quarantine for 3 days at a location designated by the quarantine station chief and to take a test again on the third day. If the test is positive, quarantine is conducted in accordance with the Quarantine Act. Even if all test results are negative, self-quarantine at home or in a hotel is required until completing the remainder of the 14-day self-quarantine period (*3,4*). Initially, all patients testing positive were admitted to a designated hospital. At present, asymptomatic positive individuals and those with mild symptoms are quarantined in a designated hotel.

The Japan Ministry of Health, Labor, and Welfare has reported 2,687 cases (of the 641,842 tests performed) of COVID-19, including 116 patients who required inpatient treatment confirmed at the quarantine office prior to May 1, 2021 (*5*). However, the Ministry has not released detailed information about those patients. The current authors' hospital is one of the designated

hospitals caring for patients with COVID-19 sent by the local government under the Infectious Diseases Control Act as well as patients with COVID-19 sent by quarantine offices under the Quarantine Act. Admitting patients under the Quarantine Act in the middle of a local epidemic is a heavy burden and can affect the local healthcare system.

The purpose of this study is to describe the profile of patients with COVID-19 admitted to this hospital and to evaluate the impact of admitting patients referred from the quarantine office under the Quarantine Act.

This hospital-based, retrospective cohort study was conducted at the Japanese Red Cross Narita Hospital, a large tertiary teaching hospital with 716 beds, located 20-minutes' drive from Narita International Airport in Chiba, Japan. This hospital is one of the two major hospitals that treat patients from the Narita Airport Quarantine Station under the Quarantine Act. The study was approved by the Ethics Committee of the Japanese Red Cross Narita Hospital under the condition that the confidentiality of all personal data be maintained (JRCNH-718-01). Given the retrospective, observational nature of the study, the requirement for individual consent was waived.

Subjects included all patients with COVID-19 who were admitted under the Quarantine Act between January 2020 and April 2021. Information on these patients was obtained from this department's database. The diagnosis of COVID-19 was made based on either a nucleic acid amplification test or antigen quantification test. Patients with COVID-19 hospitalized under the Infectious Diseases Control Act were excluded.

Information on demographics, comorbidities, status at admission, clinical condition, treatment, outcome, status at discharge, and duration of hospitalization was retrospectively collected from electronic medical records. The cost of hospitalization was also ascertained for each patient. Categorical variables are shown as numbers and percentages and continuous variables are shown as medians and ranges.

In total, 48 patients were admitted to this hospital under the Quarantine Act during the study period. Table 1 summarizes the patients' demographics, characteristics, and comorbidities. The median patient age was 38.5 years, and 39 patients (81.3%) were males. Approximately half (52.1%) of the patients were Japanese. The most common comorbidity was diabetes (12.5%), followed by a chronic respiratory disease and obesity (6.3%). The region where the patient had been most frequently before arriving in Japan was South Asia (29.2%), followed by Southeast Asia (22.9%). The two primary reasons for international travel were business (43.8%) and visiting friends or relatives (39.6%). Most (87.5%) of the patients did not live in Chiba Prefecture or they had planned to stay outside of it.

Table 2 summarizes the patients' status at admission, treatments, outcomes, and costs. The reason for admission varied. One-third (35.4%) of the patients had either hypoxia or respiratory distress. Two patients were hospitalized for evaluation or treatment of other diseases, such as malaria or tuberculosis. Three other patients were hospitalized due to a language barrier, the need for a regularly prescribed medication, and uncontrolled diabetes. Two-thirds (64.6%) of the patients were transported to this hospital directly from the quarantine station at Narita International Airport, and the remaining patients (35.4%) were from the hotel designated by the quarantine office. The most frequent time of admission was 9 PM–1 AM. Hypoxia on admission was observed in 10 patients (20.8%) and oxygen therapy was provided for 8 (16.7%). Signs of pneumonia were found in 23 patients according to a chest X-ray and in 22 patients according to a computed tomography scan. Therapy with remdesivir was provided to 7 patients (14.6%). Steroids and anticoagulants were administered to 8 patients (16.7%). Most (89.6%) of the patients were discharged; 4 (8.3%) patients were transferred to a designated hotel because of the time needed to fulfill the discharge criteria. Only one patient died due to respiratory failure. The median duration of hospitalization was 11 days, and the total duration of hospitalization was 551 days.

Table 1. Patient demographics, characteristics, and comorbidities (n = 48)

Characteristics	Overall (n = 48)
Median age in years (range)	38.5 (0-74)
Sex: male/female	39/9 (81.3/18.8)
Ethnicity	
Japanese	25 (52.1)
Non-Japanese	23 (47.9)
Comorbidities*	
Diabetes	6 (12.5)
Chronic respiratory disease	3 (6.3)
Obesity	3 (6.3)
Cardiovascular disease	1 (2.1)
Cerebrovascular disease	0 (0)
Severe renal disease or dialysis	0 (0)
Solid tumor	0 (0)
Immunosuppression	0 (0)
Region the patient visited before arriving in Japan	
South Asia	14 (29.2)
Southeast Asia	11 (22.9)
North America	7 (14.6)
Africa	6 (12.5)
Europe	5 (10.4)
Central and South America	2 (4.2)
Central and West Asia	2 (4.2)
East Asia	1 (2.1)
Oceania	0 (0)
Purpose of international travel	
Business	21 (43.8)
Visiting friends or relatives	19 (39.6)
Study	4 (8.3)
Tourism	4 (8.3)
Place of residence or destination in Japan	
Chiba Prefecture	6 (12.5)
Other	42 (87.5)

*Each comorbidity is defined according to a previous study (*8*).

Table 2. Patients' status at admission, treatments, outcomes, and costs (n = 48)

Characteristics	Overall (n = 48)
Main reasons for admission	
Hypoxia/Respiratory distress	17 (35.4)
Other symptoms (*e.g.*, fever, cough, sore throat)	26 (54.2)
Evaluation or treatment of other diseases (pulmonary tuberculosis or an imported tropical disease)	2 (4.2)
Other (*e.g.*, language barrier, lack of regular medication, uncontrolled diabetes)	3 (6.3)
Location prior to hospitalization	
Airport*	31 (64.6)
Hotel designated by the quarantine office	17 (35.4)
Time of admission	
9 AM–1 PM	10 (20.8)
1 PM–5 PM	6 (12.5)
5 PM–9 PM	12 (25.0)
9 PM–1 AM	19 (39.6)
1 AM–5 AM	0 (0)
5 AM–9 AM	1 (2.1)
Hypoxia on admission	10 (20.8)
Signs of pneumonia on chest X-ray	23/39 (59.0)
Signs of pneumonia on CT scan	22/38 (57.9)
Supportive care	
Oxygen therapy	8 (16.7)
High-flow oxygen device	2 (4.2)
Medication	
Remdesivir	7 (14.6)
Favipiravir	1 (2.1)
Tocilizumab	1 (2.1)
Steroid	8 (16.7)
Anticoagulant	8 (16.7)
Outcomes	
Discharged home	43 (89.6)
Transferred to a designated hotel	4 (8.3)
Death	1 (2.1)
Median duration of hospitalization (range)	11 (3-25)
Total duration of hospitalization (days)	551
Total cost of hospitalization (Yen/US dollars)	82,705,289/757,652

*including one patient who was transported as a medical evacuee from Indonesia.

The total cost of hospitalization was 82,705,289 yen (approximately 760,000 US dollars), which was covered by public funds.

The current results indicated that patients hospitalized with COVID-19 under the Quarantine Act were younger and had less severe disease. In COVID-19 Registry Japan, the nationwide registry for COVID-19 in Japan (*6*), patients had a median age of 52 years, and 32.1% received oxygen therapy. In contrast, subjects of the current study had a median age of 38.5 years, and 16.7% received oxygen therapy. These differences were probably attributable to the fact that patients who are able to travel abroad are generally younger and healthier. One patient, who refused intubation and continued treatment with high-flow oxygen therapy, died. The rest of the patients recovered without sequalae.

Admitting mildly ill patients to the hospital under the Quarantine Act could negatively impact the hospital's capacity to receive local patients with COVID-19 during the pandemic. This hospital has allocated beds for patients with COVID-19 based on a contract with the Chiba Prefectural Government; admitting patients from the quarantine office will require the use of those beds. Given that 87.5% of the patients whose residence or destination in Japan was outside of Chiba Prefecture, the burden should not be limited solely to a few medical facilities near the airport. Many patients were transferred at night, which also consumed this hospital's medical resources.

The current results suggest that many of the patients transferred to this hospital could have stayed in a designated hotel with adequate medical support since the vast majority (83.3%) did not need oxygen therapy or medication for COVID-19. In addition, several patients had to be admitted for reasons unrelated to the disease, such as an inability to speak neither English nor Japanese. Several patients lacked regular medication and were thus transferred to this hospital. Since Fotheringham et al. reported that special health accommodations with the support of a virtual hospital contributed to an efficient quarantine process (*7*), remote medical management including telemedicine would help prevent unnecessary hospitalization and could save medical resources.

The current study had several limitations. First, it was a small-scale, single-center study and therefore does not reflect the characteristics of patients hospitalized with COVID-19 under the Quarantine Act throughout Japan. However, Narita Airport is the largest international airport in Japan and this hospital is one of two main hospitals admitting patients sent by the quarantine office at Narita Airport, so the current findings warrant consideration. In addition, the number of patients in this study represents one-third of the patients reported by the Government as requiring hospitalization under the Quarantine Act. Second, the criteria for admission and discharge under the Quarantine Act have changed over time, and the results could have been affected by changes in these criteria.

In conclusion, this retrospective cohort study has revealed that patients hospitalized with COVID-19 under the Quarantine Act were younger and less severely ill but consumed a significant amount of medical resources in the area near Narita Airport. An efficient system to manage patients in designated hotels should be created and indications for hospitalization should be determined using remote medical management, including telemedicine, in order to prevent unnecessary hospitalization and conserve medical resources in the local area.

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