



Surgical mask use by healthcare personnel to prevent COVID-19 spread in a long-term care facility

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Abstract

Long-term care facilities are a recognized high-risk setting for severe outcomes during the coronavirus disease 2019 (COVID-19) outbreak. This study describes a COVID-19 outbreak in a long-term care facility in Japan. The index case was a nurse who wore a surgical mask and used standard precautions. Of the 17 confirmed cases of COVID-19, 14 (14/93, 15.1%) were residents and three (3/69, 4.3%) were healthcare personnel (HCP); no visitors tested positive 0 (0/22, 0.0%). Mask utilization by HCP was not much effective in preventing COVID-19 transmission, even when interaction was not considered as being in close contact.

KEYWORDS

COVID-19, disease outbreaks, long-term care, masks

1 | INTRODUCTION

Long-term care facilities are frequently recognized as high-risk settings for severe outcomes from coronavirus disease 2019 (COVID-19) outbreak. Most residents are elderly or have baseline diseases, and it is difficult for some cognitively impaired residents to comply with physical distancing. Furthermore, frequent close contact occurs between residents and healthcare personnel (HCP).^{1,2} The universal use of a surgical mask has been a widely adopted practice for infection prevention during epidemics of respiratory viruses in Asian countries, including Japan.³ Surgical masks have also been recommended for use in Europe and the United States during the COVID-19 outbreak because of its possible effect in preventing transmission to asymptomatic or from presymptomatic persons.^{4,5} However, it remains unclear whether mask use among HCP could prevent transmission to residents in long-term care facilities. Here, we report a COVID outbreak in such a facility in Japan, where all

HCP were required to wear a surgical mask, including a nurse who identified as the index patient.

2 | METHODS

This descriptive study investigated efforts used to prevent COVID-19 transmission in a long-term care facility where all HCP adhered to infection control measures, such as wearing a surgical mask. We describe a COVID-19 outbreak that occurred at a 100-bed long-term care facility in Ibaraki, Japan, in March 2020. We collected data on reverse transcription-polymerase chain reaction (RT-PCR) test results as well as the disposition and clinical characteristics of the residents. The clinical characteristics of the residents were compared with the RT-PCR test result. A description of the outbreak and subsequent control measures are shown in Figure 1 and below.

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2.1 | Description of the COVID-19 outbreak and its control at the long-term care facility

The long-term care facility is situated in Tsukuba, Japan. Nurses and caregivers routinely checked vital signs and physical condition of the residents twice daily. Both noncontact (temporal) and contact thermometers were used, which were disinfected after every application. Additionally, hand hygiene and the wearing of masks and cloth aprons were routinely practiced by all HCP before the COVID-19 outbreak. Disposable gloves were worn as needed. The facility had restricted visitors from November 1, 2019, in response to an influenza epidemic; however, a few visitors were allowed to meet with a resident in a private meeting room. Following the COVID-19 outbreak, the facility completely banned visitation and mandated the wearing of surgical masks for both HCP and residents on February 24, 2020.

2.2 | Index patient and COVID-19 surveillance

A nurse at the care facility complained of fever and upper respiratory symptoms after a night shift on March 26. Subsequently, all daytime rehabilitation services were restricted and communal activities were canceled. The index case was identified by surveyors

associated with the local healthcare center. As the index case was confirmed to be COVID-19 positive by RT-PCR testing, the local health center and an affiliate hospital immediately initiated case investigation, contact tracing, quarantine of exposed persons, isolation of persons with suspected COVID-19, and on-site enhancement of infection prevention and control measures on March 29. Further, all HCP entering the rooms of symptomatic residents were required to wear eye protection, a gown, gloves, and an N95 mask. The index case was immediately admitted to an infectious disease-designated hospital despite mild symptoms.

COVID-19 surveillance among all residents and HCP by RT-PCR testing was initiated on March 30. All symptomatic patients and HCP in close contact with the index case were tested first because of the limited availability of RT-PCR tests. While these tests were completed by April 1, testing of the remaining asymptomatic residents was completed by April 2 and that of the remaining HCP was completed by April 6.

3 | RESULTS

The index case was a nurse. She had visited Tokyo that was considered as a major outbreak area in Japan before her symptoms

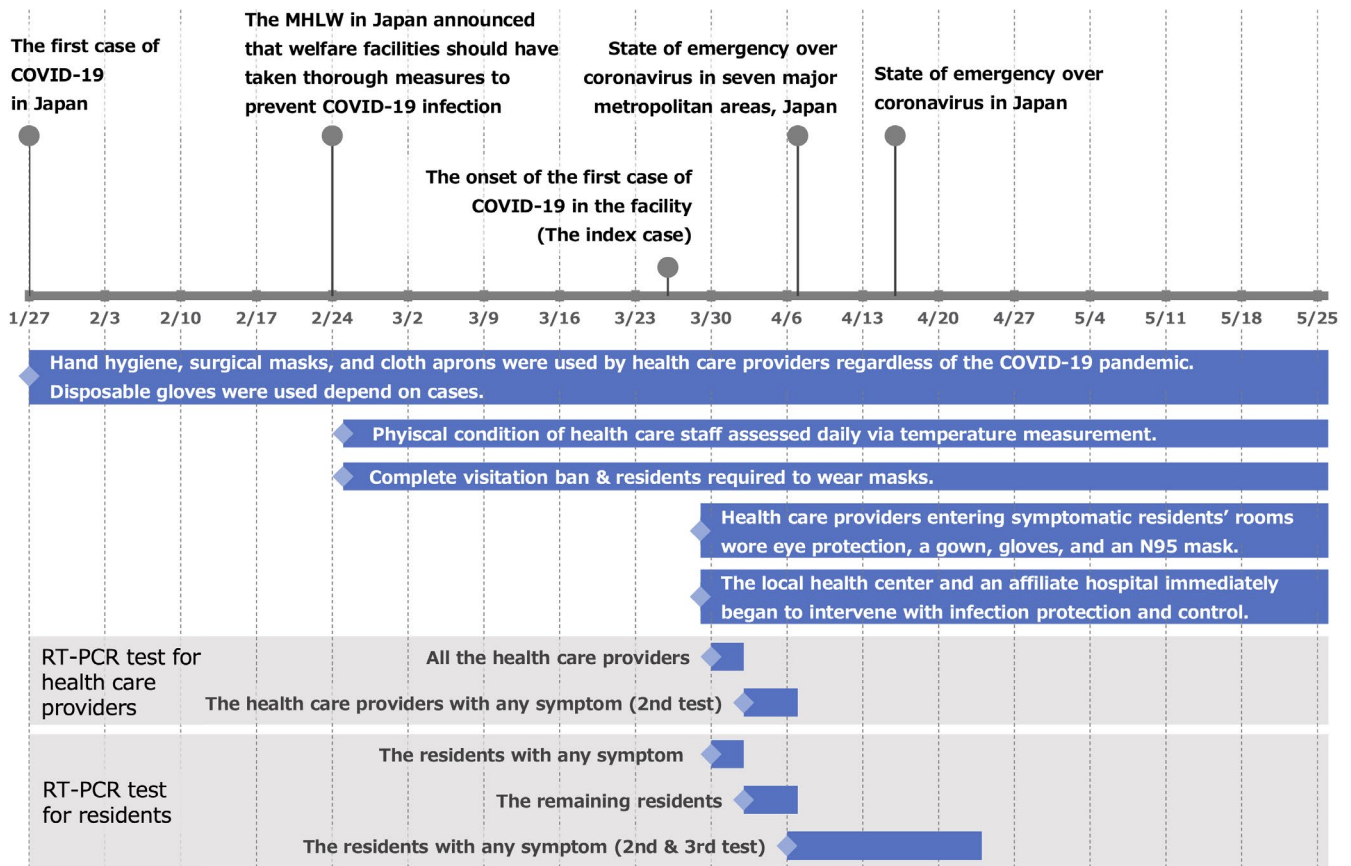


FIGURE 1 Timeline of a COVID-19 outbreak in a long-term healthcare facility, in Ibaraki, Japan, in March 2020. The measures implemented to prevent disease spread and the tests performed are shown. MHLW, Ministry of Health, Labour and Welfare; RT-PCR, reverse transcription-polymerase chain reaction

TABLE 1 Demographic and Clinical Characteristics of Residents with Confirmed COVID-19 in a long-term care facility

Characteristics	COVID-19 test result	
	Positive	Negative
n	14	79
Median age (range)—y	87 (78-98)	87 (64-101)
Sex—no. (%)	Male	
	4 (28.6)	18 (22.8)
Length of stay at facility before testing, days—Median (interquartile)	414 (130-746)	414 (122-732)
Length of stay at facility < 90 d before testing—no. (%)	1 (7.1)	17 (21.5)
Hospitalized ^b —no. (%)	Yes	
	14 (100)	6 (7.6)
Ventilator use—no. (%)	0 (0)	0 (0)
Died—no. (%)	Yes	
	4 (28.6)	3 (3.8)
Chronic underlying conditions—no. (%)	Cerebrovascular disease	21 (26.6)
	Dementia	23 (29.1)
	Cardiac disease	10 (12.7)
	Renal disease	2 (2.5)
	Hypertension	27 (34.2)
	Diabetes mellitus	12 (15.2)
	Pulmonary disease	1 (1.3)
	Cancer	9 (11.4)
	Compromised immune system	0 (0)
	Liver disease	1 (1.3)
Care-need level—no. (%)	1	8 (10.1)
	2	20 (25.3)
	3	20 (25.3)
	4	21 (26.6)
	5	10 (12.7)
Any symptoms ^a at the day when the index case confirmed	9 (64.3)	16 (20.3)
Any symptoms ^a after the day after initial surveillance, n = 84	3 (60.0)	12 (15.2)
1st RT-PCR test positive (screening), n = 93	11 (78.6)	—
2nd RT-PCR test positive, n = 18	2 (14.3)	—
3rd RT-PCR test positive, n = 1	1 (7.1)	—

RT-PCR = polymerase chain reaction

Note: There was no missing data.

Abbreviations: COVID-19, coronavirus 2019; RT-PCR, reverse transcription-polymerase chain reaction.

^aSymptoms included fever, cough, and shortness of breath, chills, malaise, sore throat, increased confusion, rhinorrhea or nasal congestion, myalgia, dizziness, and headache.

^bThe Japanese government advised that all cases of COVID-19 infection should have been hospitalized, regardless of symptoms.

occurred. She wore a standard surgical mask and using standard precautions and checked vital signs and provided care for residents during the night shift on March 26, 2020. After finishing her shift, the nurse developed a fever and upper respiratory symptoms and discontinued work. The nurse was diagnosed with COVID-19 on March 29, following which extensive screening using RT-PCR tests and contact tracing was performed, and the facility was isolated. All HCP were not considered as being in “close contact” with the index

case because they used surgical masks and adhered to standard precautions.

There were a total of 17 confirmed cases of COVID-19:14/93 (15.1%) residents, 3/69 (4.3%) HCP, and 0/22 (0.0%) visitors. The clinical characteristics of residents are presented in Table 1. All residents in the facility had do not attempt resuscitation status regardless of COVID-19 infection. All patients with COVID-19 were isolated from the facility to nearby hospitals. As of June 24, no

further cases of infection were reported, and among the infected residents, 4/14 (28.6%) had died due to COVID-19, 9/14 (64.3%) returned to the facility, and 1/14 (7.1%) remain hospitalized. Among them, two residents had died after RT-PCR was negative. All HCP with COVID-19 infection have returned to work. Among those residents without confirmed COVID-19 infection, 3/79 (3.8%) died from unrelated causes during the observation period.

4 | DISCUSSION

The index case was a nurse who routinely used a surgical mask, and the secondary spread ratio from the index case to facility residents was determined to be approximately 15%. This ratio is comparable to that reported by other studies that have investigated the effects of surgical mask utilization in healthcare workers,⁶ families,⁷ and animals.⁸ A meta-analysis to investigate the effects of face masks showed similar results to our study.⁵ Although mask use by all HCP as source control is considered to prevent transmission from a mildly symptomatic HCP (not considered as being in "close contact"),^{9,10} the wearing of a surgical mask by HCP might have had limited effects in preventing COVID-19 transmission at the long-term care facility in our study.

There are some study limitations. First, it was unclear if the index case and HCP appropriately used a surgical mask. Second, residents probably did not adhere to infection control measures, such as wearing a mask, because of dementia. Third, other infection control measures such as hand hygiene and social distancing might have had greater protective effects even though they were less modifiable in a long-term care facility.

5 | CONCLUSIONS

Mask utilization by HCP was not much effective in preventing COVID-19 transmission, even when interaction was not considered as being in close contact.

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CONFLICT OF INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

AUTHOR CONTRIBUTIONS

TA, YT, AK, and HI conceived and designed the study. TA acquired and analyzed the data. TA, YT, MI, TS, and NT interpreted the data. TA wrote the manuscript. All authors revised the manuscript critically for important intellectual content and final approval of the version to be submitted.

ETHICAL APPROVAL

Ethical committee at Tsukuba Memorial Hospital approved this study on June 6, 2020 (No. R02-06-02).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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