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## Environmental cleaning is effective for the eradication of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus in contaminated hospital rooms: A patient from the Diamond Princess cruise ship

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*To the Editor*—Doctors, nurses, and other medical staff are greatly concerned about nosocomial outbreaks of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Environmental contamination is a possible source of nosocomial transmission.<sup>1,2</sup> However, how effective environmental cleaning is against SARS-CoV-2 remains unclear.

A 75-year-old man infected with SARS-CoV-2 was diagnosed with COVID-19 during the quarantine period on the Diamond Princess cruise ship. He was transferred directly to our hospital on February 11, 2020. He resided in patient room A for 2 days then was moved to room B, where he stayed for 19 days. After cleaning the rooms thoroughly with disinfectant (Rely<sup>+</sup>On Virkon, LANXESS, or RUBYSTA in Japan), we tested 15 areas that were in close contact with the patient and medical staff. Swabs were used to transfer 5 environmental samples from room A and 10 samples from room B to universal transport media (Copan, Murrieta, CA). Cleaning was conducted immediately after the patient left the rooms. Environmental sampling was conducted within 5 days and 30 min after the patient left rooms A and B, respectively. Nucleic acids were extracted using MagMAX Viral/Pathogen Nucleic Acid Isolation Kit (ThermoFisher Scientific, Waltham, MA) and were tested using real-time reverse transcription polymerase chain reaction (RT-PCR) targeting the nucleocapsid (*N*) gene of SARS-CoV-2. Seven sets of primers and probes (CDC-N1, CDC-N2, CDC-N3, YCH-N1, YCH-N2, NIID-N1, and NIID-N2) were used to detect SARS-CoV-2 as previously described (Supplemental Table 1 online).<sup>3</sup> For the internal positive control, the human ribonuclease P 30 subunit (*RPP30*) gene was used. The patient's records, timing of cleaning and sampling, and RT-PCR results were collated.

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On admission, the patient had fever (39°C) and a mild cough (Supplemental Table 2 online). The chest X-ray and computed tomography scan on day 1 showed signs of pneumonia in both lungs. He received lopinavir/ritonavir and antibacterial therapy on day 2, but showed respiratory failure. He received supplemental oxygen from day 4 to day 15. After careful clinical management, the patient's overall status improved. RT-PCR showed that his sputum was positive for SARS-CoV-2 on day 11. Subsequently, nasopharyngeal swabs were negative on days 17, 22, and 29.

The patient stayed in room A for 3 days, during which he had the SARS-CoV-2 infection. After cleaning room A, 5 environmental samples were examined by RT-PCR. All samples were negative for SARS-CoV-2 and were positive or negative for *RPP30* (Table 1).

After the patient left room A, he resided in room B for 20 days. Ten environmental samples were collected after cleaning. All 10 samples from room B were negative for SARS-CoV-2 and were positive or negative for *RPP30* (Table 1).

SARS-CoV-2 is detectable in several types of clinical samples including bronchial lavage fluid, nasopharyngeal swab, pharyngeal swab, sputum, saliva, and feces.<sup>4,5</sup> Transmission of SARS-CoV-2 via surfaces in hospitals is of great concern to medical staff and patients. Blocking the potential routes of transmission is essential for preventing the spread of SARS-CoV-2.<sup>6</sup> A recent study showed that environmental contamination can occur via contact with patients with SARS-CoV-2 and upper respiratory tract symptoms.<sup>7</sup> After cleaning, all areas were negative for SARS-CoV-2; therefore, thorough cleaning is sufficient for SARS-CoV-2 decontamination.

This study had several limitations. First, RT-PCR was not performed before cleaning because of the risk of nosocomial transmission. Therefore, a comparison of the viral loads of high-touch areas before and after cleaning is required. Second, this study involved a single patient, and further studies are required to confirm these findings.

In summary, our data indicate the effectiveness of environmental cleaning for SARS-CoV-2 decontamination. This information is useful for infection control strategies and may alleviate the concerns of medical staff.

**Table 1.** Real-Time RT-PCR Analysis of Environmental Samples

Location	RT-PCR (No. of Samples)	
<b>Patient room A</b>	SARS-CoV-2	Human RPP30
Light switch	Negative (0/1)	Negative (0/1)
Nurse call attached to the bed	Negative (0/1)	Positive (1/1)
Toilet door handle	Negative (0/1)	Negative (0/1)
Bed guard	Negative (0/1)	Positive (1/1)
<b>Anterior room A</b>		
Dust box	Negative (0/1)	Positive (1/1)
<b>Patient room B</b>		
Bed desk	Negative (0/1)	Negative (0/1)
Bed guard	Negative (0/1)	Negative (0/1)
Door handle	Negative (0/1)	Positive (1/1)
Dust box, room side	Negative (0/1)	Negative (0/1)
Dust box, corridor	Negative (0/1)	Positive (1/1)
Control panel on mechanical ventilation	Negative (0/1)	Positive (1/1)
Light switch	Negative (0/1)	Negative (0/1)
Nurse call	Negative (0/1)	Positive (1/1)
Hand soap dispenser	Negative (0/1)	Negative (0/1)
<b>Anterior room B</b>		
Sink, external rim and internal bowl	Negative (0/1)	Positive (1/1)

Note. PCR, polymerase chain reaction; RPP30, ribonuclease P 30 subunit; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

**Supplementary material.** To view supplementary material for this article, please visit <https://doi.org/10.1017/ice.2020.144>

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# COVID-19 affects healthy pediatricians more than pediatric patients

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*To the Editor*—Coronavirus disease 2019 (COVID-19) emerged in China in late December and has spread rapidly throughout the world. The World Health Organization (WHO) considers it a pandemic. In ~4 months from start of this outbreak, as of April 4, 2020, >1,000,000 patients had been affected.<sup>1</sup>

Meanwhile, children appear less likely to be affected than adults; among the affected children, most have mild symptoms and some are even asymptomatic.<sup>2–4</sup> The Chinese Center for

Disease Control and Prevention has reported that among ~70,000 cases, <1% were aged <10 years.<sup>5</sup>

The first official COVID-19 case in Iran was announced on February 19, 2020. On March 16, 2020, 4 weeks later, the daily situation report on COVID-19 showed that <1% of ~5,000 confirmed cases were children aged <10 years.<sup>6</sup> The Children's Medical Center in Iran has 348 beds for pediatric patients, with bed occupancy rate of 94.7% and an average length of stay of 3.3 days. During the 4-week period after the first identified case in the country, only 3 positive COVID-19 cases were identified, for an estimated frequency of 1 per 1,000 admitted pediatric patients. Meanwhile, among 60 pediatricians working in this hospital, 5 were positive for COVID-19 by real-time reverse

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