Notes from the Field

A Case of an 86-Year-Old Male Survivor with Human Respiratory Syncytial Virus and SARS-CoV-2 Virus Coinfection

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As coronavirus disease 2019 (COVID-19) public health restrictions are relaxed, the circulation of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) alongside other respiratory viruses may lead to an increased likelihood of coinfection (*1*). Older patients face a higher risk of severe outcomes, when infected with multiple respiratory viruses (*2*). This study highlights the successful recovery of the oldest older adult (≥80 years) from pneumonia caused by the dual infection of human respiratory syncytial virus (HRSV) and SARS-CoV-2.

On May 18, 2023, an 86-year-old male patient with a medical history of hypertension, prostate cancer, and prior SARS-CoV-2 vaccination was admitted to the single ward of the Department of Geriatrics, First Affiliated Hospital, Zhejiang University School of Medicine. The patient presented with symptoms of cough and shortness of breath that started three days prior to admission. On May 19, a chest computed tomography (CT) scan revealed acute inflammation in both lungs (Supplementary Figure S1A, available at https://weekly.chinacdc.cn/). On May 20 (Admission day 2), the patient developed a fever. Real-time polymerase chain reaction (RT-PCR) and metagenomic next-generation sequencing (mNGS) confirmed the patient's positive status for the HRSV-B subtype and SARS-CoV-2 (reinfection). The patient received treatment including high-flow nasal cannula oxygen therapy, aerosol inhalation of ipratropium bromide, budesonide, acetylcysteine, and other symptomatic care and excellent nursing service. His respiratory symptoms significantly improved, and a positron emission tomography/CT (PET/CT) scan on May 24 a showed notable reduction in lung inflammation (Supplementary Figure S1B). The patient fully recovered after a 13-day hospital stay. Table 1 displays all the clinical symptoms and signs.

The patient's sputum was collected on May 20 at the hospital and a respiratory viral panel using RT-PCR confirmed the presence of HRSV, while influenza A and B viruses were not detected. Several swab samples and sputum were collected from May 20 to May 30, and sent to Zhejiang Provincial Center for Disease Control and Prevention. The median duration of HRSV shedding was found to be 11 days (Supplementary Figure S2, available at https://weekly.chinacdc.cn/). The HRSV strain identified in this patient was identified as HRSV-B. Sputum collected on May 24 tested negative for SARS-CoV-2, while samples collected on May 26, 28, and 29 tested positive (Supplementary Figure S2). A follow-up RT-PCR test for COVID-19 conducted on June 10 yielded a negative result. A sputum sample collected on May 29 was subjected to mNGS analysis. The results revealed the presence of 85 reads for HRSV, 13,471 reads for SARS-CoV-2, and 60 reads for *Aspergillus fumigatus* (Table 1).

To further investigate the transmission of HRSV in this elderly case, we collected throat swabs from two medical workers, one bedside caregiver, and 40 inpatients on the same floor. All 43 samples tested negative for HRSV using RT-PCR, except for the sample from the bedside caregiver. The caregiver, a 23-year-old woman without symptoms and no personal protective equipment (PPE), tested positive for HRSV-B on May 24 (Ct value =32.0) (Supplementary Figure S3, available at https://weekly.chinacdc.cn/). She had received a SARS-CoV-2 vaccination and tested negative for SARS-CoV-2.

We also took five swabs from the ward environment on May 20, and one swab collected from the bathroom tested positive for HRSV (Ct value =36.8) (Supplementary Figure S3).

We obtained the second hypervariable region (HVR2) sequences of the HRSV G gene from the elderly patient, the bedside caregiver, and one positive environmental sample. Phylogenetic analysis revealed that all three sequences belonged to the HRSV B/BA9 genotype, with 99.68% amino acid sequence similarity.

Previous studies have shown that older patients with multiple respiratory pathogens are at a higher risk of experiencing worse outcomes (*2*–*4*). However, this case report describes a rare coinfection of HRSV-B/BA9 and SARS-CoV-2 in the oldest known patient, which

TABLE 1. Symptoms and results of pathogenic testing in the case of an elderly man with dual infection of HRSV and SARS-CoV-2 virus in Hangzhou, Zhejiang Province in May 2023.

Item		In community				In hospital													
		May 14	May 15	May 16	May 17	May 18	May 19	May 20	May 21	May 22	May 23	May 24	May 25	May 26	May 27	May 28	May 29	May 30	May 31
Symptoms	Fever							38 °C									37.3 °C		
	Fatigue							√	√	√	√								
	Rhinorrhea						√	√											
	Sore throat																		
	Cough		√	√	√	√	√	√	√	√	√	√	√	√	√	√			
	Productive cough							√ (Yellow)	√ (Yellow)	√ (Yellow)	√ (Yellow)	√ (White)	√ (White)	√ (White)	√ (White)				
	Wheeze																		
	Shortness of breath		√	√	√	√	√	√	√	√									
	Loss of appetite							√	√	√	√								
	Nausea																		
	Abdominal discomfort							√	√										
Signs	Throat congestion							√	√										
	Lung rales									√	√	√	√	√	√				
Pathogen findings																			
Influenza A and B (RT-PCR)								Sputum /-											
HRSV (RT-PCR)								Sputum /+			Throat swab/ Sputum /HRSV-B (+)	Sputum / HRSV-B (+)		Sputum / HRSV-B (+)		Sputum / HRSV-B (+)	Sputum / HRSV-B (+)	Sputum / HRSV-B (-)	
SARS-CoV-2 (RT-PCR)												Sputum /-		Sputum /+		Sputum /+	Sputum /+		
mNGS																	Sputum / HRSV + SARS-CoV-2 + Aspergillus fumigatus +		
Bacterial culture of sputum specimens								Sputum /-			Sputum /-			Sputum /-			Sputum /-		
Date		May 14	May 15	May 16	May 17	May 18	May 19	May 20	May 21	May 22	May 23	May 24	May 25	May 26	May 27	May 28	May 29	May 30	May 31

Note: +: Positive; -: Negative.

Abbreviation: HRSV=human respiratory syncytial virus; mNGS=metagenomic next-generation sequencing; RT-PCR=real-time polymerase chain reaction; SARS-CoV-2=severe acute respiratory syndrome coronavirus 2.

did not necessarily increase the clinical severity, but instead prolonged the hospital stay (13 days *vs*. 7 days) (*5*). This finding can be explained by several factors. First, the patient in this case was diagnosed with HRSV infection two days after admission, enabling early initiation of proper treatment and receiving excellent healthcare services from a highly skilled professional team. Second, infections with HRSV-B genotype typically have lower disease severity scores compared to HRSV-A infections (*6*–*7*). Lastly, the patient in this case experienced a reinfection with SARS-CoV-2 six months after the initial natural infection and vaccination against SARS-CoV-2, which can provide protection against severe SARS-CoV-2 infection and COVID-19-related death (*8*–*9*).

This study has important implications for public health policies. First, older patients should take precautions to reduce their risk of exposure to respiratory viruses and prevent the spread of respiratory infections. This includes measures such as isolation in a single room, adherence to hand hygiene and PPE by healthcare workers, and caregivers. Second, early and accurate multi-etiologic diagnosis, along with prompt antiviral and symptomatic treatment, should be prioritized in order to improve clinical outcomes in older patients. Lastly, our study highlights the need to increase vaccination coverage for preventable respiratory infections, including influenza, SARS-CoV-2, HRSV, etc., in order to reduce morbidity and mortality among the elderly population.

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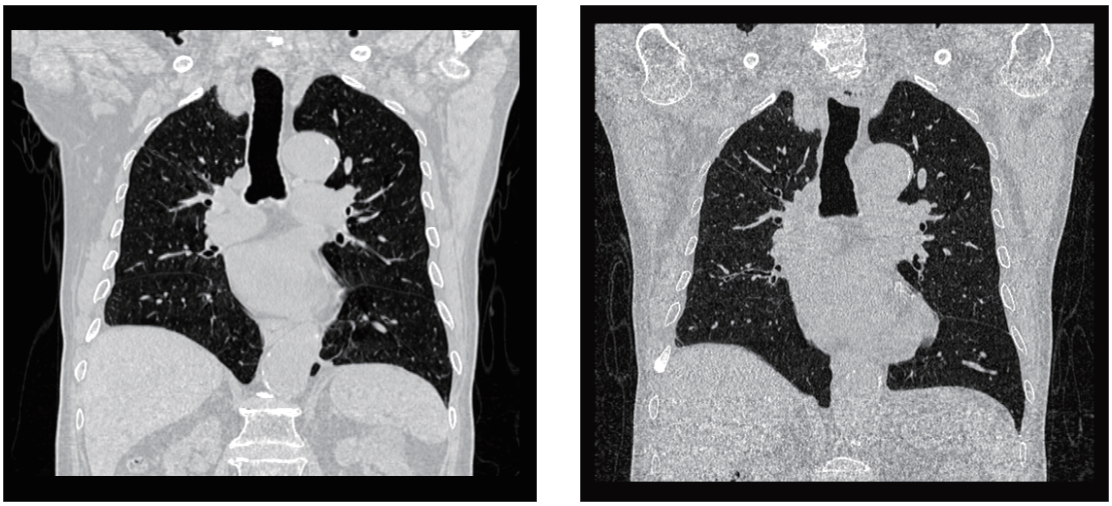
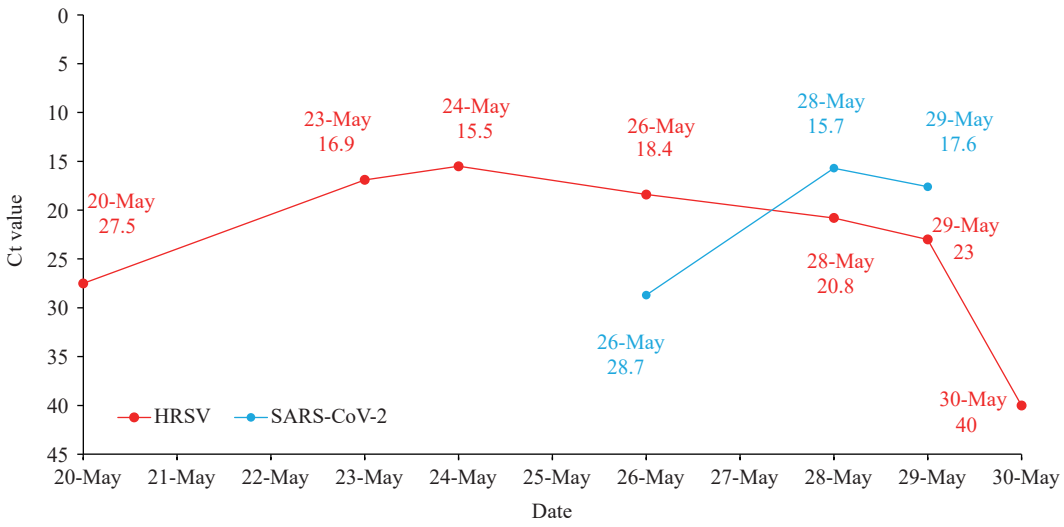
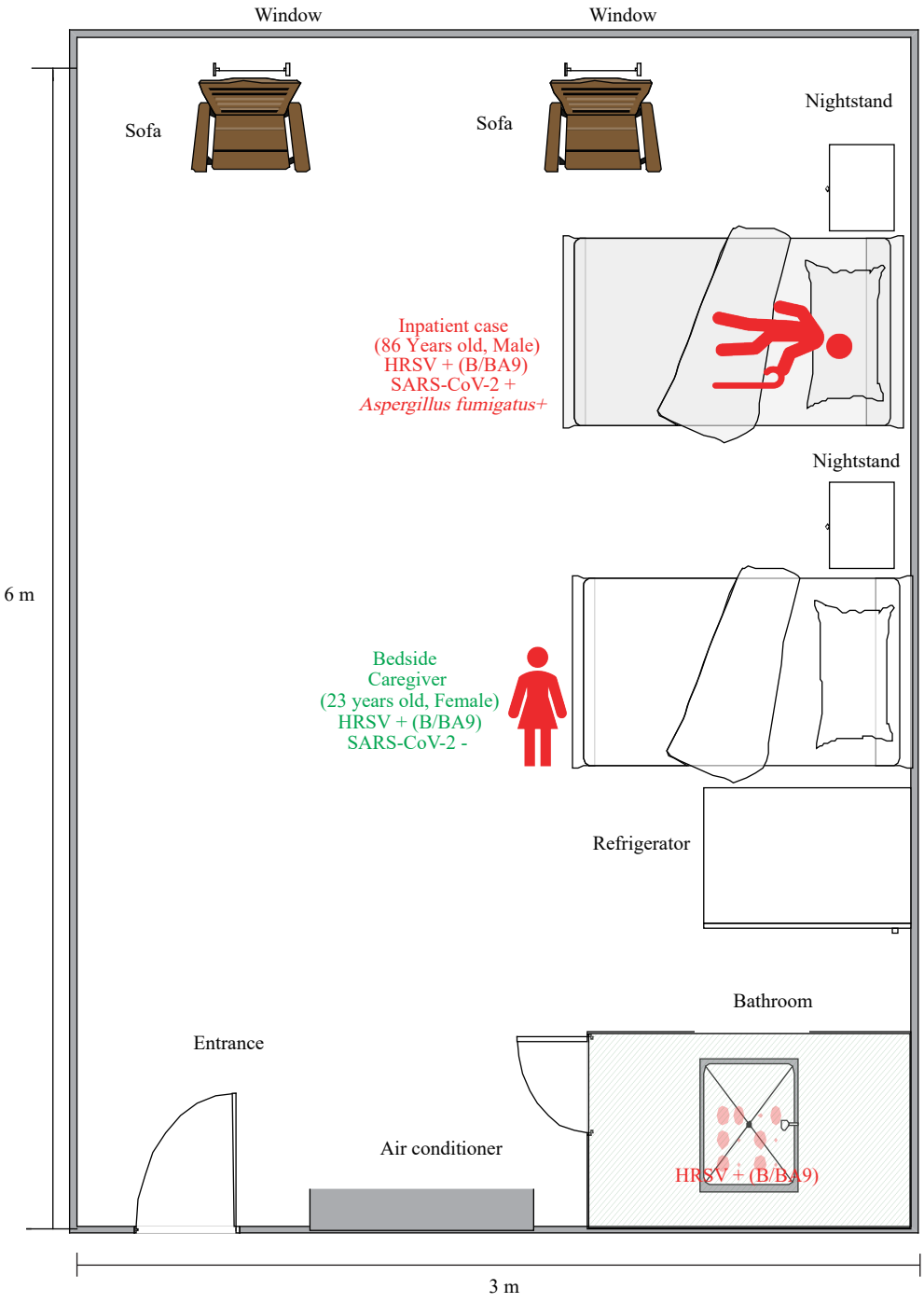
SUPPLEMENTARY MATERIAL



SUPPLEMENTARY FIGURE S1. Chest CT and PET/CT images of an elderly man coinfected with HRSV and SARS-CoV-2, obtained on May 19 and 24, 2023, respectively, in Zhejiang Province, China.
Note: Panel A shows a CT scan of the elderly patient's chest obtained on Day 1 (Day 1 = day of admission). The image indicates bronchiectasis in the upper lobe and middle lobe of the right lung and the lower lobe of both lungs, cystic bronchiectasis, and bullae formation under the pleura. Diffuse miliary nodules appear in both lungs, evenly distributed, involving the subpleural area. There is bilateral pleural thickening with nodules, calcifications, and interlobar pleural thickening with multiple subpleural nodules. In Panel B, a PET/CT scan of the elderly patient's chest obtained on Day 6 of admission shows that the pneumonic lesions in the right upper lobe and those previously present on the left side demonstrate pronounced absorption and improvement compared to before treatment.
Abbreviation: CT=computed tomography; PET/CT=positron emission tomography/CT; HRSV=human respiratory syncytial virus; SARS-CoV-2=severe acute respiratory syndrome coronavirus 2.



SUPPLEMENTARY FIGURE S2. Ct values for detection of HRSV and SARS-CoV-2 during the hospital stay of an elderly man coinfected with HRSV-B and SARS-CoV-2 from May 18 to May 31, 2023.
Note: Ct-values of RT-PCR >40 were considered negative for HRSV and SARS-CoV-2.
Abbreviation: HRSV=human respiratory syncytial virus; RT-PCR=real-time polymerase chain reaction; SARS-CoV-2=severe acute respiratory syndrome coronavirus 2.



SUPPLEMENTARY FIGURE S3. Diagram of the ward in which the elderly man coinfected with HRSV-B and SARS-CoV-2 shared HRSV-B with a bedside caregiver infected in the same room from May 18 to 31, 2023, in Zhejiang Province, China.
Note: +: Positive; -: Negative. Red dots mean HRSV positive.
Abbreviation: HRSV B=human respiratory syncytial Virus B genotype; SARS-CoV-2=severe acute respiratory syndrome coronavirus 2