cause of spotted fever in Brazil in rural settings, and *R. parkeri* is an emerging cause of infection (*8*–*10*). Antibodies that are cross-reactive with *R. rickettsii* can be stimulated by *R. parkeri*, *R. akari*, and other SFGR. *R. typhi* has been rarely reported as a cause of AFI in urban settings. Other rickettsial species identified in Brazil are *R. felis*, *R. rhipicephali*, *R. bellii*, *R. amblyommatis*, *R. andeanae*, and *R. monteiroi*, although their pathogenicity is unclear (*10*).

Although all causative rickettsial species, potential vectors, and reservoirs have yet to be identified, this study suggests that rickettsiae might be a cause of AFI in urban slum settings in Brazil. A limitation of this study is that it was performed in a single urban center; further studies will be needed to confirm the generalizability of these findings. However, these findings raise clinical awareness for rickettsiae as a potential cause of AFI in urban slum populations in the tropics and the possible need for empiric antimicrobial therapy in suspected cases, especially because diagnostic testing is often lacking in these urban environments.

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Identifying Contact Risks for SARS-CoV-2 Transmission to Healthcare Workers during Outbreak on COVID-19 Ward

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We assessed the risk for different exposures to SARS-CoV-2 during a COVID-19 outbreak among healthcare workers on a hospital ward in late 2020. We found working with isolated COVID-19 patients did not increase the risk of COVID-19 among workers, but working shifts with presymptomatic healthcare coworkers did.

One study found SARS-CoV-2 seroprevalence to be higher among healthcare workers (HCWs) with patient contact than among those without (*1*), but another study found that HCWs were less likely to acquire SARS-CoV-2 from patients than from coworkers or someone outside the hospital (*2*). We investigated a COVID-19 outbreak in a 26-bed hospital ward with 50 HCWs in Switzerland during October–November 2020, the peak of the second COVID-19 wave. During the 43-day outbreak period, transmission chains could not be reconstructed epidemiologically or phylogenetically. Instead, we used statistical modeling to assess and compare patients and coworkers as potential sources for COVID-19 among HCWs.

At all times, HCWs were to observe universal masking and social distancing protocols and regularly disinfect mutually used surfaces. HCWs also were to observe standard precaution measures (SPMs) for all patient contacts: wearing surgical masks at all times, eyewear when approaching a patient, and FFP2 (filtering facepiece) respirator masks during aerosol-generating procedures or prolonged contact with a patient with respiratory symptoms. For contact with patients with confirmed COVID-19, HCWs were to observe isolation precaution measures (IPMs), which, in addition to SPMs, meant wearing single-use gowns and disposing of personal protective equipment immediately after use. All patients were to wear masks when leaving bed and, starting in November 2020, when in contact with HCWs.

We assessed 3 possible risk factors as routes of exposure for HCWs: caring for contagious patients, stratified by whether using IPM or SPM when in contact with contagious patients, and working shifts during the contagious period of coworkers later found to have COVID-19. We defined the contagious period of a person with COVID-19 as the 48 hours before symptom onset, or a positive test if asymptomatic, until at least 14 days after sign/symptom onset or 2 days after signs/symptoms ended, whichever was later. HCWs were tested if symptomatic or during a staff screening on day 31 of the outbreak.

We assumed that transmission occurred 2–10 days before symptom onset or a positive test and calculated exposure risk scores for a given day and contact type. Exposure risk scores per contact type equaled mean numbers of patient contacts when using IPM, patient contacts when using SPM, and contacts with contagious HCWs per day (Appendix Figure 1, https://wwwnc.cdc.gov/EID/article/28/10/22-0266-App1.pdf). We included all HCW workdays during the outbreak except days worked after HCWs recovered from COVID-19. To calculate hazard ratios, we used time-updated univariable and multivariable Cox proportional-hazards models with time to COVID-19 as the outcome and exposure risk scores as predictors. We also performed a sensitivity analysis for presence or absence on the ward.

Because our analyses were part of an outbreak investigation, the Zurich Cantonal Ethics Commission waived formal ethical evaluation (Req 2021–00098). The 12 COVID-positive patients in the hospital ward were also part of a 1,118-patient study about nosocomial COVID-19 incidence in a tertiary care center (*3*).

We found that 18/50 (38%) HCWs had COVID-19 during the study period. For the 12 patients with COVID-19 on the ward, IPM were used for 11, SPM were used for 7 of those patients until diagnosis was made; 1 patient was diagnosed only after being discharged (Table). Univariable and multivariable models indicated that COVID-19 infection among HCWs working on the ward was associated with shifts worked with coworkers subsequently found to be ill (Figure), supporting results of other studies (*4*–*6*).

Our results suggested no strong association between COVID-19 in HCWs and using IPM during patient contact. Sufficiently available personal protective equipment, intensive training, and routine safety practices in handling COVID-19 patients may explain this finding. Caring for COVID-19 patients when using SPM was associated with SARS-CoV-2 infection,

Table. Number of different exposures to SARS-CoV-2 for total HCW population, HCW who tested positive, and HCW who tested negative during outbreak in hospital ward, Switzerland, October–November 2020*

Type of contact	No. (%) HCWs		
	All	SARS-CoV-2–positive	SARS-CoV-2–negative
All contacts	50 (100)	18 (36)	32 (64)
Shifts with patient contact using SPM	69 (13.9)	24 (20.2)	45 (11.9)
Shifts with patient contact using IPM	143 (28.8)	31 (26.1)	112 (29.7)
Shifts with HCW contact	284 (57.3)	64 (53.8)	220 (58.4)

*IPM, isolation precaution measure; SPM, standard precaution measure; HCW, healthcare worker.

Risk factor	Univariable HR, 95% CI	Multivariable HR, 95% CI
SPM patient contact	10.2, 1.2–86.5	7.8, 0.4–138.8
IPM patient contact	3, 0.7–12.5	2.1, 0.3–14.7
HCW contact	4.7, 1.1–20.7	5.2, 1.1–25.5

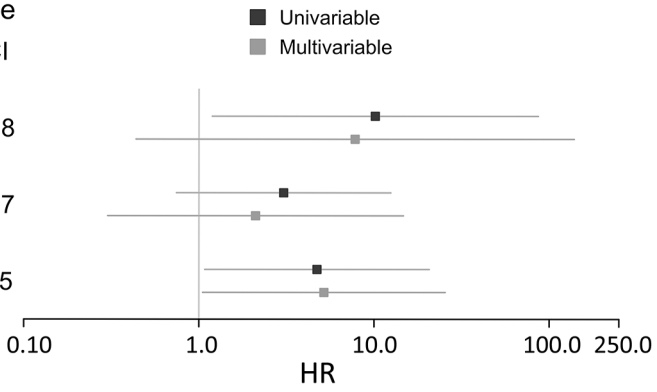

Figure. Hazard ratios and the 95% CIs for HCWs to acquire SARS-CoV-2 after using SPM and IPM for patient contact and HCW contact (i.e., contact with positive HCWs) during COVID-19 outbreak in hospital ward, Switzerland, October–November 2020. The multivariable model combined patient contact using SPM and IPM and HCW contact. HCW, healthcare worker; HR, hazard ratio; IPM, isolation precaution measures; SPM, standard precaution measures.

although only in the univariable model, pointing to a potential risk (*7*). However, we could only speculate whether our finding of increased risk resulted from the concept of SPM or as it was implemented. IPM might add extra layers of safety not only through its added protective elements but also by sensitizing HCWs to the heightened need to take precautionary measures; further investigation is needed. Ward contact, accounting for social work interactions including but not limited to those previously mentioned, showed increased SARS-CoV-2 transmission risk (Appendix Figure 2). HCWs were to wear masks, keep distance, and disinfect mutually used surfaces, but we assume full compliance at all times is unlikely. Also, social contact among peers before and after work, which might favor SARS-CoV-2 transmission, was unknown.

Two study limitations were small sample size and lack of data from exposures outside the hospital. However, applied statistical methods enabled us to investigate and identify transmission risks. Like others (*8*), we are confident that these findings provide critical information for design and adjustment of SPM and IPM during the COVID-19 pandemic. In addition, applying our methods to larger, nonoutbreak settings might be worthwhile. More detailed weighting of specific risks taking into account distribution of incubation time (*9*) might improve estimates of transmission risk in larger studies.

In conclusion, we provide additional evidence for SARS-CoV-2 infection risk for HCWs in contact with contagious coworkers and patients using SPM. Our findings highlight the importance of choosing protective equipment wisely and strictly adhering to safety protocols, including SPM.

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Sindbis Virus Antibody Seroprevalence in Central Plateau Populations, South Africa

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We report a higher percentage of Sindbis virus-specific IgG in serum from patients attending a rheumatology clinic (18.8%) compared with healthy residents (9.6%) and patients with acute febrile illness (9.4%) in Free State Province, South Africa. Sindbis virus infection should be considered a potential cause of arthritis in South Africa.

Sindbis virus (SINV) is a mosquitoborne virus that belongs to the Togaviridae family; SINV is considered an arthritogenic alphavirus, which is known to cause self-limiting acute febrile illness (AFI) in Africa, Australia, Asia, and Europe and occasional debilitating arthritis that can persist for years after infection (*1*). Outbreaks are associated with heavy rainfall and temperature changes that favor mosquito breeding. Associations between SINV infection and acute or chronic arthralgia and myalgia have been described in Finland and Sweden (*2*,*3*). The extent of chronic debilitating disease caused by SINV in South Africa remains largely unknown.

SINV was identified as a cause of human disease in South Africa in 1963, and subsequent studies confirmed that the virus was present in mosquito populations in the central plateau region, which includes Free State Province (*4*). We investigated the seroprevalence of SINV in selected human populations of Free State Province. We used an in-house ELISA to detect SINV-specific IgG in serum and confirmed positive serum samples using neutralization assays (Appendix, https://wwwnc.cdc.gov/EID/article/28/10/21-1798-App1.pdf). We screened a total of 568 stored serum samples retrospectively and anonymously. All available stored samples were tested and included 165 serum specimens submitted to the Division of Virology, National Health Laboratory Service, for routine clinical pathology tests from patients who attended the rheumatology clinic at the Universitas Hospital, Bloemfontein, South Africa, during 2013–2017 and 267 serum samples submitted to the National Health Laboratory Service during 2008–2010 from patients with AFI and no confirmed diagnosis. No clinical data were available; however, most attendees at the rheumatology clinic had chronic arthritis. We also included 136 serum samples from healthy volunteers that were collected during 2016–2017 for seroepidemiology studies of Crimean-Congo hemorrhagic fever virus and other vectorborne diseases.

We confirmed 11 serum samples were negative for SINV antibodies using a commercial immunofluorescence assay (EuroImmun, https://www.euroimmun.com); these samples were used to determine ELISA cutoff values. Positive control serum was obtained from 1 patient who had a laboratory-confirmed SINV infection. We obtained institutional ethics approval for this study from the Health Sciences Research Ethics Committee, University of the Free State (HSREC approval no. 95/2016C), and informed consent was available for samples collected for the seroepidemiology study (HSREC approval no. 34/2016), negative control serum panel (approval no. ETOVS 152/06), and positive control (approval no. ETOVS 118/06).

We determined optimal reagent dilutions for the ELISA using checkerboard titrations. We diluted serum samples 1:100 and tested for reactions to SINV-

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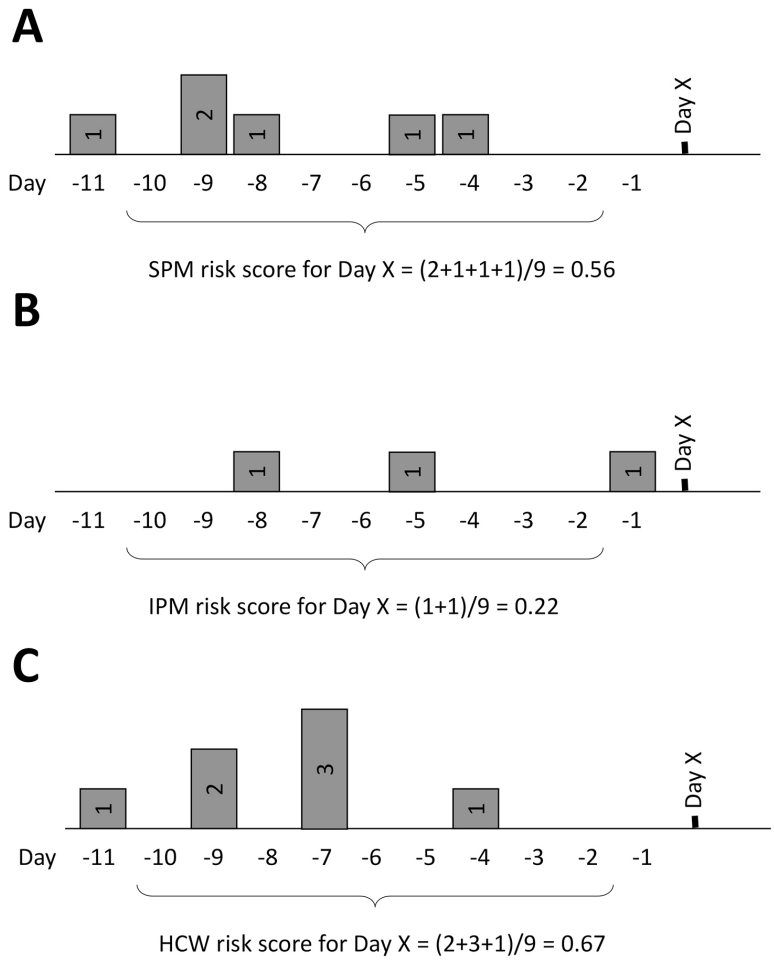
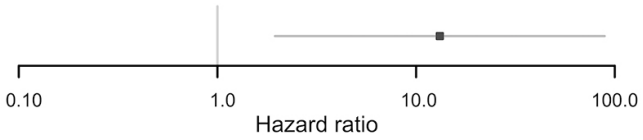
Identifying Contact Risks for SARS-CoV-2 Transmission to Healthcare Workers during Outbreak on COVID-19 Ward

Appendix



Appendix Figure 1. We assumed that transmission occurred 2–10 days before a positive test or symptom onset (Day X). Grey bars show number of contacts per day, with 1 contact defined as caring for 1 contagious patient during 1 shift or 1 shift worked with 1 contagious HCW. The risk score was then calculated as the mean contacts per day during Day X−10 to Day X−2 for each risk factor. HCW, healthcare worker; IPM, isolation precaution measures; SPM, standard precaution measures.

Risk factor	Univariable
	HR, 95% CI
Ward contact	13.2, 1.9-88.9



Appendix Figure 2. Hazard ratio and the 95% confidence interval for healthcare workers to acquire SARS-CoV-2 after contact on the ward. We defined ward contact as days spent working on the ward, irrespective of other contacts; we calculated risk score as mean number of workdays in the 2–10 days before a given day. HR, hazard ratio