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Short Report

SARS-CoV-2 infection: advocacy for training and social distancing in healthcare settings

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SUMMARY

This article reports the observed rate of infection with severe acute respiratory syndrome coronavirus-2 in healthcare workers (HCWs) who worked on wards dedicated to care of patients with coronavirus disease 2019 (COVID-19) compared with HCWs who worked on non-COVID-19 wards. The infection rate was significantly higher among HCWs who worked on non-COVID-19 wards (odds ratio 2.3, $P=0.005$), illustrating the need to strengthen social distancing measures and training.

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Healthcare workers (HCWs) are on the front line during the current coronavirus disease 2019 (COVID-19) pandemic, and account for a great number of infected people. In France, up to 9th June 2020, there were 154,188 confirmed cases of severe acute respiratory virus coronavirus-2 (SARS-CoV-2) infection, including 30,258 HCWs (28% were nurses) [1]. Recently, in the

UK, Hunter *et al.* observed no difference in the rate of SARS-CoV-2 infection in HCWs facing COVID-19 patients directly compared with non-patient-facing HCWs and non-clinical staff [2], suggesting that patients are not the primary source of infection in HCWs. The authors' experience at the University Hospital of Saint-Etienne, France supports this finding.

At the study hospital, from 24th March 2020, the systematic wearing of surgical masks was recommended to HCWs in all wards, and N95 respirators were also recommended systematically for all patient care in wards treating patients with COVID-19. The hospital was re-organized with the delineation of three types of ward: COVID-19 wards (type 1) harbouring

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dedicated HCWs; mixed wards with COVID-19 sectors (type 2) harbouring, according to ward, dedicated or shared HCWs; and COVID-19-free sectors (type 3). A 1-h on-site training session was offered to 2200 HCWs regarding proper wear, removal and disposal of personal protective equipment (PPE). Screening for SARS-CoV-2 infection was strongly recommended for all HCWs exhibiting symptoms of COVID-19, even if mild.

Between 25th March 2020 and 28th April 2020, 514 HCWs were screened, and 64 (13%) had a positive result on SARS-CoV-2 reverse transcriptase polymerase chain reaction (RT-PCR) from a nasopharyngeal swab. Of these 64 HCWs, 55 were in direct contact with patients and nine were not in direct contact with patients. Among the 1000 HCWs caring for patients during this period, 5.5% (95% confidence interval 4.0–6.9) became infected with SARS-CoV-2. The results regarding comparison between the three types of wards are shown in Table I. Using Chi-squared test for trend, the observed rate of infected HCWs was significantly higher among HCWs who worked on type 3 wards compared with HCWs who worked on type 1 or type 2 wards. The density incidence for 1000 HCW-days was 1.1, 1.0 and 2.5 in type 1, 2 and 3 wards, respectively. To rule out an impact of work load on the incidence of SARS-CoV-2 infection, a density incidence reported to 1000 patient-days was calculated; this incidence was 2.1 for type 1 wards and 2.5 for type 3 wards. It was not possible to calculate the density incidence for type 2 wards as data were not available from the emergency department, which included a ward for short-term hospitalizations.

The observed rate of infected HCWs at the study hospital was lower than that observed in other hospitals with broad recommendations for SARS-CoV-2 testing of HCWs. Keeley *et al.* reported a proportion of symptomatic HCWs with a positive SARS-CoV-2 RT-PCR of 18% [3]. Although the study hospital was located in one of the regions in France that was most heavily impacted by COVID-19 during the study period, the number of infected HCWs remained low. The systematic wearing of surgical masks on all wards, and the use of N95 respirators for all care of patients with COVID-19 may have contributed to significantly reduce the incidence of SARS-CoV-2 infection in HCWs at the study institution.

An increased risk of infection was noted in HCWs from non-COVID-19 wards. This observation confirmed that patient-to-HCW transmission is not the primary cause of SARS-CoV-2 infection in HCWs, as reported by Hunter *et al.* [2]. In another study, Wee *et al.* investigated 14 cases of SARS-CoV-2 infection in HCWs; they excluded patient-to-HCW transmission and identified the community as the primary source of HCW infection [4]. A third study showed that HCWs working on high-risk wards were more likely to be infected with SARS-CoV-2 than HCWs working on general wards; however, contact with diagnosed or suspected patients was not associated with increased risk, and contact with an infected family member

was highly associated with HCW infection [5]. In addition, Maltezou *et al.* observed that administrative personnel were more likely to get infected in hospital than front-line workers, suggesting that administrative staff were less trained in the use of PPE [6]. Lockdown commenced in France on 17th March 2020. As community transmission was decreasing during the study period in France, it is hypothesized that HCW-to-HCW transmission may explain, at least in part, HCW infection at the study institution. It is thought that HCWs working on a ward COVID-19 wards self-perceived that they were at higher risk for SARS-CoV-2 infection, so more attention was paid to social distancing from colleagues on these wards compared with the non-COVID-19 wards. During the study period, quotas of PPE were allocated to each HCW, which resulted in no shortage of masks. The hospital chose to systematize the use of N95 respirators in units where HCWs cared for patients with COVID-19, despite the fact that the recommended complementary hygienic precautions are still subject to debate: contact and droplet precautions (World Health Organization guidelines [7] and French guidelines [8]), or contact and airborne precautions (US Centers for Disease Prevention and Control guidelines) [9]. However, this particular measure is not considered to completely explain the observed differences in COVID-19 rates in HCWs. It can also be hypothesized that HCW training in infection control measures was more intensive in units caring for patients infected with SARS-CoV-2 compared with other wards. Of note, in the study hospital, use of hydro-alcoholic handrub products increased from 8395 L between 1st January 2019 and 31st May 2019 to 16,164 L between 1st January 2020 and 31st May 2020.

These observations suggest that training and implementation of proper precautions for infection control reduce the risk of nosocomial transmission on COVID-19 wards, and that social distancing between HCWs is crucial to reduce the spread of SARS-CoV-2 infection in healthcare settings. This study suffers from some limitations. First, no personal data were collected, and the populations of HCWs may have differed between COVID-19 wards and non-COVID-19 wards. Second, due to the high proportion of asymptomatic carriers, the rate of infected HCWs may be underestimated [10]. Third, with the exception of suspected nosocomial outbreaks (three patients or HCWs infected in 1 week in the same unit), HCWs were not systematically tested if they were in contact with an infected colleague; such a strategy may be useful to identify clusters due to HCW-to-HCW transmission. Fourth, the possibility that HCWs on non-COVID-19 wards may have been in contact with patients with undiagnosed COVID-19 cannot be excluded. However, during the pandemic phase, at the study institution, a large proportion of patients were sampled and patients were admitted to COVID-19 wards or mixed wards while awaiting the results of RT-PCR tests and/or thoracic computed tomography scans.

Table I

Odds ratio for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection in 1000 healthcare workers (HCWs) in the different types of wards between 25th March and 28th April 2020 at the University Hospital of Saint-Etienne, France

	Infected no./total no. of HCWs (%)	95% CI	Odds ratio for SARS-CoV-2 infection (95% CI)	P-value
COVID-19 wards (type 1)	11/315 (3.5)	1.4–5.4	1	0.005
Mixed COVID-19 wards (type 2)	7/209 (3.3)	0.9–5.7	1 (0.4–2.5)	
Non-COVID-19 wards (type 3)	37/476 (7.8)	5.4–10.2	2.3 (1.2–4.6)	

COVID-19, coronavirus disease 2019; CI, confidence interval.

In conclusion, this study showed that care of patients with COVID-19 was not a risk factor for SARS-CoV-2 infection in HCWs. PPE protects HCWs effectively from SARS-CoV-2 infection. HCWs who are not directly taking care of patients with COVID-19 should also be considered, and should self-consider themselves to be at risk for SARS-CoV-2 infection. The strengthening of social distancing measures is crucial in healthcare settings, and training should not be restricted to HCWs involved in direct care of infected patients.

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Conflict of interest statement

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