Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Risk perception among ED staff during COVID-19

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Coronavirus disease 2019 (COVID-19) was first reported in humans in late 2019 in Wuhan, China. Subsequently, the virus achieved a foothold rapidly worldwide, with the World Health Organization (WHO) declaring a pandemic in March 2020 [1]. Given the high risk of transmission, morbidity, and mortality associated with COVID-19, healthcare providers must utilize appropriate personal protective equipment (PPE) and infection control prevention techniques [2,3]. The precipitous spread of this illness has been linked to asymptomatic or presymptomatic spread of the disease during the virus's initial replication and shedding [4,5]. The utility of antibody testing during this pandemic remains unclear, but this may be a component of mitigation strategies employed by countries when infection rates surpass the ability to contain disease [6]. To our knowledge, there are few studies reporting healthcare workers' self-assessment on risk of unprotected exposure to COVID-19 or perceived likelihood of testing positive for COVID-19 antibodies [7-9].

We administered an electronic survey study at our institution among Emergency Department (ED) staff who were actively treating COVID-19 patients during the "second wave" of the pandemic in the summer of 2020 [10]. The presence or absence of COVID-19 antibodies was confirmed voluntarily (after the initial survey) during a hospital-wide initiative to test all staff facing patients. Blood spot (fingerstick) EUROIMMUN Anti-SARS-CoV-2 ELISA (IgG) was the assay utilized. This survey study was performed prior to development or distribution of any COVID-19 vaccinations. We hypothesized that ED staff may believe that their own testing for COVID-19 antibodies would be positive given reportedly high rates of asymptomatic carriers and potential suboptimal infection prevention practices. We also sought to assess differences in ED staff perception (based on their primary role) of how likely they felt that they may have been exposed to COVID-19 in the workplace without adequate PPE. In addition to assessing providers' perceptions, the survey also collected information on practice patterns, respiratory symptoms during the preceding spring months of the pandemic, and any known COVID-19 exposures.

Categorical variables were summarized as frequency (percentage) and continuous variables were reported as median (range). Continuous variables were compared between the primary roles using Kruskal-Wallis test, and categorical variables were compared using Fisher's exact test.

The demographics of ED staff completing the survey are summarized in Table 1. A total of 66 persons (representing 50% of all ED staff invited) participated in the survey, including 18 attending/fellows, 14 non-clinical staff (such as registration and case managers), and 34 nurse/technicians. Nurse/technicians were significantly younger in age (median age 34.5 years, $P = 0.034$) and non-clinical staff were more likely to be female (93% versus 33% and 62% for attending/fellow and nurse/technicians, respectively, $P = 0.003$).

Overall survey results (Table 2) revealed that staff assigned to different primary roles had significantly different answers to the following questions: "Have you cared for test confirmed COVID-19 patients?" (100% for attending/fellows versus 7% in non-clinical staff versus 100% in nurse/technicians, $P < 0.001$), "Have you had any prolonged exposure (>15 minutes) to a patient with confirmed COVID-19?" (44% for attending/fellows versus 14% in non-clinical staff versus 82% in nurse/technicians, $P < 0.001$), and also, "How likely do you feel that you have been exposed to COVID-19 in the workplace without adequate PPE?" (median score 11.5 for attending/fellows versus 2.0 in non-clinical staff versus 25.0 in nurse/technicians, $P = 0.009$). Although nurse/technicians also perceived increased likelihood of testing positive for COVID-19 antibodies (median score 25) compared with other staff (attending/fellows median score 17.5 and non-clinical staff median score 7.5), this was not statistically significant ($P = 0.26$).

Fifty staff members out of 66 underwent voluntary COVID-19 fingerstick antibody testing approximately one month after the initial survey was distributed (Table 3). Seven individuals (one attending/fellow, two non-clinical, and four nurse/technicians) tested positive for antibodies. Confirmatory blood draw was performed in six individuals, and only one revealed positive IgG antibodies to COVID-19. In the other five individuals, blood antibody testing was negative, suggestive of an initial false positive fingerstick.

In this survey study, significant differences were observed in risk perception among staff members performing different roles in the ED. This is in contrast to another study from Taiwan which suggested no difference in perceived risk or protective behavior among various healthcare workers [11]. One notable difference, however, is that the study by Chou et al. was completed during the "first wave" of the pandemic [11], when providers may have been less knowledgeable about COVID-19 or aware of the extent of its reach. Our results are more consistent, however, with two other studies suggesting that the stress burden on nursing staff during this pandemic may also correlate with their perception of increased risk of contracting COVID-19 [8,9]. Interestingly, despite the increased sense of risk among the nursing/technician group, subsequent COVID-19 antibody testing did not confirm a high incidence of antibodies in our study with only one individual having a presumed definitive antibody response. This suggests effective PPE usage, social distancing, and staff education on limiting viral spread. This conclusion is limited by employee's self-selection bias for antibody testing and survey completion. Additionally, lack of a sustained antibody response may also partially explain low rates of positivity in staff.

The extent of the psychological impact of COVID-19 on healthcare workers remains to be seen. Though nursing staff appear to report increased levels of perceived risk, nervousness, and anxiety associated with caring for COVID-19 patients [12], lack of COVID-19 antibodies as seen in our study appears to corroborate adequate use of PPE and appropriate infection control prevention techniques in the ED setting.

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Table 1
Demographics of ED staff participating in survey.

	Attending/Fellow ($N = 18$)	Non-clinical ($N = 14$)	Nurse/Technician ($N = 34$)	Total ($N = 66$)	*P* value
Age					**0.034**
N	18	14	34	66	
Median (Range)	44.5 (32.0, 63.0)	48.5 (28.0, 66.0)	34.5 (24.0, 65.0)	41.5 (24.0, 66.0)	
sex					**0.003**
Female	6 (33.3%)	13 (92.9%)	21 (61.8%)	40 (60.6%)	
Male	11 (61.1%)	1 (7.1%)	13 (38.2%)	25 (37.9%)	
Prefer not to disclose	1 (5.6%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	
Race					0.60
African American	0 (0.0%)	2 (14.3%)	1 (2.9%)	3 (4.5%)	
Asian	0 (0.0%)	0 (0.0%)	2 (5.9%)	2 (3.0%)	
White	16 (88.9%)	11 (78.6%)	28 (82.4%)	55 (83.3%)	
Other	2 (11.1%)	1 (7.1%)	3 (8.8%)	6 (9.1%)	
Are you Hispanic or Latino?					0.42
Yes	0 (0.0%)	0 (0.0%)	3 (8.8%)	3 (4.5%)	
No	18 (100.0%)	14 (100.0%)	31 (91.2%)	63 (95.5%)	

Table 2
Overall survey results.

	Attending/Fellow (N = 18)	Non-clinical (N = 14)	Nurse/Technician (N = 34)	Total (N = 66)	P value
Have you had ANY cold symptoms within the last 4 months?					0.64
Yes	4 (22.2%)	4 (28.6%)	12 (35.3%)	20 (30.3%)	
No	14 (77.8%)	10 (71.4%)	22 (64.7%)	46 (69.7%)	
If yes, approximately how long ago (in days) were the most recent symptoms?					0.41
N	4	2	12	18	
Median (Range)	17.5 (1.0, 30.0)	16.0 (2.0, 30.0)	29.0 (1.0, 60.0)	24.5 (1.0, 60.0)	
Have you had a confirmed positive COVID-19 test?					0.12
Yes	0 (0.0%)	0 (0.0%)	5 (14.7%)	5 (7.6%)	
No	18 (100.0%)	14 (100.0%)	29 (85.3%)	61 (92.4%)	
Approximately how many intubations have you performed in last 4 months (where you were at the head of the bed during the procedure)?					**<0.001**
N	18	14	34	66	
Median (Range)	3.5 (0.0, 20.0)	0.0 (0.0, 0.0)	0.0 (0.0, 4.0)	0.0 (0.0, 20.0)	
Have you cared for test confirmed COVID-19 patients (in person, not via telemedicine)?					**<0.001**
Yes	18 (100.0%)	1 (7.1%)	34 (100.0%)	53 (80.3%)	
No	0 (0.0%)	13 (92.9%)	0 (0.0%)	13 (19.7%)	
If yes to above, approximate number of COVID-19 patients you have cared for?					0.79
N	18	1	32	51	
Median (Range)	20.0 (5.0, 100.0)	20.0 (20.0, 20.0)	18.0 (2.0, 100.0)	20.0 (2.0, 100.0)	
Have you had any prolonged exposure (>15 min) to a patient with confirmed COVID-19?					**<0.001**
Yes	8 (44.4%)	2 (14.3%)	28 (82.4%)	38 (57.6%)	
No	10 (55.6%)	12 (85.7%)	6 (17.6%)	28 (42.4%)	
Have you flown on an airplane in the last 4 months?					0.36
Yes	4 (22.2%)	1 (7.1%)	3 (8.8%)	8 (12.1%)	
No	14 (77.8%)	13 (92.9%)	31 (91.2%)	58 (87.9%)	
Have you used public transportation in the last 4 months?					0.24
Yes	0 (0.0%)	2 (14.3%)	5 (14.7%)	7 (10.6%)	
No	18 (100.0%)	12 (85.7%)	29 (85.3%)	59 (89.4%)	
Have you visited a long-term care facility in the last 4 months?					1.00
Yes	0 (0.0%)	0 (0.0%)	1 (2.9%)	1 (1.5%)	
No	18 (100.0%)	14 (100.0%)	33 (97.1%)	65 (98.5%)	
Have you had contact with family members who have been positive for COVID-19?					0.32
Yes	0 (0.0%)	2 (14.3%)	3 (8.8%)	5 (7.6%)	
No	18 (100.0%)	12 (85.7%)	31 (91.2%)	61 (92.4%)	
Do you have a child in your home who has been attending daycare in the past 4 months (or other form of group childcare)?					0.38
Yes	3 (16.7%)	4 (28.6%)	4 (11.8%)	11 (16.7%)	
No	15 (83.3%)	10 (71.4%)	30 (88.2%)	55 (83.3%)	
Have you traveled outside of your state of residence in the last 4 months?					**0.021**
Yes	12 (66.7%)	5 (35.7%)	9 (26.5%)	26 (39.4%)	
No	6 (33.3%)	9 (64.3%)	25 (73.5%)	40 (60.6%)	
On a scale from 0% to 100%, how likely do you feel that you have been exposed to COVID-19 in the workplace WITHOUT ADEQUATE PPE, with 0% indicating no likely exposure and 100% indicating very likely exposure?					**0.009**
N	18	14	34	66	
Median (Range)	11.5 (2.0, 75.0)	2.0 (0.0, 85.0)	25.0 (0.0, 100.0)	10.0 (0.0, 100.0)	
On a scale from 0% to 100%, how likely do you feel you will test positive for COVID-19 antibodies, with 0% indicating no likelihood and 100% indicating complete likelihood?					0.26
N	18	14	34	66	
Median (Range)	17.5 (0.0, 51.0)	7.5 (0.0, 75.0)	25.0 (0.0, 100.0)	15.0 (0.0, 100.0)	

Table 3
COVID-19 antibody self-reporting.

	Attending/Fellow (N = 18)	Non-clinical (N = 14)	Nurse/Technician (N = 34)	Total (N = 66)	P value
Did you have COVID-19 antibody fingerstick testing performed after the initial survey?					0.87
Yes	14 (77.8%)	10 (71.4%)	26 (76.5%)	50 (75.8%)	
No	4 (22.2%)	4 (28.6%)	8 (23.5%)	16 (24.2%)	
What were the results of this COVID-19 fingerstick antibody test?					0.66
N-Miss	4	4	8	16	
Positive (Reactive)	1 (7.1%)	2 (20.0%)	4 (15.4%)	7 (14.0%)	
Negative	13 (92.9%)	8 (80.0%)	22 (84.6%)	43 (86.0%)	
If your COVID-19 antibody fingerstick was positive (reactive), was confirmatory blood draw serology performed?					0.43
N-Miss	17	12	30	59	
Yes	1 (100.0%)	1 (50.0%)	4 (100.0%)	6 (85.7%)	
No	0 (0.0%)	1 (50.0%)	0 (0.0%)	1 (14.3%)	
If confirmatory blood draw serology was performed, was IgG positive?					1.00
No	18 (100.0%)	14 (100.0%)	33 (97.1%)	65 (98.5%)	
Yes	0 (0.0%)	0 (0.0%)	1 (2.9%)	1 (1.5%)	
If confirmatory blood draw serology was performed, were antibodies negative, suggesting an initial false positive fingerstick?					1.00
No	17 (94.4%)	13 (92.9%)	31 (91.2%)	61 (92.4%)	
Yes	1 (5.6%)	1 (7.1%)	3 (8.8%)	5 (7.6%)	

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Declaration of Competing Interest

None.

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