

variant predominated, representing a roughly 8-fold increase in the proportion of HAI to non-HAI COVID-19 admissions. Acquisition from visitors was a likely mechanism; many remove their masks while in patient rooms, and maskless patient-to-patient spread may have occurred in the HAI cluster in the milieu of inpatient psychiatric units. Transmission from HCP was mitigated by universal pandemic precautions; however, early in January 2022, SARS-CoV-2-positive HCP were allowed to return to work as early as 6 days after positive testing based on updated guidelines from the Centers for Disease Control and Prevention (CDC).⁸

This study had several limitations. Most patients with the SARS-CoV-2 (omicron) variant were symptomatic at the time of positive testing, perhaps to a greater degree than during the prior months of δ (delta)-variant predominance, although the significance of this contrast is likely limited by small case numbers. Also, exposure investigations were restricted to chart review. We did not conduct genomic investigation of HAI strains for determination of strain identity, acquisition in the hospital rather than community, or likely source of transmission.

Our findings suggest that COVID-19 HAI was far more common during the SARS-CoV-2 (omicron)-variant surge. If future variants demonstrate similar transmissibility, hospitals may consider more rigorous testing protocols, which could include reflexive testing of any patient with appropriate symptoms or possible exposures from infected patients or visitors as well as repeated surveillance testing of patients in congregate settings (eg, inpatient psychiatry units). Furthermore, detailed screening of visitors and staff per CDC guidelines must be undertaken alongside enforcement of universal masking while in the hospital. Lastly, a uniform system of defining and reporting COVID-19 HAI should be established because current CDC definitions are inadequate in capturing the broad range of symptomatic and asymptomatic presentations that have real epidemiologic and clinical significance for hospitalized patients.⁹

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

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Impact of the coronavirus disease 2019 (COVID-19) pandemic on infection control practices in a university hospital

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As the coronavirus disease 2019 (COVID-19) pandemic spread, our center had to increase its capacity and was transformed to attend to COVID-19 patients. This transition included the creation

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of new intensive care units (ICUs) and the incorporation of untrained personnel in infection control practices and ICU patient care. Infection control activities were shifted to deal with COVID-19-related tasks.¹ Hand hygiene audits were suspended. A double-glove protocol was implemented for COVID-19 patient care. These factors may have affected the optimal compliance with basic infection control practices.² In our center, blood culture contamination rates increased from 1.1% in the pre-pandemic period (March 2019–February 2020) to 2.7% in the pandemic period (March 2020–February 2021) and peaked at

Table 1. Barriers to Compliance With Standard Infection Control Practices During the COVID-19 Pandemic

Variable	Total ^a (N=159)	Physicians (N=67)	Nurses ^b (N=72)	Nursing Assistants (N=20)	P Value ^c
Demographics of respondents^a					
Age, in years (Median; IQR)	36 (23–64)	35 (25–68)	36 (22–60)	39 (20–60)	
Sex, women	121 (76.0)	37 (55.2)	64 (88.8)	20 (100)	
Professional experience, in years (Median; IQR)	11 (2–39)	11 (2–40)	11 (1–41)	10 (1–30)	
To what extent do you think the following barriers have hindered optimal hand hygiene compliance during COVID-19 pandemic?					
Routine use of double gloving, no. (%)					.036
Much	24 (15.1)	6 (9.0)	12 (16.7)	6 (30.0)	
Often	48 (30.2)	16 (23.9)	24 (33.3)	8 (40.0)	
A little	56 (35.2)	27 (40.3)	23 (31.9)	6 (30.0)	
Very little	31 (19.5)	18 (26.9)	13 (18.1)	0 (0)	
Hand sanitizer location, no. (%)					.050
Much	34 (21.4)	12 (17.9)	17 (23.6)	5 (25.0)	
Often	64 (40.3)	26 (38.8)	30 (41.7)	8 (40.0)	
A little	41 (25.8)	19 (28.4)	18 (25.0)	4 (20.0)	
Very little	20 (12.6)	10 (14.9)	7 (9.7)	3 (15.0)	
Unpleasant hydroalcoholic formulation, no. (%)					.075
Much	19 (11.9)	4 (5.9)	11 (15.3)	4 (20.0)	
Often	43 (27.0)	21 (31.3)	19 (26.4)	3 (15.0)	
A little	56 (35.2)	31 (46.3)	17 (23.6)	8 (40.0)	
Very little	41 (25.8)	11 (16.4)	25 (34.7)	5 (25.0)	
Insufficient hand sanitizers, no. (%)					.019
Much	41 (25.8)	14 (20.9)	20 (27.8)	7 (35.0)	
Often	47 (29.5)	17 (25.4)	26 (36.1)	4 (20.0)	
A little	48 (30.2)	26 (38.8)	17 (23.6)	5 (25.0)	
Very little	23 (14.5)	10 (14.9)	9 (12.5)	4 (20.0)	
To what extent do you think the following barriers have interfered with the optimal management and care of CVCs? (n=72)^d					
Type of hub, no. (%)					
Much			10 (13.9)		
Often			14 (19.4)		
A little			30 (41.6)		
Very little			18 (25.0)		
Staff deficits, no. (%)					
Much			28 (38.9)		
Often			23 (31.9)		
A little			16 (22.2)		
Very little			5 (6.9)		
Performing tasks for which I was untrained, no. (%)					
Much			13 (18.1)		
Often			18 (25.0)		
A little			21 (29.2)		
Very little			20 (27.8)		
Lack of stock of PPE, no. (%)					
Much			30 (41.7)		
Often			30 (41.7)		

(Continued)

Table 1. (Continued)

Variable	Total ^a (N=159)	Physicians (N=67)	Nurses ^b (N=72)	Nursing Assistants (N=20)	P Value ^c
A little			8 (11.1)		
Very little			4 (5.5)		
Workload					
Much			36 (50.0)		
Often			27 (37.5)		
A little			7 (9.7)		
Very little			2 (2.8)		

Note. IQR, interquartile range; PPE, personal protective equipment. Data are presented as n/N otherwise specified.

^aAll respondents except the 4 infection preventionists.

^bIncludes nurses and nursing supervisors.

^cPerformed with a Kruskal-Wallis test.

^dOnly applicable to surveys answered by nurses.

4.8% in April 2020. Central-line-associated infections increased from 0.2 per 1,000 patient days to 0.4 per 1,000 patient days between these periods. To assess the effect of the pandemic on infection control practices and to identify issues needing urgent attention, we conducted a survey among frontline HCWs at a university hospital.

Methods

The survey was conducted at the Bellvitge University Hospital, a 700-bed hospital in Barcelona, Spain, where 2,486 patients had been hospitalized with COVID-19. The survey was distributed via institutional e-mail on March 9, 2021, to 762 HCWs responsible for caring for COVID-19 patients (in the departments of infectious diseases, internal medicine, respiratory medicine, ICUs) and 5 infection preventionists. HCWs completed the survey once using a personalized code. The survey included questions assessing the World Health Organization (WHO) Five Moments for Hand Hygiene,³ central venous catheter (CVC) insertion and maintenance practices, and use of personal protective equipment (PPE). Other questions focused on HCW perceived workload or changes in infection control activities. Data were collected in an anonymized REDCap database and were analyzed using SPSS version 25.0 software (IBM, Armonk, NY). The local ethics committee approved the study, and respondents provided informed consent.

Results

Overall, 159 HCWs and 4 infection preventionists completed the survey (response rate, 21.3%). Among HCWs, 72 (45.3%) were nurses, 67 (42.1%) were physicians, and 20 (12.6%) were nursing assistants. By department, 69 (47.8%) worked in ICUs, 37 (22.7%) worked in infectious diseases and internal medicine wards, and 33 (20.2%) worked in respiratory medicine wards. Also, 20 HCWs (12.2%) were employed temporarily in these units.

Regarding hand hygiene, 52 respondents (32.7%) never or occasionally performed hand hygiene before touching CVC hubs (clean or aseptic task; WHO moment 2) and 25 respondents (15.7%) performed hand hygiene after touching a patient's environment (WHO moment 5). The main factors interfering with hand hygiene compliance were inappropriate location (reported as "much" or

"often" by 98 respondents, 61.7%) and shortages of hand sanitizers (reported as "much" or "often" by 88 respondents, 55.3%), and double gloving (reported as "much" or "often" by 72 respondents, 45.3%) (Table 1). For CVC insertion bundles, hand hygiene compliance and rates of sterile gowns and glove use rates were 100% (26 of 26) among physicians performing this procedure. Among these physicians, 22 (84.6%) reported using ultrasound-guided CVC insertion always or frequently. For catheter maintenance, 38 (52.7%) of 72 nurses reported that changing dressings was challenging with double gloves. Among these 72 nurses, 38 (52.7%) stated that prone position complicated blood culture collection, and 42 (58.3%) reported that they obtained blood samples for culture through CVC hubs.

The shortage of PPE during the first COVID-19 wave (March–June 2020) was reported by 129 HCWs (81.1%). This issue was recognized as a problem, together with increased HCW workload (reported by 89 HCWs, 55.9%), staff deficits (reported by 45 HCWs, 28.3%), and the incorporation of nontrained personnel in ICU patient care and infection control practices (reported by 73 HCWs, 45.9%). Finally, at the beginning of the pandemic, 70%–90% of infection preventionists duties involved COVID-19-related tasks.

Discussion

Our survey identified significant barriers for optimal infection control practices during the pandemic. Contact and airborne precautions and the use of PPE (ie, masks, face shields, goggles, gloves, and gowns) were implemented during patient care.⁴ However, the use of PPE is protective but also may hinder infection control practices.⁵ During the first COVID-19 wave, the PPE stockpile was insufficient, and HCWs used the same gloves and gown when treating different patients and when performing different tasks.⁶ As the survey shows, suboptimal hand hygiene practices were an issue.⁷ Previous studies have identified changes in PPE use and hand hygiene practices as key elements associated with multidrug-resistant outbreaks,⁸ increased blood culture contamination rates, and central-line-associated infections.^{9,10} Indeed, the double-glove protocol, patient prone position, and the increased workload hampered CVC manipulation and made blood extraction more difficult and less aseptic than it

should have been. Additionally, the need to reallocate untrained staff to COVID-19 units was a recognized problem. To optimize staffing, we had to reassess the adequate nurse–patient ratio, and a pool of nurses was daily redeployed to areas with more need. To mitigate the insufficient preparedness of the new staff on infection control practices, we planned to replace face-to-face training (which was suspended during the COVID-19 pandemic) with online training. Compensating for the shift of infection preventionists activities to SARS-CoV-2–related issues in the pandemic situation was even more challenging.¹ Perhaps better coordination between regional hospitals with common protocols would help infection preventionists deal with conflicting guidelines.

Our study had several limitations. The survey was conducted in a single center with a moderate response rate and potential recall bias. We do not have information on nonrespondents, who might have identified different problems. However, the respondents included a variety of HCWs and medical departments, making data more generalizable to a range of contexts.

Our survey results emphasizes the negative effect of the COVID-19 pandemic on basic infection control practices. The use of double gloves, suboptimal hand hygiene practices, the incorporation of untrained personnel, and the reassignment of infection preventionists to COVID-19 duties have been major issues. Seeking to achieve infection control excellence should be a priority during future pandemic waves.

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Universal admission testing with a rapid molecular point-of-care test and real-time polymerase chain reaction (PCR) assay for the detection of severe acute respiratory coronavirus virus 2 (SARS-CoV-2): Comparative performance and infection prevention implications

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The coronavirus disease 2019 (COVID-19) pandemic has strained hospitals and healthcare systems worldwide, with bed capacity and

throughput posing considerable challenges during surges.¹ In the United States, >70% of hospitals have <200 beds and most have a combination of single- and multiple-occupancy rooms, which complicates the placement of COVID-19 patients in cohorts.² With an estimated 30% of cases asymptomatic, rapid and reliable testing is important to safely placing inpatients in cohort.³ Small and critical-access hospitals often lack the volume or capacity for on-site molecular testing. Many safety-net hospitals are

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