

LETTER

Changes in compliance and knowledge of infection prevention and control practices following the COVID-19 outbreak: A retrospective study of 197 nonfrontline healthcare workers

Dear Editor,

Since the onset of the coronavirus disease 2019 (COVID-19) pandemic, infection prevention and control (IPC) strategies to minimize nosocomial transmission have taken center-stage.¹ There are increasing reports documenting the high infection rates in healthcare workers (HCWs).^{2,3} A recent finding⁴ was that hospital administrative personnel showed higher infection rates than frontline HCWs, indicating the inadequacy of IPC trainings for administrative staff. Furthermore, Chu et al⁵ revealed that over 70% of nosocomial infections occurred in HCWs not assigned to frontline departments during the epidemic. Shortages in personal protective equipment (PPE) could have led to this, but we wanted to investigate if the lack of awareness regarding IPC practices in nonfrontline HCWs was also a contributing factor. In China, most hospitals routinely conduct IPC trainings for HCWs, but it is difficult to evaluate whether these trainings adequately prepare staff to respond to emergencies. Therefore, we conducted a survey to investigate if HCWs were sufficiently knowledgeable about IPC practices and adequately trained in emergency pandemic response.

In April 2020, 236 self-administered questionnaires (Appendix S1) were distributed to eight hospitals designated for managing COVID-19 patients in Hubei Province, China. The questionnaire surveyed the knowledge of HCWs, training frequency, and adherence to IPC policies under different settings: preoutbreak, postoutbreak/prefrontline deployment, and postfrontline deployment. Individual scores were recorded on a scale of 1 to 10, with 10 indicating superior knowledge and compliance. We also asked participants which setting from among simulations, tests, self-study, training videos, practical experience, and didactic lectures, provided the most useful training for an emergency pandemic response. Statistical analysis was performed by SPSS using paired *t* test and Tamhane T2 test ($P < .05$).

197 HCWs (response rate 83.5%) from different nonfrontline departments (Dermatology-27.9%; Surgery-22.8%; Internal Medicine-20.8%; etc.) completed the questionnaire (Table 1). Between late December 2019, and early April 2020, IPC trainings were organized more than twice as frequently as usual (6.34 ± 5.02 vs 2.67 ± 2.41 , $P < .001$); or every 14.20 days. Compliance with and knowledge of IPC practices improved significantly postoutbreak (total score, 72.06 ± 11.17) compared with preoutbreak (63.72 ± 13.44), and after

working at the frontline (77.07 ± 5.36). These trends were observed to varying degrees across all the categories of IPC policies and procedures (Figure 1). Of note, the biggest improvement in scores was in knowledge regarding the correct donning and doffing procedures for PPE (A: 1.86; 95%CI, 1.30-2.41; $P < .001$. B: 0.91; 95%CI, 0.58-1.25; $P < .001$). In addition, the majority of HCWs (30%) considered field experience to be the most beneficial form of training among the various training settings. However, traditional forms of IPC training, such as didactic lectures (5%) and written tests (14%) were not deemed to be very useful by the HCWs (Figure 2).

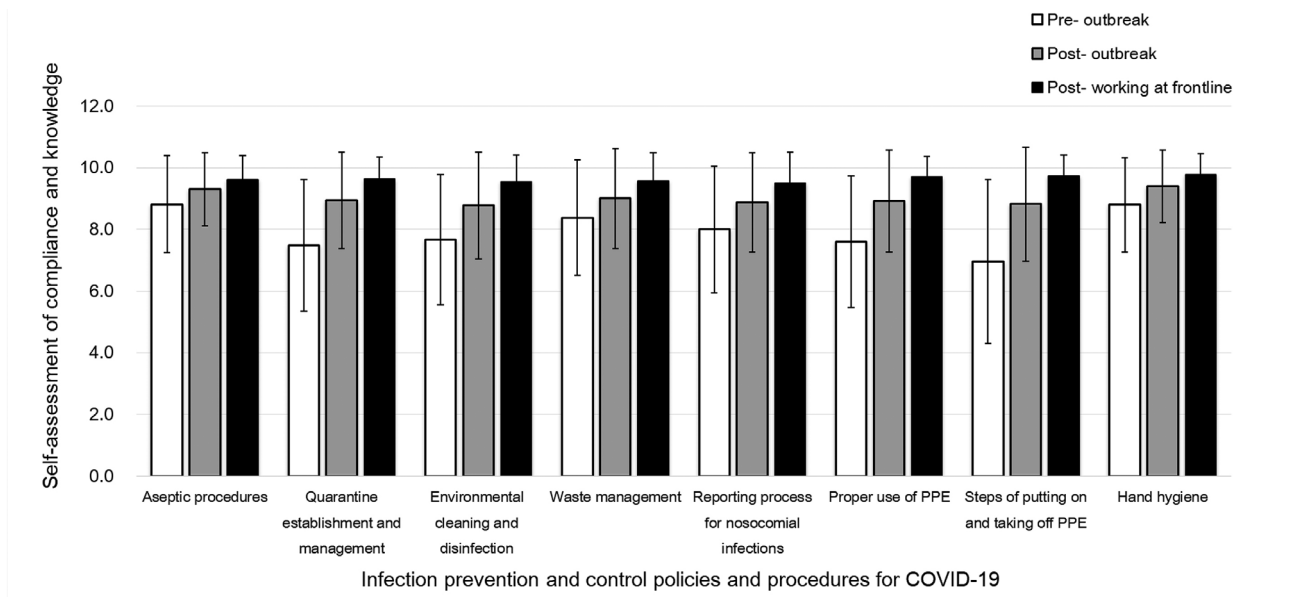
In response to the outbreak, healthcare facilities in China are actively conducting IPC trainings of staff to ensure robust compliance with policies, therefore contributing to the enhancement of post-outbreak IPC awareness. Our study suggested that nonfrontline HCWs' knowledge regarding proper use of PPE and protocols for quarantine and isolation zones need further improvement. In the future, nonfrontline HCWs should be trained adequately in relevant knowledge and skills,⁶ such that they may safely engage in clinical duties during current and future pandemics. Though the retrospective and subjective nature of our study are its limitations, we learned some important insights. Practical experience at the frontlines resulted in significant improvements in knowledge regarding prevention strategies, highlighting the benefit of clinical practice in raising awareness. Furthermore, HCWs reported practical experience to be of great

TABLE 1 Departmental proportion of nonfrontline medical staff

Involved departments	Participants (N = 197), No. (%)
Dermatology	55 (27.9)
Surgery	45 (22.8)
Internal medicine	41 (20.8)
Gynecology and obstetrics	18 (9.1)
Pediatrics	8 (4.1)
Ophthalmology and Otorhinolaryngology	7 (3.6)
Rehabilitation medicine	5 (2.5)
Others ^a	18 (9.1)

^aReferring to Departments of Stomatology, Geriatrics, Anesthesiology, Traditional Chinese Medicine, Ultrasonics, Oncology, Pharmacy and Laboratory Medicine.

Liu Yang and Mahin Alamgir have contributed equally to this study.



Mean difference ^A	0.49	1.46	1.11	0.63	0.86	1.33	1.86	0.60
95% CI	0.15 to 0.82	1.00 to 1.91	0.64 to 1.57	0.33 to 0.93	0.42 to 1.31	0.87 to 1.79	1.30 to 2.41	0.27 to 0.93
P value	0.002	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mean difference ^B	0.30	0.71	0.77	0.55	0.63	0.80	0.91	0.37
95% CI	0.06 to 0.54	0.41 to 1.00	0.43 to 1.10	0.23 to 0.87	0.30 to 0.95	0.49 to 1.10	0.58 to 1.25	0.13 to 0.60
P value	0.010	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001

^A Post-outbreak versus Pre-outbreak. ^B Post-working at the frontline versus Post-outbreak.

FIGURE 1 Knowledge of infection-control and prevention strategies and compliance in HCWs across three settings

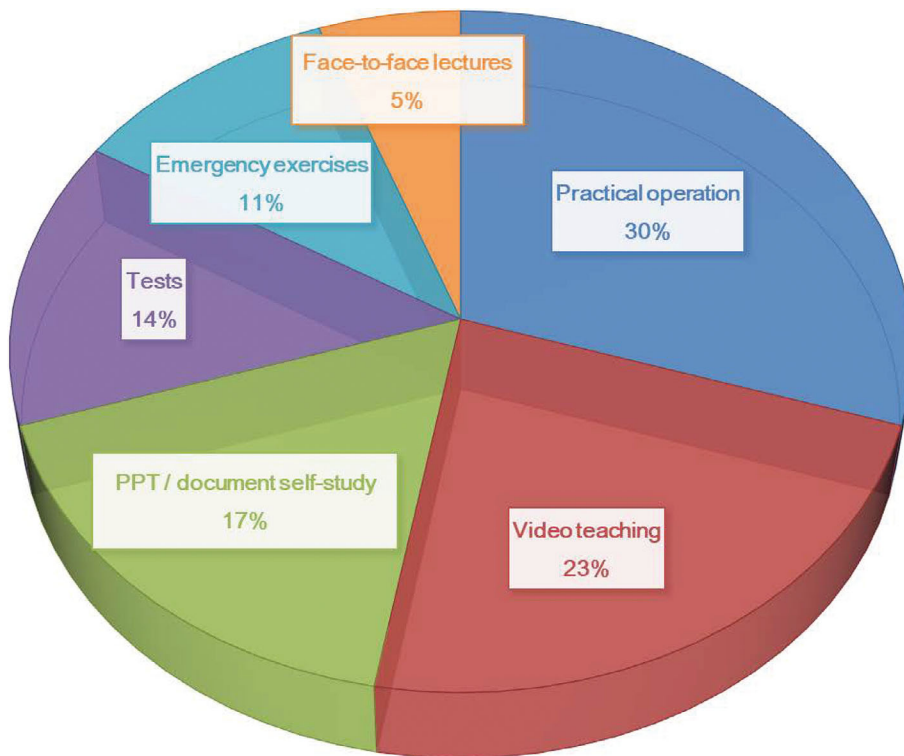


FIGURE 2 Percentage of HCWs reporting each setting to be the most beneficial for infection-control trainings

benefit in improving compliance; lending support to the role of field training in the preparedness of HCWs' emergency response to pandemic.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Juan Tao and Yan Li conceptualized the study. Liu Yang and Mahin Alamgir drafted the initial manuscript. Qing Wang, Jingjiang Cao, Jianxiu Wang, and Han Liu collected the data and Xiaoxu Yin conducted the data analysis. All authors contributed to revisions of the initial manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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