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.

care between each use. Twenty cycles of steam treatment did not adversely affect fit testing performance, consistent with previous reports that short cycles of steam treatment may have minimal effect on N95 filtration and fit performance.[1,4] Further work is needed to assess the impact of short cycles of steam treatment on filtration efficiency and to develop technologies that could provide steam treatments for respirators and face masks in health care settings.

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Application of fluorescence method in the process of personal protective equipment removal

To the editor,

More than 1.2 million cases of Coronavirus disease 2019[1] had been confirmed worldwide as of April 6, 2020. With the increase in overseas returnees and visitors to China, Hangzhou sets up a working group, including health care workers and staffs from public security, transportation, foreign affairs, and other nonmedical system, responsible for quarantine work. Proper wear and removal of personal protective equipment (PPE) becomes a critical measure to ensure the safety of frontline personnel. This study intends to carry out the practice of pollutant simulation, so as to grasp the key point of PPE removal and guarantees the safety of frontline staffs.

We trained 140 staffs from the working group for the theory of PPE in batches, followed by one-to-one field practice of wear and removal of PPE. Forty-six frontline staffs from nonmedical systems were selected to carry out the pollutant simulation test. According to the characteristics of the phosphors which can be identified by naked eyes under ultraviolet irradiation, we dissolved the phosphors in gel like ethanol as pollutant. We applied the phosphors on the outer surface of the gloves, forearms of the whole-body protective gowns, the outer surface of the gown hat, and the bare outer surface of kn95 respirator. After removing the PPE, we irradiated the clothes and the exposed skin through the ultraviolet lamp to show the risk points during the removal process.

In the pollutant simulation test, 21 staffs polluted the upper chest, accounting for 45.7% of the total, followed by 20 and 15 staffs polluted the hands and the front chest, accounting for 43.5% and 32.6% of the total, respectively. The number of people with face and back pollution was less than 10%. See Table 1 for details.

Table 1
Analysis of contaminated sites in pollutant simulation test

Contaminated sites	Number of people contaminated	Proportion of pollution (%)
Upper chest	21	45.7
Bare hands	20	43.5
Anterior chest	15	32.6
Upper limbs	6	13.0
Inner surface of protective gowns	6	13.0
Lower limbs	5	10.9
The face	2	4.3
The back	1	2.2

The correct use of PPE is an effective way to ensure the safety of personnel, and improper wear and removal will bring potential harm to users.[2] In this study, 45.7% of the workers caused the upper chest pollution during the unloading process of PPE, and the main pollution source was from the lower edge of outer surface of kn95 respirator. When the user lowered his head in the removal process, the chest was contaminated. Therefore, in the wear process, it is necessary to protect the external surface of the kn95 respirator with the placket seal.

During the removal of PPE, 43.5% users contaminated their hands. In this study, 50% of the workers' hand hygiene actions were not standardized, and 39.1% of the workers forgot to do hand hygiene at least once when they took off PPE. Hand hygiene is considered the most economical, convenient, and efficient way to control hospital infection,[3,4] it is of great significance to enhance the awareness of hand hygiene.[5] To reduce the risk of infection, we should pay more attention to the removal of PPE without contamination as well as its supply.

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