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Contamination by respiratory viruses on outer surface of medical masks used by hospital healthcare workers

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Abstract

Background: Medical masks are commonly used in health care settings to protect healthcare workers (HCWs) from respiratory and other infections. Airborne respiratory pathogens may settle on the surface of used masks layers, resulting in contamination. The main aim of this study was to study the presence of viruses on the surface of medical masks.

Methods: Two pilot studies in laboratory and clinical settings were carried out to determine the areas of masks likely to contain maximum viral particles. A laboratory study using a mannequin and fluorescent spray showed maximum particles concentrated on upper right, middle and left sections of the medical masks. These findings were confirmed through a small clinical study. The main study was then conducted in high-risk wards of three selected hospitals in Beijing China. Participants (n = 148) were asked to wear medical masks for a shift (6-8 h) or as long as they could tolerate. Used samples of medical masks were tested for presence of respiratory viruses in upper sections of the medical masks, in line with the pilot studies.

Results: Overall virus positivity rate was 10.1% (15/148). Commonly isolated viruses from masks samples were adenovirus (n = 7), bocavirus (n = 2), respiratory syncytial virus (n = 2) and influenza virus (n = 2). Virus positivity was significantly higher in masks samples worn for > 6 h (14.1%, 14/99 versus 1.2%, 1/49, OR 7.9, 95% CI 1.01-61.99) and in samples used by participants who examined > 25 patients per day (16.9%, 12/71 versus 3.9%, 3/77, OR 5.02, 95% CI 1.35-18.60). Most of the participants (83.8%, 124/148) reported at least one problem associated with mask use. Commonly reported problems were pressure on face (16.9%, 25/148), breathing difficulty (12.2%, 18/148), discomfort (9.5% 14/148), trouble communicating with the patient (7.4%, 11/148) and headache (6.1%, 9/148).

Conclusion: Respiratory pathogens on the outer surface of the used medical masks may result in self-contamination. The risk is higher with longer duration of mask use (> 6 h) and with higher rates of clinical contact. Protocols on duration of mask use should specify a maximum time of continuous use, and should consider guidance in high contact settings. Viruses were isolated from the upper sections

of around 10% samples, but other sections of masks may also be contaminated. HCWs should be aware of these risks in order to protect themselves and people around them.

Keywords: Health care workers; Infection control; Mask; Viruses.

Figures

Fig. 1 Fluorescent particles (UV Glow power)...

Fig. 2 Fluorescent particles (UV Glow powder)...

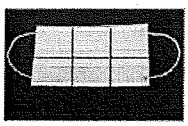

Fig. 3 Sections of medical masks for...

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