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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Keeping the Workplace Safe in Troubled Times

The protection of health-care workers (HCWs) from potentially transmissible diseases is a fundamental principle of occupational health and safety. All of us should be committed to providing the best possible care to our patients, but this principle should also be balanced by minimizing the risk of contracting the disease for which the patient is being treated. This balance is particularly relevant to HCWs involved in the management of patients with potentially transmissible respiratory infections.

In the last 2 decades, the world has witnessed two epidemics of viral respiratory infection, namely the severe acute respiratory syndrome (SARS) outbreak of from 2002 to 2003 and the avian influenza outbreak that commenced in 2003. The SARS outbreak was, according to World Health Organization data, associated with a case fatality ratio of 9.6% and a significant rate of infection in HCWs as a proportion of total cases (1,706 of 8,096 HCWs; 21%).[1] There are no data available regarding the details of disease transmission in the affected HCWs, in particular whether any were involved in the provision of noninvasive ventilation (NIV). The avian influenza A (H5N1) outbreak has had fewer total cases (413)[2] but a much higher case fatality ratio (256 of 413 HCWs; 62%) as of March 2009. While there are no data regarding either the rates of infection or mortality in HCWs involved in the clinical care of patients with avian influenza, there does seem to be very limited evidence of human-to-human transmission. It seems reasonable, therefore, to conclude that the risk of transmission of avian influenza to HCWs is low.

NIV is of proven benefit in the management of patients with acute hypercapnic exacerbations of COPD. Its role in the management of patients with hypoxemic, normocapnic acute respiratory failure (ARF) is, however, far less certain. This uncertainty is particularly relevant to the potential management of patients with ARF associated with viral respiratory infections. With respect to this particular clinical scenario, we have conflicting data about both efficacy and safety. In a nonrandomized study of NIV therapy in patients with SARS associated with ARF, Cheung et al[3] reported positive outcomes with NIV when compared with standard care, including reduced need for intubation, shorter length of ICU stay, and more rapid improvement in chest radiograph appearance. There were no instances of infection transmitted to HCWs in this study; however, the number of patients treated with NIV was small (only 20 patients). On the other hand, a study[4] of SARS in Guangzhou and Hong Kong identified NIV therapy as an independent risk factor for nosocomial outbreaks. It is clear, therefore, that both the efficacy and safety of NIV in patients with ARF secondary to viral respiratory infection are of paramount importance in determining the role of this therapy in current and future outbreaks.

In the setting of influenza and other respiratory virus epidemics, and with the potential use of NIV in patients with influenza and other respiratory viruses, the issue of HCW protection is of critical importance. It is therefore imperative that studies like that reported by Hui et al[5] in this issue of *CHEST* (see page 998) be considered when formulating current and future treatment guidelines. These researchers and clinicians have demonstrated, in a human patient simulator experimental design, that there is significant dispersion of exhaled air when NIV is applied, and that this dispersion is influenced by both mask selection and the level of inspiratory positive airway pressure (IPAP) applied.

In particular, the dispersion of exhaled air is increased with both higher IPAP and the use of masks that have swivel exhalation ports.

So, where to from here? We have limited data to support the use of NIV in this particular clinical setting. We have limited, if any, data regarding the real-world risk to HCWs administering NIV therapy to patients with these infections. We have clear evidence of significant dispersion of exhaled air when NIV is applied, at least in the available bench studies. At the time of writing, these issues have become more immediately relevant with the current outbreak of swine influenza A (H1N1) in a number of parts of the world, but particularly in Mexico, Canada, and some states in the United States. The illness with this influenza subtype seems to be, in general, relatively mild, but with a tendency to affect not only the elderly with comorbidities, but also young, healthy adults. Therefore, the role for, and safety of, NIV in patients with ARF secondary to viral respiratory infection must be rapidly addressed. With this in mind, I would recommend consideration of the following clinical, and occupational and health safety issues when treating these patients:

- Careful consideration of the absolute need, or otherwise, for NIV in each case;
- Management of patients in isolation rooms that are equipped with negative-pressure, unidirectional airflow;
- Restriction of the number of HCWs actively involved in each case;
- The use of appropriate personal protective equipment by the HCWs involved in treatment;
- Appropriate mask selection when applying NIV;
- Maintenance of as low an IPAP as possible, keeping in mind that the delta pressure (*ie*, IPAP − expiratory positive airway pressure) is critical to the optimal augmentation of ventilation when NIV is applied; and
- The use of filters between the mask and exhalation devices.

Hui and colleagues[5] have brought to our attention the critically important issue of the protection of HCWs when managing ARF patients with potentially transmissible respiratory infections using NIV. One of the first principles of clinical care is "to first do no harm." We need to remember that this principle applies not only to our patients but also to all HCWs.

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The Patient-Ventilator Interaction Has a Third Player

The Endotracheal Tube

During invasive mechanical ventilation, physicians usually concentrate on treating the patient's underlying lung disease and adjusting the ventilator in such a way that it does not cause harm (*eg*, ventilator-induced lung injury, pneumothorax, or hemodynamic compromise) and delivers flow or pressure with such timing and magnitude that it matches the output of the patient's respiratory controller. Quite often, physicians forget that in this patient-ventilator interaction, there is a third player present: the artificial airway. Only after several days in the ICU, is the artificial airway considered as a potential source of trouble. In this issue of *CHEST* (see page 1006), Wilson et al[1] challenge this view. In the laboratory, they measured the resistance (*ie*, the pressure drop at three different constant flow rates) of 71 endotracheal tubes immediately after being removed from ICU patients and that of a similar number of new tubes of equal size (internal diameter range, 7 mm to 8.5 mm). They found that three-quarters of the patients' endotracheal tubes had pressure drops of >3 SDs of size-matched controls. In one-half of the extubated tubes, the resistance was equivalent to the next smaller size of new tubes, and in 10