It’s Not Just about the Mask

COMMENTARY

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ABSTRACT

Occupational health and infection prevention and control should utilize both the precautionary principal and the scientific literature to ensure staff safety during an Influenza Pandemic. The literature indicates that N95 respirators should be used whenever the mode of transmission is not clearly understood. However, focusing just on the type of respiratory protection while necessary is not sufficient. A multi-pronged approach to staff safety should be used when planning for an Influenza Pandemic. This includes the implementation of Routine Practices and Additional Precautions in all healthcare institutions, optimal hand hygiene, fit-tested N95 respirators for staff providing direct care to patients with a virus of unknown epidemiology or which is known to be transmitted by the airborne route, vaccination of all staff when an effective vaccine is available and chemoprophylaxis against Influenza A. Patients will be best cared for when workers believe that everything possible is being done to protect their health.

Silas et al. have written a position paper that illustrates the importance of the precautionary principal and the role of occupational health and infection prevention and control in ensuring staff safety. At issue are not the recommendations. The recommendations of
the Canadian Federation of Nurses Unions are those felt to be necessary by the grassroots members of their organizations.

However, appropriate safety standards should not be dictated by emotion and scaring workers by stating that “sending health-care workers to work with surgical masks is akin to sending soldiers into Iraq with BB guns” (Lamey 2006). Such approaches only serve to polarize those concerned with providing care to patients and those concerned with protecting staff into opposing camps.

The Scientific Debate

The scientific debate as to whether to use a surgical mask or an N95 mask for pandemic influenza continues in respected publications. It is marked by intense discussion of the available literature to determine whether the influenza virus is spread by aerosol means or large droplets. Tellier provides us with the scientific rationale for determining whether it is likely that influenza is spread by aerosol means (2006); Lemieux and her co-workers have conducted a meta-analysis of the available literature to determine whether it supports aerosol transmission, and conclude that it doesn’t (Lemieux et al, 2007; Brankston et al, 2007). Basic science helps shed some light on this. Influenza A attaches to epithelial cells by hemagglutinin. The hemagglutinin of human influenza viruses binds to cell sialic acid linked to galactose by an α-2,6 linkage found on human cells, whereas avian viruses prefer to attach to sialic acid with an α-2,3 linkage. This accounts for the limited spread of the influenza A H5N1 virus, which is the presently circulating avian strain that can be transmitted to humans. When it does spread to humans, it preferentially binds to epithelial cells in the alveoli (Shinya et al. 2006), which suggests that aerosol transmission is required for the H5N1 virus to infect humans. Some of the issues could be resolved by widening the classification of routes of transmission of respiratory viruses to include opportunistic airborne transmission (Roy and Milton 2004). However, if aerosol transmission occurs, fit-tested N95 respirators will provide better protection than surgical masks but are also not perfect (Balazy et al. 2006).

It is also important to note that Silas et al. have made a substantial leap from severe acute respiratory syndrome (SARS) to pandemic influenza. These are not the same types of illness. SARS was basically a nosocomial illness that was acquired by patients, staff and their close family members. It was infectious only when the patient was symptomatic, and there was no vaccine, treatment or possibility of prophylaxis. A pandemic influenza would be a different type of infectious disease emergency. It would be community based and infectious before the onset of symptoms. A vaccine would definitely be possible, and prototype vaccines to the influenza H5N1 virus exist. Furthermore, prophylaxis against the common strains of influenza has been shown to be effective (Moscona 2005; Peiris et al. 2007). Models exist to show that prophylaxis of healthcare workers could be achievable and cost effective (Balicer et al. 2005).

It is not at all clear what an influenza pandemic would look like. The H5N1 strain of influenza has certainly caused a pandemic in birds, but spread to humans has been limited, and spread among humans even more limited. Researchers are hypothesizing that several mutations would have to occur in this strain of influenza before it could spread from person to person. If this were to occur, the virulence and the clinical picture might be markedly changed from what is seen now (Horimoto and Kawaoka 2001; Peiris et al. 2007). The epidemiology and clinical picture of pandemic influenza might also differ
substantially from what is seen in the annual outbreaks of influenza.

**The Precautionary Principle**

The precautionary principle, as first enunciated by Krever (1997, Page 295), states, “Where there is reasonable evidence of an impending threat to public health, it is inappropriate to require proof of causation beyond a reasonable doubt before taking steps to avert the threat.” It is clear from Justice Campbell’s five-volume report that he did not intend for the precautionary principle to be used as a simple justification for N95 masks (Campbell 2006). What he stated was, “The real problem during SARS was not the N95 respirator or fit testing but deep structural contradictions in worker safety in the health care system.” (Page 1043) Failure to generalize the precautionary principle and applying it in its narrowest sense as an argument for the use of N95 masks misses the thrust of Justice Campbell’s report.

Our staff are our most valued resource. During SARS, our staff demonstrated their dedication and courage every day. This should never be lost in the discussions that occur as we plan to mitigate damage in the event of a pandemic. In turn, we are obliged to provide our healthcare workers with the best level of protection available to enable them to do what they do best. Studies looking at healthcare workers’ willingness to report to duty during a catastrophic disaster or pandemic concluded that education, provision of appropriate personal protective equipment (PPE) and assurance of effective environmental controls are major facilitators (Qureshi et al. 2005). Our goal is to ensure that our workers remain healthy and are able to come to work so that the health sector continues to operate effectively and care for patients during a pandemic. The question then becomes, What is the best way to protect our staff?

**Infection Prevention and Control Strategies**

**Routine Practices and Additional Precautions**

One of the most important and widely agreed upon precautionary measures during a pandemic is strict adherence to routine practices and additional precautions (Health Canada 1999). This includes optimal hand hygiene, which has been termed *the cornerstone of infection prevention and control*. Despite the simplicity of the intervention, experts estimate that health practitioners only comply with recommended hand hygiene procedures 50% of the time, leaving ample room for improvement (Institute for Health Improvement 2006).

**N95 Respirators**

Fit-tested N95 respirators should be used when the epidemiology of a virus is incompletely understood. Staff should have this level of protection available when required to care for patients infected with a virus of unknown epidemiology or one that is known to transmit from human to human by the airborne route, whether obligately or opportunistically. When fit-tested N95 respirators are used in conjunction with the proper use of gowns, gloves and goggles and excellent hand hygiene practices, the occupational transmission of viruses of unknown epidemiology can be substantially reduced.

**Vaccination**

Vaccination is the preferred strategy for preventing influenza in high-risk groups annually. This strategy may be difficult to apply to a pandemic since the nature of the virus causing the pandemic will only be known just as the pandemic is developing. The US Food and Drug Administration (2007) has approved a vaccine for humans...
against the avian influenza A H5N1 virus. This vaccine is well tolerated. However, only “45% of individuals who received the 90 microgram, two-dose regimen developed antibodies at a level that is expected to reduce the risk of getting influenza” (US Food and Drug Administration 2007). It is likely that this vaccine will be less efficacious against a virus strain that has mutated sufficiently to cause a pandemic. It is expected that an effective vaccine would not be available until approximately six months after the appearance of a pandemic strain of influenza A.

Chemoprophylaxis against Influenza A

Since a pandemic would not be limited to hospitals but would also involve the community, and considering the fact that influenza is usually infectious before it is symptomatic, the best protection for our healthcare workers would be one that provides constant protection both inside and outside the hospital. There are two classes of antiviral agents against influenza A, the adamantanes and the neuraminidase inhibitors. The neuraminidase inhibitors have a wider spectrum of activity and demonstrate less toxicity than the adamantanes. They act by interfering with the release of the influenza virus from infected host cells, preventing infection of new host cells and halting the spread of infection in the respiratory tract (Peiris et al. 2007). There are two available neuraminidase inhibitors on the market, oseltamivir (Tamiflu) and zanamivir (Relenza). Both of these agents have been shown to prevent infection with influenza A (Hayden et al. 1999a, 1999b; Monto et al. 1999; Welliver et al. 2001). In addition, at the recommended dose for prophylaxis, Tamiflu has limited side effects, consisting mainly of nausea, and can be taken safely for an eight-week period (Ward et al. 2005). However, influenza H5N1 has been able to develop resistance to this agent (de Jong et al. 2005; Le et al. 2005).

The Influenza Subcommittee of the Toronto Academic Health Science Network (TAHSN), after a one-year review, has recommended the purchase of a sufficient amount of Tamiflu to provide prophylaxis for all staff for an eight-week period (2006). In addition, TAHSN has recommended the purchase of sufficient zanamivir to provide prophylaxis to 5% of staff for an eight-week period.

Conclusions

The goal of leaders in the healthcare sector is to ensure that patients are cared for appropriately. This can only be achieved if we have healthcare workers willing to take up the challenge. And this will only be accomplished if workers are kept healthy and believe that everything possible is being done to protect their health. Thus, a multi-modal approach to the protection of healthcare workers is required, including excellent implementation of routine practices and additional precautions in all healthcare institutions, vaccination of staff when a vaccine is available, chemoprophylaxis for healthcare workers during a pandemic and appropriate PPE for all those required to provide direct patient care.

References


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