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EDITORIAL OPINION

Pandemic Influenza: Impact on Perianesthesia Nursing Areas

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As our readers are aware, these pages are typically used by the editors. However, in light of the recent events and concerns surrounding the swine flu, the editors have elected to quickly substitute an informative piece regarding influenza for the usual editorial. We thank Dr. Daphne Stannard for her willingness to disseminate her knowledge on the topic. The Editors

INFLUENZA, also known as flu and grippe, is an acute and contagious respiratory illness of viral etiology. Perhaps one of the older diseases of civilization, influenza was described as early as 1679 as significant respiratory impairment (such as violent cough and thickened pulmonary secretions), fever, and vomiting.[1] At the time of publication, the 2009 H1N1 flu (a strain of what was initially called swine flu) was emerging with pandemic potential and had already caused three deaths and 3,009 laboratory confirmed cases in the United States, and 4,694 cases in 30 countries (www.cdc.gov; www.who.int). The purpose of this article is threefold: to describe influenza viruses, to differentiate between epidemics and pandemics, and to discuss the impact of emerging biologic threats on perianesthesia nursing areas.

Influenza Viruses

Influenza viruses are members of the *Orthomyxoviridae* family of viruses and can be classified as A, B, or C. All influenza types can cause human disease and seasonal epidemics, but type B viruses are not categorized into subtypes and have not been known to cause pandemics. Type C viruses are a major cause of respiratory infection in children under 6 years of age, but the majority of humans acquire protective antibodies to influenza C early in life.[2]

Type A is the primary pathogen for human disease and is the only influenza virus that has historically caused pandemics. Influenza A viruses are further divided into subtypes based on the surface proteins of the particular virus. These proteins are called hemagglutinin (H) and neuraminidase (N), which determine host immunity and subtype designation.[3] The naming convention is based on which proteins are present on a given virus. The avian flu outbreak that emerged in 2002 was a strain of Influenza A H5N1, where 5 and 1 correspond to the specific type of hemagglutinin and neuraminidase found on the surface of the virus.

Human influenza attaches to and invades the epithelial cells of the upper respiratory tract. Viral replication in these epithelial cells leads to a proliferation of proinflammatory cytokines and apoptosis (or programmed cell death of the host cells) when the new viral particles burst through the host cell surface to invade other cells.[2,4] The destruction at the cellular level in the pulmonary bed leads to violent coughing, which further disperses the influenza virus. Transmission occurs through multiple routes, including large droplets and direct and indirect contact. Fine droplet inhalational transmission may also occur.

The incubation period for influenza is usually one to four days. Virus replication begins within six hours of infection and continues for at least 24 hours before the onset of symptoms. In adults, viral shedding continues for one

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to two days after onset of symptoms, and children can shed virus for 10 days or more. Classic signs and symptoms of influenza include fever, myalgia, malaise, sore throat, and a cough. Additional symptoms may include headache, rhinorrhea, nausea, and diarrhea. In most patients, the duration of symptomatology is three to six days. Although most influenza is associated with an acute, yet mild and self-limiting illness, patients with severe disease can rapidly progress to severe respiratory failure, multiorgan failure, and death.[5]

Epidemics and Pandemics

Influenza viruses can change in two ways. One way of changing is called antigenic drift, which is a gradual process whereby the virus adaptively mutates to increase the capability of binding to human cells during subsequent human infections. These small, but important, mutations in the surface proteins of the influenza virus require the flu vaccine to be re-formulated on an annual basis. In a typical year, seasonal influenza causes widespread illness and approximately 30,000 deaths in the United States alone. These seasonal influenza epidemics are caused by slight mutations in the influenza virus. During these outbreaks, people may have some residual immunity from exposure to previously circulating influenza strains or cross-subtype immunity from seasonal influenza vaccinations.[6]

Another way the influenza virus can change is called antigenic shift or reassortment, which is an abrupt, major change in the influenza virus. Dramatic changes in the surface proteins of the influenza virus, through mutation of nonhuman (e.g., avian or swine) viruses or reassortment of human and nonhuman viruses, result in the creation of a new human subtype or a protein combination that has not been seen in humans for many years. Pandemic influenza can cause a public health crisis because most people would be immunologically naïve to the new virus.[7]

In order for a pandemic to occur, three elements must be present. First, an influenza virus must emerge from an animal reservoir and engage in a reassortment event with a human influenza virus. Genetic material can be exchanged between human and avian or swine viruses during coinfection of a human, bird, or pig. Second, the novel virus must actually make humans sick. Reassortment events occur frequently, yet most do not yield pathogenic viruses. Third, the virus must be fully transmissible from human to human—spread easily through coughing, sneezing, or a handshake. If all three elements are present, the public is at great risk in facing a new and potentially deadly virus that is easily transmissible.

In the past 100 years, there have been three influenza pandemics. The first was the 1918-1919 "Spanish Flu" pandemic, which was responsible for 20-40 million deaths worldwide. The virus responsible for this pandemic was Influenza A H1N1. This pandemic was unique because the virus was extremely virulent and spread across the globe in six months. Almost half of those who died were young, healthy adults between 20 and 40 years of age.[8] The second pandemic was the 1957 "Asian Flu," which was responsible for 1-4 million deaths worldwide. The virus responsible for this pandemic was Influenza A H2N2. The highest mortality rate with this pandemic was among the elderly population. Finally, the third pandemic, "Hong Kong Flu," occurred in 1968 and was responsible for 1-4 million deaths worldwide. The offending virus in this case was Influenza A H3N2. This virus still circulates today, though many people have acquired protective antibodies.[9]

Because the last influenza pandemic occurred nearly half a century ago, the seriousness of these global events seems remote to many health care workers (HCWs). However, the outbreak of severe acute respiratory syndrome (or SARS) in 2002 was a call to action for many. This outbreak was not caused by an influenza virus as was initially feared, but rather by a novel coronavirus. During the 2002-2003 outbreak, SARS resulted in 8,450 cases and 810 deaths in 33 countries on 5 continents.[10] According to the World Health Organization (WHO), HCWs accounted for 21% of the SARS cases reported worldwide. The number of fatal infections in HCWs is not known, but deaths have been reported.[11]

Impact of Emerging Biologic Threats on Perianesthesia Areas

Emerging biologic threats would definitely impact perianesthesia areas. Despite the uncertainties about a possible pandemic, advanced planning is possible based on the principles of leadership, communication, surveillance, capacity management, and support.[12] Leadership and communication go hand in hand. Strong leadership is necessary in a crisis to instill confidence and provide direction as events unfold. Clearly delineated roles and responsibilities are necessary, as well as frequent communication both up and down the line of command. Surveillance would include, among other things, monitoring prevalence rates and other patient-related data, as well as monitoring staff compliance with infection control measures.

Capacity management in this situation refers to surge capacity. All health care facilities have policies and procedures in place for infection control practices and specific operational plans for handling a large influx of potentially infectious patients in the event of a significant outbreak.[13] Surge capacity refers to the flexibility within a health care facility to accommodate a large number of

patients. Operating Rooms (ORs) and Post Anesthesia Care Units (PACUs) are often designated surge areas within a health care facility. They are designated surge areas primarily because of their physical layout: ORs and PACUs have oxygen and gas hookups, suction, and monitoring capabilities. Additionally, many PACUs are staffed with nurses who have critical care background/training and/or are currently ACLS certified. However, having a critical care background does not mean that the PACU nurse feels competent and capable of caring for a surge patient.

The final principle is support. Perianesthesia nursing leaders should ensure that their staff has the proper education and training to care for surge patients, adequate quantities of surge supplies, and sufficient staff reinforcements should a true influenza pandemic present itself. Because of the inherent infection control issues, staff should also receive training regarding which personal protective equipment (PPE) is necessary and how to properly don and doff the PPE.[14,15] Supply shortages will be routine in a pandemic, thereby making it impractical to rely on just-in-time supplies. Some supplies will be available to health care facilities from the federal Strategic National Stockpile; however, these "push packages" are delivered to the state level, and it may take time for the supplies to arrive at the local facility requesting the items.[16] As such, par levels should be increased for critical items, in anticipation of high use and broken supply chains.

Ensuring adequate staffing is the last line of support. A recent qualitative study examining nurses' beliefs and concerns during public health emergencies revealed an overwhelming fear of abandonment. Nurses believed the clinical settings would be chaotic, with unmanageable numbers of patients and inadequate supplies of PPE. Loss of freedom to leave the hospital and fears that the hospital would not provide treatment to front-line nurses who became ill contributed to nurses' sense of abandonment.[17] Cross-training staff and exploring modified staffing patterns (such as a two-tiered nursing approach in caring for critically ill patients in surge areas with non-critical care nurses) are strongly encouraged so that adequate planning and buy-in can occur before a crisis mandates these actions. Depending on the extent of the pandemic, routine non-urgent activities may be suspended and redeployment of staff instituted to enhance surge capacity and reinforce existing staffing.

In conclusion, the 2009 H1N1 virus strain causing the current outbreaks is a new virus that has not been seen previously in either humans or animals. Additionally, H1N1 appears to be more contagious than seasonal influenza. At the present time, the virus strain appears to cause very mild illness. But scientists are always concerned about the intrinsic mutability of influenza viruses. At the time of publication, there is no way to know if the pandemic threat will erupt or evaporate. In any event, the following are modest recommendations based on the knowledge we have today and the evolving threat of 2009 H1N1:

- Regularly check the CDC website for updates, recommendations, and pandemic flu planning tools (www.cdc.gov).
- Practice good hand hygiene frequently and teach friends and family members to do the same.
- Practice respiratory hygiene/cough etiquette, such as covering your mouth with the "antecube hook" when coughing. This simple change in habit reduces the viral load on your hands.
- Do not go to work sick. If you have children, do not send them to preschool/school if they are sick. Voluntary isolation helps to stop the spread of the virus to others.
- Implement social distancing measures, such as avoiding crowded settings.[18]
- Keep yourself up to date with the latest information. Family members, friends, and consumers will look to you for information. Sir Francis Bacon said, "Knowledge is power." A corollary to that maxim is that ignorance is fear. Keep abreast of the evolving situation and share the information freely with others.
- Get vaccinated with the annual flu vaccine. An unvaccinated HCW is an at-risk HCW because viral shedding occurs before influenza symptoms present themselves. This puts all of the patients for whom you care at risk.[19]
- Get involved on your hospital-wide disaster planning committee.
- Do not keep exotic pets, as they provide reservoirs for zoonotic pathogens and opportunities for microbial transmission.[20]

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