

Pandemic Flu

Practical Information and Strategies for Preparedness

By Jill A. Antoine, M.D., and Tai L. Antoine, M.P.H.

Jill A. Antoine, M.D., Associate Clinical Professor at University of California San Francisco, received her M.D. at the Uniformed Services University of the Health Sciences. Tai L. Antoine, M.P.H., is a 2009 J.D. Candidate at Case Western Reserve University School of Law studying Health Law. She received her Master's in Public Health from Dartmouth Medical School in 2005.

Influenza is a disease with which we are all very familiar. We see it in our patients every year. Those of us who work in the ICU setting care for patients with complications of influenza, most notably the secondary infection of bacterial pneumonia. What is influenza, and what does the concern about Pandemic Influenza mean to us as anesthesiologists? We will define and discuss these concerns and hope to provoke you into action for your safety, that of your family, and ultimately the care of all patients during Pandemic.

Influenza is an RNA virus subject to a high mutation rate. This virus has three distinct types: A, B, and C. Certain subtypes of Influenza A and Influenza B circulate among humans and cause annual outbreaks. Hemagglutinins (H) and Neuraminidase (N) are the antigenic spikes, which sit on the viral surface. The different strains of flu are named for the combination of H and N spikes. The Influenza virus is highly unstable and prone to small mutational errors. It has a segmented genome with eight genes allowing easy swapping of genetic material when a host is co-infected with two different viruses. Humans develop immunity or decrease the likelihood of severe influenza disease by obtaining a vaccine to the Hemagglutinin or Neuraminidase of the Influenza type suspected to be present in the human population for a given year. Tamiflu, an antiviral agent, inhibits the activity of neuraminidase and blocks virus release, thus decreasing the length and severity of Influenza illness.

Annual Influenza has an incubation period of one to four days. The whole respiratory tract may be involved. The disease begins with an abrupt onset of fever, chills, malaise, and muscle aches. A cough, sore throat, and headache follow. The duration of severe symptoms is three to seven days. A serious concern is that viral shedding occurs BEFORE the onset of any symptoms, with large amounts of virus shed in the respiratory secretions. This puts those who perform airway procedures such as intubation at high risk for contracting the virus.

Pandemic Flu (cont'd)

Annual Influenza already has a significant impact on the U.S. We typically see 36,000 deaths, 200,000 or more hospitalizations and 17 million to 50 million people infected each year. Influenza infections also cause 70 million missed workdays and 40 million missed school days, with 3 billion to 15 billion dollars in direct and indirect costs to our economy.

Where does Avian Influenza fit into this picture? Avian Influenza was first described as affecting poultry in Italy in 1878. It was recognized later as the cause for an outbreak in humans in 1955. Innumerable Avian Influenza strains are found in many avian species. Some strains are low potential virulence and are known as low pathogenic avian influenza (LPAI). Others are highly pathogenic (HPAI). The incubation period in birds is three to 14 days and the virus highly contagious, with virtually 100 percent of an exposed population contracting the disease. The virus is shed in bird droppings. HPAI causes 95 percent mortality in birds in 24 to 48 hours. There have been 23 recognized human outbreaks in the world since 1959. H5N1 is the strain of HPAI currently spreading and we are concerned that it will mutate and create Pandemic Influenza. One can easily understand that the migratory nature of the world's wild bird population is a serious concern.

H5N1 has been found in humans and appears to have resulted when humans are in close contact with infected poultry. Humans are exposed to the avian virus in bird droppings or by eating undercooked infected poultry. The H5N1 Avian Influenza begins as a typical Influenza, with fever, myalgia, cough, and sore throat, which progresses to a diffuse viral pneumonia and cytokine storm resulting in a 50 percent case-fatality rate. To date, we have not seen any sustained human-to-human transmission of H5N1 virus. It is only a matter of time for this to occur. Influenza has occurred in the past as a pandemic. In 1918, the Spanish Flu H1N1 killed at least 3 percent of the world's population (50 million people). In 1957 the Asian flu killed 1.5 million and in 1968 the Hong Kong Flu H3N2 killed one million. Pandemic Influenza occurs when a major change, mutation, or genetic reassortment of type A virus from an avian strain occurs. The new virus spreads rapidly in a population with no previous immunity or minimal immunity, thus resulting in a Pandemic. We cannot prevent a Pandemic from occurring. We do not have a vaccine yet and we cannot produce enough doses in time to prevent a Pandemic should development of a vaccine occur. So, for the moment, the key is to be prepared when a Pandemic arrives.

A Pandemic is a disease that occurs over a wide geographic area, affecting an exceptionally high proportion of the population. With 6.6 billion people on earth today, 300 million of whom live in the U.S., a pandemic of H5N1 with a 30 percent infection rate and current reported death rate of 50 to 60 percent

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will result in upwards of 50 million deaths in the U.S. alone. One can only imagine the death toll in countries with health care systems that are less developed than those in the U.S.

Pandemic is the worst-case public health scenario that can occur. The world's population has grown dramatically this past century. Transportation is now global. A Pandemic will not be contained like a hurricane or tsunami. It will be sustained over weeks to months. This will result in a breakdown of our healthcare infrastructure, which is already operating at 100 percent to 105 percent capacity on a daily basis. There will be a demand that cannot be met for ventilators in all of the nation's ICUs. Supplies will run out, transportation will be disrupted, and an economic recession will occur. Order and security will be disrupted nationally for several months.

What can you do for yourself, your family and your local hospital and patients? Preparedness for Pandemic starts at home. You will find an excellent plan to put into action in your home at <http://www.pandemicflu.gov/plan/checklists.html>. Once you have this plan in place, you can develop a pandemic preparedness plan for your anesthesia department.

No researcher, organization, or government agency has stated how we can protect ourselves from the H5N1 virus or any other virus that may cause this Pandemic. Many have been told that the N-95 mask will be sufficient. Logically, this is not the case. N-95 is a nomenclature developed by industry to define a mask that will filter 95 percent of particles presented to it that are 0.3 microns or greater in diameter. It was never tested with live virus particles, and H5N1 is a 0.1-micron virus ... NOT 0.3 microns! What other viable options exist for anesthesiologists in contact with infected patients when called to perform intubations? Intubation is a known aerosol-generating procedure. We also know that an infected patient sheds the influenza virus through respiratory secretions. The best clearly described method for protection from infection during aerosol generating procedures is wearing Personal Protective Equipment (PPE) and a Powered Air-purifying Respirator (PAPR). PAPR is the current recommendation of the California Department of Health Services (CDHS) for use at all intubations and on bronchoscopes. One must be educated on how to appropriately don and doff protective clothing and the PAPR in order to prevent inadvertent infection when removing the device. More important, one must have PPE and PAPR in one's hospital for one's explicit use. Currently, across this nation, it is more common to find hospital Emergency Rooms equipped with PPE and PAPR and not operating rooms, ICUs, and the corresponding personnel. We must approach our hospitals and obtain the equipment and training we need to perform as professionals during a Pandemic, while protecting ourselves from infection and death. If we become infected, we can no longer care for those who need us most!