

# AORN Guidance Statement: Human and Avian Influenza and Severe Acute Respiratory Syndrome

## I. OVERVIEW

### A. INTRODUCTION

#### ASSUMPTIONS

The AORN guideline on human and avian influenza and severe acute respiratory syndrome (SARS) is based on research and the experience of health care workers. It is assumed that ongoing research will result in new knowledge, procedures, and medical and nursing interventions for the treatment of patients with human and avian influenza and SARS. This guideline is designed to assist perioperative registered nurses in creating and maintaining an optimal health care environment for patients with human and avian influenza and SARS. The guideline defines the unique physical and psychosocial needs of the influenza and SARS patient populations and presents guidance for establishing a plan of care for these patients.

### B. HUMAN AND AVIAN INFLUENZA

During the twentieth century, influenza took an enormous toll on human life. More than four pandemics occurred.

- The 1918-1919 pandemic (ie, the "Spanish flu") caused an estimated 20 million to 50 million deaths worldwide. In the United States alone, there were 500,000 deaths.
- The "Asian flu" caused 60,000 deaths in the United States in 1957-1958.
- The "Hong Kong flu" pandemic of 1968-1969 caused approximately 40,000 deaths in the United States.
- The pandemic of 1977 (ie, the "Russian flu") had low mortality.<sup>1,3</sup>

During the last decade of the twentieth century, although there were no influenza pandemics, influenza-related deaths increased to 36,000 per year in the United States. During periods of epidemics, this number increased to 40,000. Influenza continues to be the sixth leading cause of death in the United States. For those over the age of 65, it is the fifth leading cause of death.<sup>4</sup>

Looking at the first five years of the twenty-first century, it is clear that the incidence of human influenza is not declining. The emergence of avian influenza as a potential threat to humans has become significant, making the threat of a future pandemic from avian influenza very real.<sup>1</sup>

#### DEFINITIONS

For the purposes of this document, the following definitions apply.

**Antigenic drift:** Point mutations leading to changes in antigenicity of the major hemagglutinin (HA) and neuraminidase (NA) antigen subtypes of an influenza virus.<sup>5</sup>

**Antigenic shift:** Change in circulating major antigen (ie, HA, NA) determinants either through exchange and reassortment of genetic material or adaptation to human transmission.<sup>5</sup> Occasionally, the antigenic shift that occurs with the influenza A virus is an abrupt, major change in the virus.<sup>6</sup>

**Hemagglutinin:** One of the two major surface proteins of the influenza virus. Important for virus attachment to cells of the respiratory epithelium. Subtypes include H1 to H15. The only described determinants involved in sustained human-to-human transmission are H1, H2, and H3.<sup>2</sup>

**Influenza epidemic:** A seasonal outbreak of influenza viruses that are already in existence among humans.<sup>2</sup>

**Influenza pandemic:** A global outbreak of disease that occurs when a new influenza A virus emerges in the human population, causes serious illness, and then spreads easily from person to person worldwide. Influenza pandemics are caused by a new subtype or by subtypes that have never circulated among humans or that have not circulated among humans for a long period of time.<sup>2</sup>

**Neuraminidase:** One of the two major surface proteins of the influenza virus that are less important for attachment but probably are important for propagation and virulence (ie, subtypes N1 to N9).<sup>5</sup>

## HISTORY

Hippocrates (470 BC to 410 BC) described the first case of influenza-like illness.<sup>1</sup> The first recorded influenza pandemic occurred in 1580 AD and spread from Europe to Asia and Africa. During the seventeenth century, local epidemics were reported. In the eighteenth century, three known pandemics occurred, in 1729-1730, 1732-1733, and 1781-1782. In the nineteenth century, three pandemics occurred, in 1830-1831, 1833-1834, and 1889-1890. The pandemic of 1889-1890, known as the Russian flu, killed approximately one million people. It spread throughout Europe, reaching North America in December 1889 and spreading to Latin America and Asia in 1890.<sup>3</sup>

The most devastating influenza pandemic in recent history (ie, the "Spanish flu") occurred in the twentieth century. Worldwide, the death toll is estimated between 20 million and 50 million people and may have been as high as 100 million. In the United States, the mortality rate was more than 500,000 people. The Spanish flu was caused by the influenza A (H1N1) strain. It most likely originated in the United States and spread to Europe. The Asian flu of 1957-1958 was caused by the influenza A (H2N2) strain and had a mortality rate of approximately one million people worldwide. The virus was first identified in China. In 1968-1969, the Hong Kong flu, which was caused by the influenza A (H3N2) strain, had an estimated mortality rate in the United States of 40,000. Unlike seasonal influenza, influenza epidemics are particularly hard on people over the age of 65. At least initially, all three of these pandemics were characterized by a shift in age distribution of deaths to the population younger than age 65.<sup>3</sup>

The influenza A (H1N1) strain (ie, the Russian flu) appeared in 1977. Isolated in northern China, this virus was similar to the virus that spread before 1957. Consequently, people born before 1957 generally were protected. Children and young adults born after 1957, however, were not protected because they had no prior immunity.<sup>7</sup>

During the 1990s and into the 2000s, avian influenza A strains H5N1 (in Hong Kong, China, Thailand, Vietnam), H7N2 (in Virginia, New York), H7N3 (in Canada), H7N7 (in the Netherlands), and H9N2 (in China, Hong Kong)

appeared, causing epidemics in the international poultry industry. With the appearance of these strains came human exposure to avian viruses. Of these strains, H5N1 caused 31 deaths, and H7N7 caused one death. These outbreaks demonstrated that bird-to-human transmission does occur. In the Netherlands, there were three possible H7N2 transmissions from poultry workers to family members.

## POPULATION AFFECTED

### PREVALENCE

In the United States, the influenza season runs from autumn to spring, with peak activity occurring from December to early March.<sup>7,8</sup> Five percent to 20% of the population contracts influenza every year in the United States. Of the population that contracts influenza, more than 200,000 are hospitalized from influenza complications; and of these, approximately 36,000 die from influenza each year.<sup>9</sup> Although any person can contract this disease, some people have a higher risk of contracting influenza. This group includes those age 65 and older, children age six months to 23 months, pregnant women, and persons of any age with certain chronic medical conditions. Persons age 50 to 64 years also are targeted because they have an elevated prevalence of certain chronic medical conditions. Another high-risk group is those who live with or care for persons at high risk.<sup>10</sup>

The high-risk groups described above are always at risk, particularly for the influenza A viruses that currently are circulating. History has shown that there have been influenza pandemics that were devastating to the younger population, as seen with the pandemic of 1918-1919.

### SOCIOECONOMIC FACTORS

The socioeconomic impact of influenza, whether epidemic or pandemic in nature, can be substantial. Lost productivity as a result of missed work days caused by illness or caring for a sick loved one, the cost of hospitalization, and the impact of deaths related to the disease can be devastating to the community, and indeed to the nation. In one research study, it was estimated that an influenza pandemic in the United States could result in an "estimated

89,000 to 207,000 deaths; 314,000 to 734,000 hospitalizations; 18 to 42 million outpatient visits; and 20 to 47 million additional illnesses." The estimated economic impact would be \$71.3 billion to \$166.5 billion, excluding disruptions to commerce and society.<sup>11</sup> Clearly, preventing influenza through vaccination will reduce the incidence of the disease and its potential health effects, as well as reduce mortality, health care costs, and societal economic impact.

#### EPIDEMIOLOGY

Influenza is caused by a virus that belongs to the family of orthomyxoviridae and is classified as type A, B, or C. The key difference among type A, B, and C influenza viruses is their host range.<sup>1</sup>

Type A influenza viruses are the most predominate and have been isolated from humans, pigs, horses, seals, ferrets, mink, and whales. These viruses can be divided into subtypes based on their surface glycoproteins, HA and NA.

Subtypes of HA, designated as H1 through H15, are the crucial components of influenza vaccines. "Hemagglutinin facilitates entry of viruses into host cells through its attachment to sialic acid on epithelial cell receptors, promotes membrane fusion, and elicits protective neutralizing antibody response."<sup>1(p524)</sup> Hemagglutinin 1 through 3 are found in humans. Hemagglutinin 1 through 15 are found in birds.<sup>1</sup>

Subtypes of NA, designated as N1 through N9, are a target for antiviral agents. "Neuraminidase has enzyme activity, which cleaves sialic acid on virion proteins, facilitating the release of progeny virions from infected cells."<sup>1(p524)</sup> Neuraminidase 1 and 2 are found in humans. Neuraminidase 1 through 9 are found in birds. Currently, 15 HA and nine NA glycoproteins have been identified.<sup>1</sup>

Many combinations of HA and NA are possible. Currently, influenza A subtypes H1N1 and H3N2 are circulating worldwide. In 2001, influenza A (H1N2) emerged after genetic reassortment between human A (H1N1) and A (H3N2).<sup>12</sup>

Influenza B viruses usually are found in humans but have been isolated from seals and pigs.<sup>1</sup> These viruses do not cause pandemics, although they can cause epidemics. The influenza B viruses are not classified according to sub-

types. Influenza C viruses cause mild illness in humans and do not cause epidemics or pandemics. Like B viruses, influenza C viruses are not classified according to subtypes.<sup>6</sup>

Another characteristic of influenza B viruses and subtypes of the influenza A virus is their ability to produce new strains. Through the process of antigenic drift, new strains of influenza viruses appear and replace older strains. Antigenic drift is the reason why a person is susceptible to seasonal outbreaks of influenza.

*When a new strain of human influenza virus emerges, antibody protection that may have developed after infection or vaccination with an older strain may not provide protection against the strain. Thus, the influenza vaccine is updated on a yearly basis to keep up with the changes in influenza viruses.<sup>6(p2)</sup>*

Occasionally, the antigenic shift that occurs with the influenza A virus is an abrupt, major change in the virus. When this occurs, the virus has an HA protein or HA and NA protein combination that has not been seen in humans for many years. This leads to a new influenza A subtype for which most people have little or no immunity. If the virus is transmitted from human to human easily, the result may be a pandemic outbreak of influenza.<sup>6</sup>

Transmission of human influenza (ie, A, B, C) primarily is via virus-laden droplets that are expelled when an infected person coughs or sneezes. When a susceptible person is nearby (eg, within 3 ft), the droplets are deposited onto the mucosal surfaces of the person's upper respiratory tract (ie, close contact). Another mode of transmission may occur from direct or indirect contact with respiratory secretions of an infected person. At this time, studies have not demonstrated transmission of human influenza via contact with environmental surfaces.<sup>13</sup>

Avian influenza, also known as bird flu, is caused by viruses that occur naturally among birds. These viruses, which are seen worldwide, live in the gastrointestinal tract of wild birds. The viruses usually do not cause illness in wild birds, but when transmitted to domestic flocks, particularly poultry (eg, chickens, ducks, turkeys), it

can be devastating. All subtypes of the influenza A viruses can be found in birds.<sup>14</sup> Outbreaks of highly pathogenic avian influenza viruses have occurred recently; however, most avian strains are of low pathogenicity.<sup>15</sup> Avian influenza usually does not affect humans. Since 1997, however, several cases of human infection with avian influenza viruses have occurred.<sup>14</sup> Avian viruses cross over to humans by direct contact from infected birds, contaminated surfaces, or through an intermediate host, such as a pig.<sup>16</sup>

Adaptation of the avian influenza virus occurs via mutation of the avian virus genome or genetic reassortment, which is the mixing of segments from a virus already adapted to humans.<sup>1</sup> As an example, if a pig is infected simultaneously with a human influenza A virus and an avian influenza virus, the potential for reassortment exists, which could result in a new virus. This virus would have most of the genes from the human virus, and HA protein and/or NA protein from the avian virus, creating a virus with surface glycoproteins not previously seen in humans. The new virus may then infect humans and can spread from person to person.<sup>16</sup>

Human reassortment also is possible. In this case, the human host would be infected with a human influenza strain and an avian influenza strain. If this were to happen, the reassortment would create a virus with HA from the avian virus and genes from the human virus, again resulting in a virus to which humans have little or no immunity. Consequences of this type of reassortment, in theory, could be sustained human-to-human transmission leading to an influenza pandemic.<sup>16</sup>

The 1918, 1957, and 1968 pandemics of the twentieth century were caused by a novel type of influenza A virus of avian origin. Mutation of the genes of what was originally pure avian virus is the suspected cause of the catastrophic 1918 pandemic. In the 1957 and 1968 pandemics, the viruses involved "had components of previous human viruses as well as avian viruses."<sup>15</sup>

#### CLINICAL SIGNS AND SYMPTOMS OF INFLUENZA

When a person is exposed, the average incubation period for influenza is two days, but it can range from one to four days. "Adults can be

infectious from the day before symptoms begin through approximately five days after illness onset. Children can be infectious for more than 10 days, and young children can shed virus for several days before the onset of their illness. Severely immunocompromised persons can shed virus for weeks or months."<sup>17</sup> Signs and symptoms for an uncomplicated illness include fever, myalgia, headache, malaise, nonproductive cough, sore throat, and rhinitis. Otitis media, nausea, and vomiting are commonly reported in children.<sup>10</sup>

Clinical signs and symptoms for human influenza are consistently predictable. With the recent outbreak of avian influenza A (H5N1) strain in Vietnam during 2004 that affected 10 people and the outbreak in Hong Kong that affected 18 people during 1997, however, differences in patient response became evident. Nine of the people in Vietnam had direct contact with infected chickens. None of these patients had preexisting conditions. Their ages ranged from five to 24, with the median age being 13.7 years. After exposure, the median time of incubation was three days. The range of incubation was two to four days. Similar to with human influenza, the patients presented with fever and cough. They also had diarrhea, pronounced lymphopenia, and radiographic abnormalities. The mortality rate was significant, with eight patients dying after 10 days. These patients experienced liver dysfunction, renal failure, coagulopathy, and pancytopenia. The 1997 Hong Kong outbreak had the same clinical signs and symptoms as the Vietnam outbreak. Additionally, rhabdomyolysis was seen in this patient population. Of the 18 people infected, six died; all were healthy young adults.<sup>1</sup> Although a localized incident, this outbreak nevertheless demonstrates that if human-to-human transmission was efficient, the result could have been a devastating pandemic, particularly for the young, which was also the case for the pandemic of 1918.

#### DEVELOPING A PROGRAM

Health care facilities should have a plan for handling influenza epidemics, as well as for future pandemics that many health care planners believe are inevitable.

**OPERATIONAL PLANNING***Impact of influenza on the health care workplace*

Unvaccinated health care workers can be a primary cause of influenza outbreaks in health care settings. Throughout the influenza season, health care workers encounter high-risk patients in medical practices, hospitals, home-care sites, long-term care and rehabilitation facilities, and other health care settings.<sup>18</sup> In addition to spreading influenza to patients, health care workers who contract influenza will be unable to provide the necessary care to their patients.

The National Foundation for Infectious Diseases reports that 23% of the staff members in an internal medicine ward became ill with influenza, resulting in 14 person-days of sick leave, postponement of eight scheduled admissions, and suspension of emergency admissions for 11 days. The average additional cost per patient was \$3,798. The total cost of the outbreak was \$34,179.<sup>18</sup>

When an influenza outbreak occurs in a health care setting, peers often have to work extended shifts. Extended shifts increase overtime costs, and studies show that attention lags after about 12 hours. In many cases, pool or temporary workers must replace health care workers who do not report to work due to illness. Additionally, regular staff members are less prone to patient-care errors than pool or temporary workers such as agency workers.<sup>18</sup>

*Risk to the health care worker*

An unvaccinated health care worker is an at-risk health care worker. This, of course, assumes that vaccination effectively protects against the current circulating strain of influenza causing the outbreak. If a strain of influenza rapidly appears for which effective vaccination has not been developed, or health care workers have not developed immunity from previous exposure to the circulating virus, health care workers will be at significant risk because of exposure to patients, family members, and those in the general population who have the disease.

**VACCINATION**

Vaccination is the key to preventing influenza and its severe complications. It reduces

*influenza-related respiratory illness and physician visits among all age groups, hospitalization and death among persons at high risk, otitis media among children, and work absenteeism among adults.*<sup>10(p1)</sup>

The Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention (CDC) recommends annual vaccination for the following groups of people:

- adults 65 years of age and older;
- residents of nursing homes and other chronic-care facilities;
- adults and children with chronic pulmonary or cardiovascular disorders;
- adults and children who have required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases, renal dysfunction, hemoglobinopathies, or immunosuppression;
- adults and children who have conditions that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration (eg, cognitive dysfunction, spinal cord injuries, seizure disorders, other neuromuscular disorders);
- pregnant women;
- persons with chronic medical conditions;
- adults aged 50 to 64 years because of elevated prevalence of certain chronic medical conditions;
- children and adolescents aged six months to 18 years receiving long-term aspirin therapy who might be at risk for Reye syndrome after influenza infections;
- children aged six to 23 months; and
- persons who live with or care for persons at high risk, to include health care workers.<sup>10</sup>

Vaccination of health care workers is crucial, and all health care workers should be vaccinated against influenza. Mandatory vaccination "will protect health care workers, their patients, and communities, and will improve prevention of influenza-associated disease [and] patient safety and will reduce disease burden."<sup>10(p1)</sup> According to the National Foundation for Infectious Diseases, 36% of health care workers receive influenza vaccinations each year. The 64% who do not get vaccinated consequently

contribute to institutional outbreaks that put high-risk patients at increased risk of contracting influenza and suffering from its potentially major complications.<sup>18</sup>

Although vaccination is crucial in preventing influenza, there are those who should not be vaccinated. This group includes those who

- have a severe allergy to chicken eggs,
- had a severe reaction to an influenza vaccination in the past,
- developed Guillain-Barré syndrome within six weeks of getting an influenza vaccine previously, and
- children less than six months of age.

Vaccination also should be withheld from people who have a moderate or severe illness with fever. The vaccination can be administered when symptoms have lessened.<sup>12</sup>

#### **PERSONAL PROTECTIVE EQUIPMENT AND BEHAVIORS**

##### *Patients with human influenza*

The primary method of transmission of human influenza is via large respiratory droplets. Consequently, standard precautions plus droplet precautions are recommended for the care of patients infected with human influenza.<sup>19</sup> Droplet precautions include patient placement, mask protocol, and patient transport.<sup>20</sup>

A patient infected with human influenza should be placed in a private room. If a private room is not available, the patient should be placed in a room with another patient who is infected with the same microorganism but not with another infection. If this is not possible, spatial separation of a least three feet should be made between infected patients and other patients and visitors.<sup>20</sup>

Staff members and visitors should wear masks according to protocols for droplet precautions. Additionally, the mask should be worn when anyone is within 3 ft of the patient. Transporting the patient infected with human influenza should be limited and should be only for essential purposes. If transport becomes necessary, the patient should wear a mask to help minimize dispersal of respiratory droplets.<sup>20</sup>

##### *Patients with avian influenza*

Recent outbreaks of avian influenza in

humans indicate that the risk of serious disease and increased mortality may be significantly higher than infection by human influenza viruses. Although rare, when a human is infected with avian influenza, viral adaptation can occur, which may result in easier human-to-human transmission. This in turn can possibly lead to the emergence of a pandemic strain.<sup>19</sup>

Avian influenza presents additional challenges to health care workers because of the uncertainty about the exact modes of transmission of avian influenza to and between humans. Additional precautions for health care workers involved in the care of patients with documented or suspected avian influenza should be implemented.<sup>19</sup>

##### *Recommendations for avian influenza*

Patients arriving at a health care facility with fever and respiratory symptoms should be managed according to CDC guidelines for respiratory hygiene and cough etiquette. They also should be questioned about their recent travel history. If a patient has traveled within the past 10 days to a country with avian influenza activity and is hospitalized with a severe febrile respiratory illness or is under evaluation for avian influenza, the patient should be managed using the following isolation precautions:

- standard precautions with careful attention to hand washing before and after patient contact or contact with surfaces potentially contaminated with respiratory secretions;
- eye protection within 3 ft of the patient;<sup>21</sup>
- droplet precautions and contact precautions to include patient placement, and patient transport.<sup>21</sup>

Should there be a suspicion of SARS, manage the patient with airborne precautions (N95 mask protocol [ie, fit tested]) as well as contact precautions.<sup>21</sup>

**PHYSICAL PLANT CONSIDERATIONS.** Visual alerts should be posted at facility entrances instructing patients and persons who accompany them to practice respiratory hygiene and cough etiquette (ie, containing respiratory secretions by covering nose /mouth) if they have symptoms of a respiratory infection when they first register at the facility.<sup>21</sup> During an influenza outbreak, it is best

practice to provide infected patients with private rooms. If this is not possible, then semiprivate rooms should be made available. If multiple patients are admitted, and space requirements are limited, then patient care areas should be of sufficient size to maintain a distance of at least three feet between patients.<sup>19</sup>

**INTEGRATED SERVICES AND MULTIDISCIPLINARY PARTICIPATION.** Successful containment of the influenza virus requires a multidisciplinary approach. All personnel directly or indirectly involved in patient care must understand protocols for containment. All personnel should implement standard precautions and droplet precautions and should enforce respiratory hygiene and cough etiquette for infected patients. A coordinated effort must be made to ensure that adequate procedures are in place for the disinfection of environmental surfaces, beds, bed rails, bedside equipment, and other frequently touched surfaces. Linen should be considered infectious and handled in a manner that prevents skin and mucous membrane exposures, as well as contamination of clothing.

**HEALTH CARE PROVIDER EDUCATION AND COMPETENCY.** Health care provider education and competency should be mandatory for all facility employees and physicians. Educational activities should include information concerning etiology of human and avian influenza, importance of vaccination, standard precautions, respiratory hygiene and cough etiquette, masking, and droplet precautions. Additionally, health care providers should be able to demonstrate behaviors that are required to successfully implement standard precautions, respiratory hygiene and cough etiquette, masking, droplet precautions, and the use of fit-tested respirators if SARS is suspected.

### **C. SEVERE ACUTE RESPIRATORY SYNDROME**

During the twenty-first century, SARS became a global threat after making its debut in November 2002. By February 2003, the illness had spread to more than 12 countries, including Asia, North America, Europe, and South America. According to the World Health Organization (WHO), a total of 8,098 people worldwide became ill with SARS during the 2003

outbreak. Of the 8,098, 774 died. In the United States, only eight people, all of whom had traveled to areas of world where SARS had been identified, had laboratory evidence of SARS.<sup>22</sup>

### **HISTORY**

Severe acute respiratory syndrome may have originated in Guangdong Province in southern China in November 2002. A Chinese physician carried SARS to a Hong Kong hotel where several hotel guests on the same floor as the physician contracted the disease in February 2003. Airline passengers who had SARS and were traveling from Hong Kong spread the disease to Singapore, Toronto, and Hanoi, Vietnam. In March 2003, a diagnosis of SARS was made on the Chinese physician in Hong Kong.<sup>23</sup> A physician from the Hanoi office of the WHO was called to investigate a patient with an atypical pneumonia from a Hanoi hospital.<sup>24</sup> Additional WHO officials and the CDC were called in. A global alert was issued for SARS, and infectious disease experts started studying this new infectious respiratory disease.<sup>23</sup>

### **POPULATION AFFECTED**

#### **PREVALENCE**

SARS was recognized as a global threat when it spread to nearly 30 countries in Asia, North America, and Europe.<sup>23</sup> The first pandemic of the twenty-first century is attributed to SARS.<sup>25</sup> Transmission has occurred most often from person to person via droplet spread when an infected person coughs or sneezes. Most of the SARS outbreaks involved health care workers who were in close contact with infected patients. The 2003 global outbreak was contained, but there is still a possibility of recurrence.

#### **SOCIOECONOMIC FACTORS**

In 2003, the SARS epidemic resulted in more than 800 deaths and other sequelae. Some airports had no passengers, and stock markets lost value.<sup>26</sup> The SARS epidemic spread to more than 30 countries in a short time. The disease created anxiety around the world because of its capacity to spread quickly via international air travel, communicability, novelty, and the fact that a large number of health care workers were

becoming infected. Nurses in Canada working with SARS patients were concerned about working conditions, staffing, employee health and safety, and wages.<sup>27</sup>

#### EPIDEMIOLOGY

The scientific community accepts the Coronavirus (CoV) as the cause of SARS.<sup>28,29</sup> To stop the spread of SARS, there must be early diagnosis by virus isolation or serological testing.<sup>30</sup> The coronaviruses are a viral group that, when viewed under a microscope, appear to have a halo or crown-like (ie, corona) structure. These viruses commonly cause mild to moderate upper respiratory illness in humans. In animals, they are linked with respiratory, gastrointestinal, liver, and neurological disease.<sup>31</sup> The SARS-CoV has been found in wild civets and raccoon dogs in southeastern China, where they are considered culinary delicacies; on the other hand, domestic pigs and poultry are not hosts. Asymptomatic humans have a lag time during the incubation period; therefore, because they are still healthy, they are able to travel by air to any destination after being exposed. After the individual becomes symptomatic, SARS is most likely spread through person-to-person transmission. Health care workers are at high risk if there has been no suspicion of SARS but patients are positive for SARS.

#### CLINICAL SIGNS AND SYMPTOMS OF SARS

Symptoms of SARS include, but are not limited to,

- fever (ie, greater than 100.4° F [38.0° C]);
- cough, shortness of breath, and dyspnea;
- headache;
- general malaise; and/or
- diarrhea (affects only a small percent of patients).<sup>23,31</sup>

Some of the above symptoms and the patients' chest x-rays initially led physicians to diagnose the disease as an atypical pneumonia.<sup>31</sup> Patients develop progressive respiratory compromise quickly. Symptoms usually occur in two to seven days; sometimes 10 days after infection. Supportive treatment consists of antibiotics, steroids, and treatment of individual patient symptoms.<sup>23</sup>

#### DEVELOPING A PROGRAM

Health care facilities should have a written preparedness and response plan that is flexible and scalable and designed to address the variable nature of a SARS outbreak.

#### OPERATIONAL PLANNING

##### *Impact of SARS on the workplace*

A SARS coordinator should be appointed to serve as the point person for communicating information both internally and externally.<sup>32</sup> Testing the facility's response via a tabletop exercise is effective.

Staffing needs must be evaluated by health care facilities. Designated teams should be created in advance for the care of SARS patients to provide emergency and routine care. Infection control education also should be provided to these teams in advance to foster preparedness.<sup>32</sup> If there is a more extensive outbreak, nursing staff members may need to be relocated to other areas. Issues may occur that will exceed the scope of the health care facility. These must be addressed at community, regional, and national levels.

##### *Psychology*

During a SARS outbreak, it may be exhausting to wear full personal protective equipment (PPE) for lengthy periods of time. The focus required for donning and removing equipment also may be laborious. The health care facility should make arrangements to provide mental health professionals to assist its staff in coping with a SARS outbreak and the related stressors.<sup>32</sup> In 2003, the Toronto nurses and other health care workers were placed under work quarantine and required to wear a mask at all times in the presence of others. They were not allowed any physical contact with their family members. Stress and tension levels were high. Nurses mourned the loss of colleagues and worried about the effect of SARS on their families and what was yet to come.<sup>27</sup> Severe acute respiratory syndrome and other emerging infectious diseases may create a new type of workplace. All health care workers must wear full PPE when caring for patients with SARS or suspected of having SARS. This includes eyewear, gown, gloves, and an N95 mask.



### PERSONNEL PROTECTIVE BEHAVIOR: RECOMMENDATIONS FOR SARS

A comprehensive infection control program should be in place in the health care facility. Primary infection control strategies include the following.

**Standard precautions**—Health care workers should wear eye protection in addition to using routine standard precautions when caring for patients.<sup>33</sup>

**Transmission-based precautions**—The second tier of precautions are transmission-based precautions, which include

- **contact precautions**—health care workers should wear gowns, gloves, and eyewear when caring for patients in their environment;<sup>33,34</sup> and
- **airborne precautions**—health care workers should wear an N95-filtering disposable respirator during patient care. The facility should have training, fit-testing, and fit-checking in place as part of a complete respiratory program, which is required by the Occupational Safety and Health Administration.<sup>35</sup> Furthermore, the patient should be assigned to an isolation room with negative air pressure.<sup>33</sup>

#### PHYSICAL PLANT CONSIDERATIONS

Key infection control measures for inpatient care areas include the following.

- Use negative pressure isolation rooms.
  - Use private rooms with separate bathrooms if airborne precautions cannot be fully implemented. Keep doors closed.
  - Assign patients with SARS or suspected of having SARS to the same unit. Keep equipment on that unit dedicated for their care.
  - Use disposable equipment for patient care if available.
  - Organize patient care activities. Keep only essential equipment, items, and supplies in rooms with patients who have SARS.
  - Minimize patient movement or transport.
  - Reduce traffic. Restrict visitors to the health care facility, patient care unit, and patient. Only essential health care workers should have access to patient rooms.<sup>23</sup>
- If possible postpone surgery on patients with

infectious diseases. If a patient who has SARS is in urgent need of a surgical procedure, the perioperative team must be prepared to follow precautions. Key infection control measures for the OR include the following.

- Schedule the procedure at the end of the day when other patients are not present and only a minimum number of staff members are present.<sup>33</sup>
- Place a surgical mask on the patient before transport to the OR.<sup>34</sup>
- Ensure that contact precautions are maintained during patient transport.
- Handle specimens from patients carefully. Place the specimen in a leak-proof container and clean the exterior surface of the container with a chemical germicide when it is transferred off the surgical field.<sup>35</sup> Ensure that all specimen containers are labeled properly and identified as infectious material. Place the container in a biohazard bag for transport to the laboratory.
- Minimize the number of staff members in the OR involved in the care of the patients with SARS. Arrange for additional staff members to assist by stationing them outside the room to get needed supplies and equipment.
- Place isolation signage on the doors to the OR indicating that transmission-based precautions should be used.
- Remove unnecessary equipment from the OR. Keep supply cabinet doors closed.
- Request that the anesthesia care team use a smaller anesthesia cart designated for isolation patients and use single-use items if possible.
- Confine and contain contamination during the procedure within the immediate vicinity of the surgical field when possible.<sup>34</sup>
- Reestablish a safe and clean environment when a surgical procedure is completed on a patient who has SARS.<sup>36</sup>
- Ensure that health care workers wear full PPE as required for contact and airborne precautions to reduce the risk of exposure to bloodborne or infectious microorganisms throughout the surgical procedure, cleaning, and recovery period.
- Carefully handle surgical instruments, equipment, furniture, and soiled linen and trash.

Clean the patient transport vehicle. Use an Environmental Protection Agency-registered hospital disinfectant for cleaning. Discard unused disposable supplies after completion of the surgical intervention.<sup>23</sup>

- Environmental services personnel should be trained and supervised in proper cleaning and disinfection methods.

#### **INTEGRATED SERVICES AND MULTIDISCIPLINARY PARTICIPATION**

An optimum level of communication between the facility's infection control team, clinical staff members, and public health authorities should be ongoing.<sup>23</sup> Nursing staff members in the facility's emergency department and clinics must be prepared to identify patients who are suspected of having SARS and know how to manage an influx of patients.<sup>37,38</sup> The infection control team should be involved with nursing staff members to provide guidance and direction in coordinating the hospital experience of patients who have SARS.

Health care facility administrators should take a proactive and multidisciplinary approach by conducting a disaster drill involving an influx of patients who have SARS to operationalize their policies and protocols, assess readiness, and evaluate plan effectiveness.<sup>39</sup> A coordinated multidisciplinary response is required to manage a SARS outbreak.<sup>32</sup> Clinical services may include, but are not limited to,

- emergency department (eg, entry screening and triage, isolating patients suspected of having SARS as soon as possible);
- engineering (eg, air handling system, maintenance of negative pressure isolation rooms);
- environmental services;
- human resources personnel;
- infection control team, which includes infection control practitioners and the hospital epidemiologist;
- intensive care unit;
- laboratory;
- materials management (eg, for acquisition of PPE and N95 respirators) because supplies may run short during an outbreak;
- medical patient care unit;
- medical staff members;
- nursing leadership;

- outpatient clinics;
- pharmacy;
- public relations department personnel (eg, to communicate with press and public);
- radiology;
- risk management;
- safety department;
- security department (eg, access control efforts);
- senior management and finance representative; and
- staff development and education department.

This multidisciplinary group includes patient care, administration, and support staff. A representative from the local or state health department should be involved to coordinate planning with the community.<sup>32</sup>

#### **EMPLOYEE EDUCATION AND SELF-PROTECTIVE BEHAVIOR**

Facility staff members from all disciplines providing care to patients with SARS should participate in a comprehensive education program. The contents of the program should have a basic component for all staff members and a discipline-specific component that is current and appropriate for the specialty. Competency in standard, contact, and airborne precautions and the use of fit-tested respirators is mandatory for the care of patients with SARS.

Staff members must exercise vigilance in their practice by following infection control policies and procedures of the health care facilities where they work. These documents need to be reviewed by the infection control committee and staff development personnel at least annually. Inservice programs should be provided for all staff members so that infection control precautions are understood and followed to prevent SARS transmission; preparation is the key.<sup>37</sup> Practicing self-protective behavior with staff members builds their confidence.

During the inservice program, stress the importance of planning and communicating with staff members. In the perioperative arena, communication is vital among the surgical team members throughout the patient's surgical experience. Postoperative disposition of patients with SARS needs to be determined and agreed upon. Nurse managers should take the

lead in planning the logistics of patient care in consultation with the infection control practitioner and the hospital epidemiologist. If the facility does not have an isolation cubicle in the postanesthesia care unit, patients with SARS may need to be directly admitted to the intensive care unit isolation room for recovery. The nurse manager must confer with the physicians and OR nurses caring for patients with SARS to implement the plan of care. It is vital to adhere to infection control precautions to limit transmission of SARS to staff members.

#### PHYSICIAN EDUCATION AND SELF-PROTECTIVE BEHAVIOR

Anesthesia care providers should exercise care during the induction and extubation phases of the procedure to protect members of the surgical team that are in close contact and may be exposed to exhalations from SARS patients. Using PPE, to include full-face shields, is essential, especially if a bronchoscopy is being performed. The patient should be orally suctioned in a gentle manner to prevent aerosolization when intubating. Health care providers must be careful and precise when removing and placing laryngoscope blades, endoscopes, or bronchoscopes to prevent splatter and minimize the opportunity of particle aerosolization.<sup>23</sup> The anesthesia care provider is at risk when performing endotracheal intubation.<sup>40</sup> He or she should minimize touching other equipment with gloves used for intubation or extubation.<sup>23</sup>

Employees and physicians should understand the importance of proper hand hygiene after removing PPE. Personnel should wash hands with soap and water or use an alcohol-based waterless hand hygiene product before and after patient contact. The health care facility should require adherence and proficiency in self-protective behavior.

#### PRECAUTIONS FOR AVIAN INFLUENZA, HUMAN INFLUENZA, AND SARS

Human influenza precautions include—

- **standard precautions** (eg, careful attention to hand washing before and after patient contact or contact with surfaces potentially contaminated with respiratory secretions)<sup>23</sup> and
- **droplet precautions** (eg, surgical mask, patient

placement in a private room or shared with another patient with the same epidemiology).<sup>20</sup>

Avian influenza precautions include—

- **standard precautions** (eg, careful attention to hand washing before and after patient contact or contact with surfaces potentially contaminated with respiratory secretions);
- **eye protection** within 3 ft of the patient;<sup>23</sup> and
- **droplet precautions and contact precautions** (eg, patient placement; if SARS is suspected an N95 mask protocol [fit tested]; patient transport).<sup>21</sup>

SARS precautions include—

- **standard precautions** (eg, careful attention to hand washing before and after patient contact or contact with surfaces potentially contaminated with respiratory secretions);<sup>33</sup>
- **eye protection** within 3 ft of the patient;<sup>23</sup>
- **contact precautions** (eg, gown, gloves, eye-wear);<sup>33,34</sup> and
- **airborne precautions** (eg, patient is placed in a negative air pressure room, health care workers wear fit-tested N95 masks).<sup>33</sup>

## II. NURSING PROCESS APPLICATION

### A. PERIOPERATIVE NURSING VOCABULARY

The perioperative nursing vocabulary is a clinically relevant and empirically validated standardized nursing language. It relates to the delivery of care in the perioperative setting. This standardized language consists of a collection of data elements (ie, the Perioperative Nursing Data Set [PNDS]), and includes perioperative nursing diagnoses, interventions, and outcomes.<sup>41</sup>

Care of the perioperative patient with human and avian influenza, SARS, and other types of similar diseases must be individualized to each patient's needs. The perioperative nurse must bear in mind that care must be taken to protect the surgical team, other patients, and their family members because of the contagious nature of these diseases. Documentation should reflect the unique aspects of care provided using the PNDS. The examples listed below may not apply to all types of surgery for patients with human and avian influenza, SARS, and other similar diseases. Each situation must be assessed for

appropriate outcomes, nursing diagnoses, and interventions.

### **B. NURSING DIAGNOSES**

The perioperative nurse analyzes the assessment data to determine nursing diagnoses. Following is a partial list of nursing diagnoses that may be associated with patients who have human or avian influenza or SARS.

**X28 (D2)**—infection, risk for.

### **C. OUTCOME IDENTIFICATION**

To develop a plan of care for the patient, the perioperative nurse identifies desired patient outcomes collaboratively with the patient. Following is a partial list of nursing outcomes that may be associated with patients who have human or avian influenza or SARS.

**O10 (D2)**—The patient is free from signs and symptoms of a surgical site infection.

### **D. PLANNING**

The perioperative nurse develops a plan of care for patients who have human or avian influenza or SARS that prescribes nursing interventions and activities are selected according to individual patient needs and the type of procedure to be performed. Following is a partial list of interventions that may be associated with patients who have human or avian influenza or SARS.

**I4**—Administers care to wound sites.

**I7**—Administers prescribed antibiotic therapy.

**I21**—Assesses susceptibility for surgical site infection.

**I83**—Manages culture specimen collection.

**I86**—Monitors body temperature.

**I88**—Monitors for signs and symptoms of infection.

**I98**—Protects from cross-contamination.

## **III. CONCLUSION**

This guideline is intended to be used in the event of an outbreak of human or avian influenza or SARS to promote safe care for those affected patients who may require urgent or emergent surgical intervention or other invasive procedures. Perioperative personnel should use strict

infection control measures while caring for these types of infectious patients to limit transmission.

These diseases are extremely complex and require special understanding by perioperative team members to ensure optimal patient outcomes. This document addresses assumptions, definitions, history, prevalence, socioeconomic factors, epidemiology, and clinical signs and symptoms. In addition, it addresses

- developing a program;
- operational planning;
- impact on the workplace;
- risks to health care workers;
- vaccination;
- use of PPE;
- personal protective behaviors;
- physical plant considerations;
- integrated services, which includes a multidisciplinary approach;
- employee and physician education and competency; and
- the nursing process application regarding this patient population.<sup>41</sup>

This guideline may require modification based on specific patient and facility needs. It is AORN's intent that practitioners will use this document in their facilities to develop policies, procedures, and protocols specific to perioperative care of patients affected by outbreaks of human and avian influenza and SARS for patients who must undergo surgical or other invasive procedures. ♦

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## Patients With Lymphedema Have Treatment Options

Today, more patients with lymphedema are being diagnosed correctly and receiving treatment by health care professionals, according to a May 16, 2006, article from [BellevilleNewsDemocrat.com](http://BellevilleNewsDemocrat.com). Lymphedema is a chronic, sometimes painful condition created by a buildup of excess lymph fluid, typically in a patient's leg or arm. Untreated, lymphedema can predispose a limb to infection. Millions of Americans suffer from lymphedema, which is found more commonly in women than in men.

The two recognized types of lymphedema are primary lymphedema and secondary lymphedema. Primary lymphedema is believed to arise from abnormal development of the lymphatic system and is not as common as secondary lymphedema, which is caused by damage to the lymphatic system as a result of a surgical procedure or radiation.

Secondary lymphedema is common in patients who have been treated for breast cancer, but it can result from any procedure that requires the removal of lymph nodes.

Until recently, diagnosis of this condition was uncommon, and effective therapy was nonexistent. Newer therapeutic treatments include use of compression garments and manual lymph drainage (ie, a massage that stimulates lymph vessels and assists the flow of fluid). Although these measures do not cure the condition, they can ease symptoms and help prevent infection.

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