# Isolate ICU Patients Until H1N1 Test Results Return

BY BRUCE JANCIN

SAN DIEGO — Antigen testing for the pandemic influenza A(H1N1) virus using nasopharyngeal swabs is not sensitive enough to be reliable in ICU patients, the experience at one busy inner-city New York hospital suggests.

Just 3 of 15 critically ill adults admitted to the ICU at Lincoln Medical Center in the South Bronx with H1N1 flu during the May-July outbreak had a positive nasopharyngeal swab. The other 12 tested positive only on bronchial washings or tracheal aspirates, Dr. Raghu S. Loganathan reported at the annual meeting of the American College of Chest Physicians.

**Just 3 of 15 critically ill adults with H1N1 influenza had a positive nasopharyngeal swab.**

**DR. LOGANATHAN**

Lincoln Medical Center has one of busiest emergency departments in the country, serving a disadvantaged minority population particularly hard hit by 2009 H1N1. The hospital's experience during the first wave of H1N1 infection in late spring/early summer led to a change in ICU practice at the hospital—one deserving of consideration elsewhere, said Dr. Loganathan, director of the medical ICU and stroke center there.

It can take 24-48 hours to obtain a lower respiratory tract specimen and diagnose H1N1 influenza in ICU patients. So now patients admitted to the Lincoln ICU with respiratory symptoms are placed in isolation with droplet and contact precautions, at least until a lower respiratory specimen is obtained and the test results are known.

During the May-July outbreak, when this practice was not yet in place, unprotected health care workers and other ICU patients were exposed to the virus during that initial 24-48 hours, and if test results came back positive for H1N1, they required prophylaxis with oseltamivir (Tamiflu).

The 15 patients with H1N1 flu admitted to the ICU averaged 49 years of age, and were among 40 adults hospitalized with the infection during May-June, for a 37.5% ICU admission rate.

Of the 15 patients, 13 had at least one comorbid condition, including overweight or obesity in 9, diabetes in 8, and asthma or chronic obstructive pulmonary disease (COPD) in 7. These comorbidity rates are substantially higher than those cited for ICU patients with H1N1 flu in other recent series from Mexico, Canada, Australia, and elsewhere in the United States, probably reflecting the demographics of the South Bronx, Dr. Loganathan observed.

Four ICU patients had normal chest x-rays. Eight had unilateral radiographic lung abnormalities, in contrast to the typically bilateral abnormalities seen in patients with seasonal flu. The radiographic findings consisted of alveolar consolidation in seven patients, interstitial infiltrates in two, and nodular infiltrates in two.

Lymphopenia was present in 10 of 15 patients, with a median value of 600 cells/mL. Elevated creatine phosphokinase was detected in nine patients, with a median value of 563 U/L. The median lactate dehydrogenase level in the 15 patients was 362 U/L, with 7 patients having a significantly elevated level indicative of hemolysis.

Mechanical ventilation was used in 12 patients, including 7 with acute respiratory distress syndrome; 10 patients had severe sepsis or septic shock.

The mean ICU length of stay was 9.6 days. Four of the 15 patients died.

According to a recent report, the mean ICU length of stay for critically ill patients with seasonal flu was just 3 days (J. Clin. Virol. 2009;46:275-8), compared with 9.6 days for the H1N1 flu patients, and the in-hospital mortality rate was 18.8% for the seasonal flu group, compared with 26% for the New Yorkers with severe H1N1 influenza. ■

# *Rx Delay Increases Deaths In Bloodstream Infections*

BY ROBERT FINN

SAN FRANCISCO — A delay in administering adequate antimicrobial therapy is strongly associated with elevated mortality in patients with bloodstream infections, according to a prospective study involving 381 patients.

The association between therapeutic delay and mortality was seen not only in patients with severe sepsis or septic shock, but also in patients with less-severe sepsis or with bloodstream infections not involving systemic inflammatory response syndrome, according to a poster presentation by Dr. Ana Fernández-Cruz at the Interscience Conference on Antimicrobial Agents and Chemotherapy, sponsored by the American Society for Microbiology.

Each hour of delay in administering adequate antimicrobial therapy increased the risk of death by an average of 1.4%, wrote Dr. Fernández-Cruz and her colleagues from the Hospital General Universitario Gregorio Marañón, Madrid. The mean time from blood culture to adequate antimicrobial therapy was 12.9 hours, and the median time was 4.5 hours.

Overall, the initial antibiotic treatment was adequate in 74% of the patients and inadequate in the remaining 26%. The investigators defined adequate antimicrobial therapy as the administration of an antimicrobial to which the microorganism isolated in the blood culture was susceptible in vitro according to the antibiogram.

The study included all patients with a microbiologically significant bloodstream infection at a 1,450-bed tertiary care hospital during a 3-month period. Of the 381 patients, 61% were male; their median age was 64 years, and 72% of their infections were hospital acquired or health care associated.

According to the Bone sepsis score when the blood culture was taken, 68% of the patients had sepsis, 15% had severe sepsis, 7% had septic shock, and 6% had a bloodstream infection without systemic anti-inflammatory response syndrome.

Mortality increased with delay in adequate antimicrobial therapy, irrespective of the severity of sepsis. For example, among patients with severe sepsis, a 20-hour delay corresponded to about 25% mortality, and a 100-hour delay corresponded to about 90% mortality. Among patients with a bloodstream infection without systemic anti-inflammatory response syndrome, mortality was about 10% with a 20-hour delay, and about 40% with a 100-hour delay.

At discharge, 16.5% of the patients had died. In a multivariate analysis, three variables emerged as independent predictors of mortality. For each hour of delay from blood culture to adequate antimicrobial therapy, the risk of death increased by an average of 1.4%. For each one-point increase in the patient's Charlson score, the risk of death increased by a mean of 24%. And for each year of age, the risk of death increased by a mean of 1.9%. The multivariate analysis was adjusted for place of acquisition, McCabe and Jackson classification, Charlson Index, underlying disease, sepsis score, bloodstream infection source, hospital ward, previous length of stay, and previous antimicrobial therapy.

The investigators reported no relevant conflicts of interest. ■

# Driving Culture Change

safety and teamwork. They also brought in senior leadership early in the process. And they got health care providers involved by asking them a simple question: What are we going to do to harm someone today? "The people who are giving care know what's going to happen," Mr. Watson said.

Dr. Peter J. Pronovost, who developed the checklist used in Michigan and is now expanding the concept around the country, agrees that culture change is a critical element.

"That's really what the secret sauce is," said Dr. Pronovost, a professor in the departments of anesthesiology and critical care, surgery, and health policy and management at Johns Hopkins University in Baltimore.

Dr. Pronovost and his team address the culture change component through a program called the Comprehensive Unit-Based Safety Program (CUSP). The program teaches front-line providers about the science of safety, teamwork, and communication. It also encourages providers to bring up problems, rather than designing workarounds, said Chris Goeschel, R.N., who is part of Dr. Pronovost's research team at Johns Hopkins and was the first executive director of the Keystone Center.

As part of the work with CUSP, the researchers conduct a survey of health care providers to assess how they view the climate of safety. At the beginning of a project, physicians and nurses working in the same areas typically have very different views on safety and teamwork, Ms. Goeschel said.

"Doctors almost always think that teamwork is really good, and nurses almost always think that teamwork is really abysmal," Ms. Goeschel said. But once the project is underway, those responses tend to blend together and improve overall, she added.

Now Dr. Pronovost and his team are taking those lessons about culture change, along with the proven infection control measures, and rolling them out to 28 states in an effort to curb catheter-related bloodstream infections in the ICU. The ultimate goal is to expand the program to all 50 states, he said. Currently, Dr. Pronovost and his colleagues are collecting baseline data from participating hospitals.

Given the significant reductions seen in Michigan, Dr. Pronovost said he is confident that they will see similar results in other states. If so, it could be a major public health success story. Catheter-related bloodstream infections kill between 30,000 and 62,000 people a year in the United States and ring up nearly $3 billion in excess costs, he said. Michigan's successful infection control intervention saved $200 for every $1 invested.

Although the specific interventions will vary based on the clinical area being targeted, Dr. Pronovost said he expects the culture component is transferable. For example, researchers at Johns Hopkins are working to apply the same culture change model in cardiac surgery operating rooms to reduce surgical site infections.

"It really is a generic model that I think has enormous potential to make health care better," he said. ■

*Tools to help reduce catheter-related bloodstream infections are available at http://safercare.net.*