

Optimal Use of ECMO Debated

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on conventional algorithms that include blood gases, ventilator pressure, the extent of shock, and other factors. When ECMO is used early on, survival rates for patients with severe respiratory failure can approach 60%-70%, Dr. Bartlett said. Recent advances in technology have made ECMO simpler and less expensive, and adoption of newer technology will bring down the cost, which is currently about \$2,000/day, he added.

During a month-long "superepidemic" of H1N1 influenza in Australia earlier this year, 6% of hospitalized patients were admitted to the ICU, and 2% of all admissions (or 30% of ICU patients) were sick enough to need ECMO, he said.

His institution recently had to cancel pediatric cardiac procedures because all of its ECMO systems were in use by six influenza patients. Since then, one ECMO system has been kept in reserve for use in neonatology and cardiac surgery.

Dr. Charles Hoopes of the University of California, San Francisco, isn't con-

vinced that ECMO will spread to every community hospital or even that it should, but he does expect more demand for it. Its growth probably will mimic that of artificial heart programs, in which smaller hospitals refer patients to tertiary-care centers, he said.

That spoke-and-wheel model of care was tested in a study that randomized adults with severe respiratory failure to consideration for ECMO treatment or to conventional ventilation support and management. After 6 months, 57 patients (63%) in the ECMO group survived without disability, compared with 41 patients (47%) of 87 in the control group, reported Dr. Giles J. Peek of Glenfield Hospital, Leicester, England, and his associates in the Conventional Ventilation or ECMO for Severe Adult Respiratory Failure (CESAR) trial (Lancet 2009 [doi:10.1016/S0140-6736(09)61069-2]). Dr. Peek and an associate received travel grants from Chalice Medical Ltd., which makes some of the equipment used in ECMO. The study was funded by public

health systems in the United Kingdom.

Although the CESAR trial is the largest and best randomized study of adult ECMO referral, it is unlikely to end debate about ECMO's role in adult critical care, Dr. Joseph B. Zwischenberger and Dr. James E. Lynch said in an editorial (Lancet 2009 [doi:10.1016/S0140-6736(09)61630-5]). Critics will cite the modest 16% survival benefit, the risk of patients dying during transport to ECMO centers, and previous data from more poorly designed studies that favored conventional management, wrote Dr. Zwischenberger of the University of Kentucky, Lexington, and Dr. Lynch of the University of Texas, Galveston. The authors reported having no relevant conflicts of interest.

"We're going to see an increase in respiratory failure secondary to viral necrotizing pneumonia, presumably related to H1N1 influenza" that will increase demand for ECMO, Dr. Hoopes predicted. If available ECMO beds can't handle demand, how should patients be triaged? What should the criteria be for referral to an ECMO center? And—perhaps the greatest quandary—what should be done for young patients who don't recover on ECMO?

His institution and others—including Johns Hopkins University, Baltimore—have had to manage young adults with presumed H1N1 who did not recover respiratory function after weeks on ECMO. His program at UCSF has had some success in using ECMO as a bridge to lung transplant in these patients, but "that's a lot more controversial" than providing ECMO to allow recovery, said Dr. Hoopes, who reported having no relevant conflicts of interest.

Discussions are underway at many ECMO centers to define criteria for referring patients. The key, Dr. Hoopes said, is to call the ECMO center sooner rather than later, to at least begin discussions. "Let us know up front if someone has been on the vent for 5 days, is young, and is going in the wrong direction," he said. If physicians wait to use ECMO in a last-ditch salvage attempt, as has often been the case, half of the patients will die.

The numbers aren't yet available on survival rates with earlier use of ECMO in patients with respiratory failure from presumed H1N1 influenza, "but they're definitely better than if you wait until it's salvage," Dr. Hoopes added. ■

Influenza-Related ARDS Leads To Demand for Oxygenation

BY KERRI WACHTER

Among patients in Australia and New Zealand who were infected with 2009 influenza A(H1N1) during the winter season and developed acute respiratory distress syndrome, 79% of those who were treated with extracorporeal membrane oxygenation survived.

"Our findings have implications for health care planning and the clinical management of patients with 2009 influenza A(H1N1) during the 2009-2010 northern hemisphere winter," wrote Dr. Andrew R. Davies of Monash University, Melbourne, and his colleagues (JAMA 2009 Oct. 12;doi:10.1001/JAMA.

2009.1535). The study findings suggest that about 1,300 U.S. patients could need extracorporeal membrane oxygenation (ECMO) for acute respiratory distress syndrome related to 2009 H1N1 during the 2009-2010 winter season, the researchers said.

The study by the Australia and New Zealand Extracorporeal Membrane Oxygenation Influenza Investigators included all adult and pediatric patients who were treated with ECMO between June 1 and Aug. 31, 2009, in 15 ICUs in the two countries.

Of the 252 patients admitted with influenza to the participating ICUs, 201 received mechanical ventilation. The 68 patients who received ECMO had a mean age of 34 years; half were male and 61 had confirmed H1N1 infection. The most common comorbidities were obesity, asthma, and diabetes. Six patients were pregnant, and four were post

partum. Three patients were younger than 15 years. Of the 68 ECMO patients, 48 survived to ICU discharge (32 were discharged from the hospital and 16 were still hospital inpatients), 14 (21%) died, and 6 remained in the ICU as of early September.

Among the 14 patients who died, the cause of death was intracranial hemorrhage (6 patients), other hemorrhage (4), and intractable

respiratory failure (4). Of the 10 pregnant/postpartum patients, 7 survived. All three of the children treated with ECMO were alive, though one was still in the ICU.

During ECMO, hemorrhagic complications occurred in 54% of patients and infective complications in 62%.

"Our results indicate that the incidence of ARDS [acute respiratory distress syndrome] sufficient to warrant consideration of ECMO ... exceeds 2.6 per million inhabitants" with confirmed or suspected 2009 influenza A(H1N1) during the winter season. When only confirmed cases were considered, the estimated incidence of ECMO use fell to 2.0 cases per million. In the preceding winter season, 0.15 cases per million were treated with ECMO for ARDS.

Compared with 133 patients with confirmed H1N1 who were treated with mechanical ventilation but not ECMO, those treated with ECMO had longer median durations of mechanical ventilation (18 days vs. 8 days), longer median ICU stays (22 vs. 12), and greater ICU mortality (14 vs. 12).

The authors had no relevant financial relationships. ■

ICU Admissions Up During Flu Season Down Under

BY MITCHEL L. ZOLER

The number of patients infected with pandemic influenza A(H1N1) who required intensive care this past winter in Australia and New Zealand was 15 times the number admitted to an ICU with viral pneumonitis in recent years.

Admission to the ICU was especially high among H1N1-infected patients who were younger than 1 year, pregnant women, people with a body mass index greater than 35 kg/m², people with asthma or other chronic pulmonary disease, or a member of an indigenous group in Australia or New Zealand, the Australian and New Zealand Intensive Care Influenza Investigators reported (N. Engl. J. Med. 2009 Oct. 8; doi:10.1056/nejmoa0908481).

The data came from a review of 722 patients admitted to an ICU from June through August with a confirmed diagnosis of pandemic H1N1 infection. During each winter of the preceding 4 years, an average of 57 patients with viral pneumonitis required ICU admission. The peak of ICU admissions occurred about 4-6 weeks following the first confirmed ICU admission of an H1N1 patient.

The incidence of ICU admissions was more than 70 per million inhabitants among infants younger than 1 year, substantially greater than the 20-40 admissions per million in any other age category.

The highest number of ICU admissions occurred among patients

aged 25-49—about 300 patients, or more than 40% of the total.

Pregnant women constitute about 1% of the population in the two countries, but formed 9% of the ICU admissions. People with a BMI over 35 are about 5% of the population but made up 29% of the ICU admissions. The ICU admission rate for people with asthma or another chronic pulmonary disease was roughly threefold higher than expected based on the prevalence of these disorders.

Of patients who needed intensive care, 32% had no predisposing factor, 49% had acute respiratory disease or viral pneumonitis, and 20% were clinically diagnosed with bacterial pneumonia.

The median duration of hospitalization was 12 days, and the median duration of ICU treatment was 7 days. Treatment with a mechanical ventilator occurred in 65% of the ICU patients, for a median of 8 days.

By Sept. 7, 17% of the ICU-treated patients had died. Virtually all deaths occurred while patients were hospitalized. Patients with seasonal influenza who required ICU admission had similar mortality, the authors said.

Three factors were independently associated with an increased risk of death during hospitalization: need for invasive ventilation at ICU admission (5.5-fold increased risk), a coexisting condition (2.5-fold increased risk), and age (2% increase for each year of age). ■