

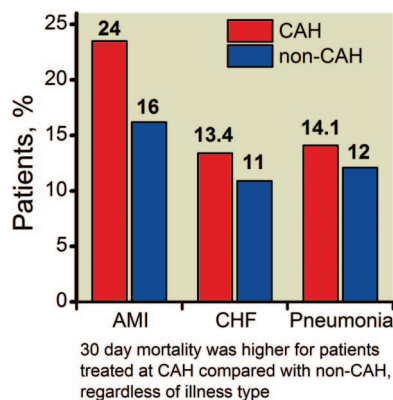
Timothy J. Brennan, Ph.D., M.D., Editor

Perioperative Medicine

J. Lance Lichtor, M.D., Editor

Quality of care and patient outcomes in critical access rural hospitals. JAMA 2011; 306:45–52

Critical access hospitals (CAH), defined as having no more than 25 hospital beds and being more than 35 miles from a hospital, are an important resource for individuals who live in rural areas. This retrospective analysis of nearly 5,000 hospitals examined the quality of care and clinical outcomes of patients with acute myocardial infarction (AMI), congestive heart failure (CHF), and pneumonia. Patients admitted to CAHs had significantly higher 30-day mortality compared with non-CAHs ($P < 0.001$; *see fig.*). CAHs were less likely to have intensive care units, cardiac catheterization capabilities, or electronic health records ($P < 0.001$). CAHs also had lower performance scores on process of care ($P < 0.001$).



Interpretation

In this retrospective analysis of treatment for myocardial infarction, congestive heart failure, and pneumonia, outcome was worse in CAH compared with non-CAHs. Although outcomes after surgery were not studied, this study does demonstrate reduced capabilities and quality of care in regional CAHs.

Malpractice risk according to physician specialty. N Engl J Med 2011; 365:629–36

A recent American Medical Association survey revealed that 5% of respondents face malpractice claims annually. However, data regarding subspecialty risk is lacking. Malpractice data from a large nationwide professional liability insurer

including 40,916 physicians were analyzed. Approximately 7% of physicians had a malpractice claim annually, and 1.6% of these led to a payment. Neurosurgery had the highest claim rate (19.1%), psychiatry had the lowest (2.6%), and anesthesiology was similar to the average of all physicians. Overall, the mean and median indemnity payments were \$274,887 and \$111,749, respectively. Anesthesiology was ranked in the lower half of specialties based on payments to plaintiffs. However, anesthesiology had the third-most payments exceeding \$1 million.

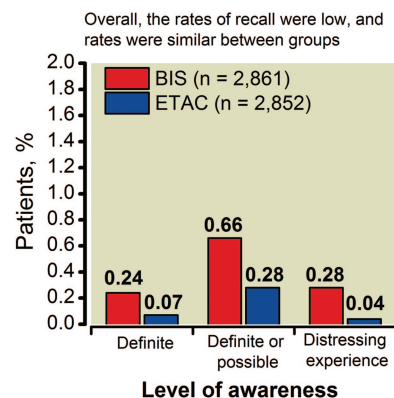
Interpretation

The authors used malpractice claims from a physician-owned professional liability insurer that provided physician coverage in every U.S. state. Based on median payments to plaintiffs, anesthesiology ranked in the lower half. Overall, specialties in which physicians were more likely to have a claim against them did not necessarily have the highest average payment size.

Prevention of intraoperative awareness in a high-risk surgical population. N Engl J Med 2011; 365:591–600

General anesthesia – minding the mind during surgery. N Engl J Med 2011; 365:660–1

Every year in the United States, up to 40,000 patients experience awareness that may lead to persistent problems like posttraumatic stress disorder. A prospective, randomized, and evaluator-blinded multicenter trial was conducted to determine if incorporation of electroencephalogram-derived bispectral index (BIS) prevented awareness more than standard monitoring of end-tidal anesthetic-agent concentration (ETAC). Inclusion of the electroencephalogram-derived bispectral index protocol did not reduce the number of patients with intraoperative awareness (*see fig.*).



Interpretation

In this study, more than 6,000 patients at high risk for recall were randomly assigned to receive a volatile anesthetic for elective surgery guided by electroencephalogram-derived bispectral index or end-tidal anesthetic agent monitoring. The incidence of awareness was lower than anticipated, and the incidence of awareness was no better if electroencephalogram-derived bispectral index monitoring or end-tidal agent monitoring was used. Patients undergoing total intravenous anesthesia were not studied.

Peripheral venous catheter-related *Staphylococcus aureus* bacteremia. Infect Control Hosp Epidemiol 2011; 32:579–83

Hospital-acquired infections, including *Staphylococcus aureus*, are often associated with peripheral and central venous catheter use. A retrospective review of peripheral venous catheter (PVC)-related *S. aureus* bacteremias in adult patients was conducted to assess risk factors for infection. Twenty-four cases were identified over a 2.5-yr period. Patients with the peripheral venous catheter in the antecubital fossa, placed in the emergency department, or for a longer duration of catheterization were more likely to develop *S. aureus* bacteremia (see fig.).

Interpretation

This study suggested that minimizing antecubital fossa vein catheters, replacing catheters that were placed under emergent conditions within 24 h, and replacing peripheral venous catheters in place for 72 h may reduce the risk of *S. aureus* bacteremia in adult patients.

Nitric oxide scavenging by red blood cell microparticles and cell-free hemoglobin as a mechanism for the red cell storage lesion. Circulation 2011; 124:465–76

An increased incidence of negative clinical outcomes associated with transfusion of a large number of units and with units of prolonged storage time was recently demonstrated. The current *in vitro* study of packed erythrocyte units found that after only 39 days of storage, hemoglobin accumulates in the cell-free and microparticle-encapsulated forms. These hemoglobins react with nitric oxide approximately 1,000 times faster than hemoglobin in intact erythrocytes. In *in vivo* rat studies, low concentrations of hemoglobin resulted in potent vasoconstriction, and infusion of plasma from stored human erythrocyte units also resulted in vasoconstriction.

Interpretation

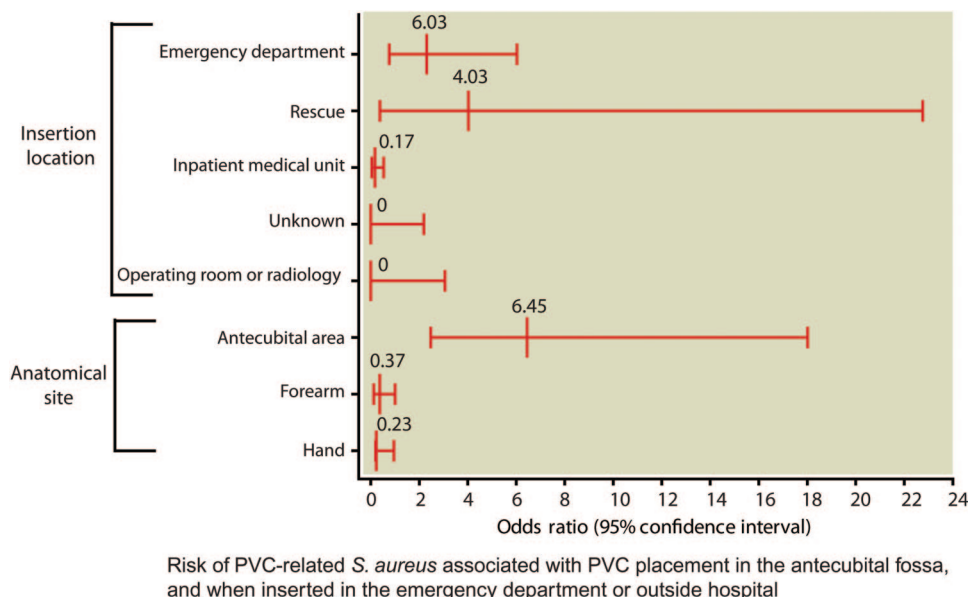
This study indicates that intravascular hemolysis and microparticles in stored blood cause dysregulation of nitric oxide signaling in the endothelium and induce vasoconstriction and hypertension. This may represent a component of injury in the patient receiving multiple erythrocyte transfusions.

Critical Care Medicine

Jean Mantz, M.D., Ph.D., Editor

A high admission syndecan-1 level, a marker of endothelial glycocalyx degradation, is associated with inflammation, protein C depletion, fibrinolysis, and increased mortality in trauma patients. Ann Surg 2011; 254:194–200.

Complications, such as infection and hyperinflammation, contribute to mortality after trauma. A prospective cohort study of



Level 1 trauma patients was conducted to investigate the association between markers of acute endothelial glycocalyx degradation, inflammation, coagulopathy, and mortality after trauma. High levels of circulating syndecan-1 were associated with a three-fold increase in mortality ($P = 0.006$). High levels of syndecan-1 were also associated with increased catecholamines, interleukins 6 and 10, thrombomodulin, and other inflammatory markers.

Interpretation

Syndecan-1 level was an independent predictor of mortality in trauma patients. Based on these results, the authors propose that degradation of endothelial glycocalyx may trigger a prothrombotic state with protein C activation, followed by depletion in protein C, coagulation disorders, and fibrinolysis. This cascade may represent an in-hospital therapeutic target to decrease mortality in trauma patients.

Brainstem responses can predict death and delirium in sedated patients in intensive care unit. *Crit Care Med* 2011; 39:1960–7

Although difficult, assessment of neurologic responses in sedated, critically ill patients may offer prognostic information. This prospective multicenter observational cohort study developed and validated the use of neurologic exams in mechanically ventilated patients in the intensive care unit sedated with midazolam. The absence of cough reflex at day 1 of admission predicted mortality at day 28, and the lack of oculocephalic reflex predicted altered mental status and delirium at day 28 (*see fig.*).

Interpretation

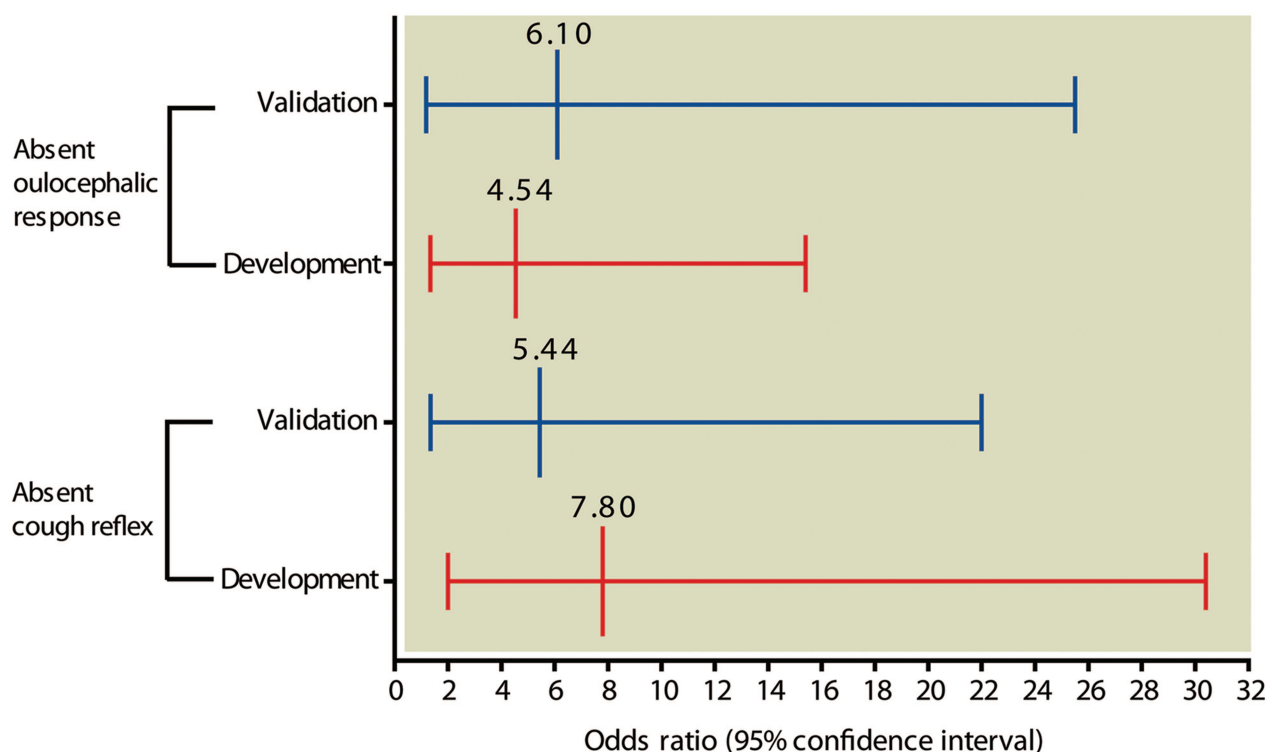
This prospective multicenter observational cohort study demonstrated that neurologic examination is feasible and useful in sedated, mechanically ventilated, and critically ill patients. Though preliminary, the findings are robust and may provide early tools that may help to clarify patients' prognosis upon admission to the intensive care unit.

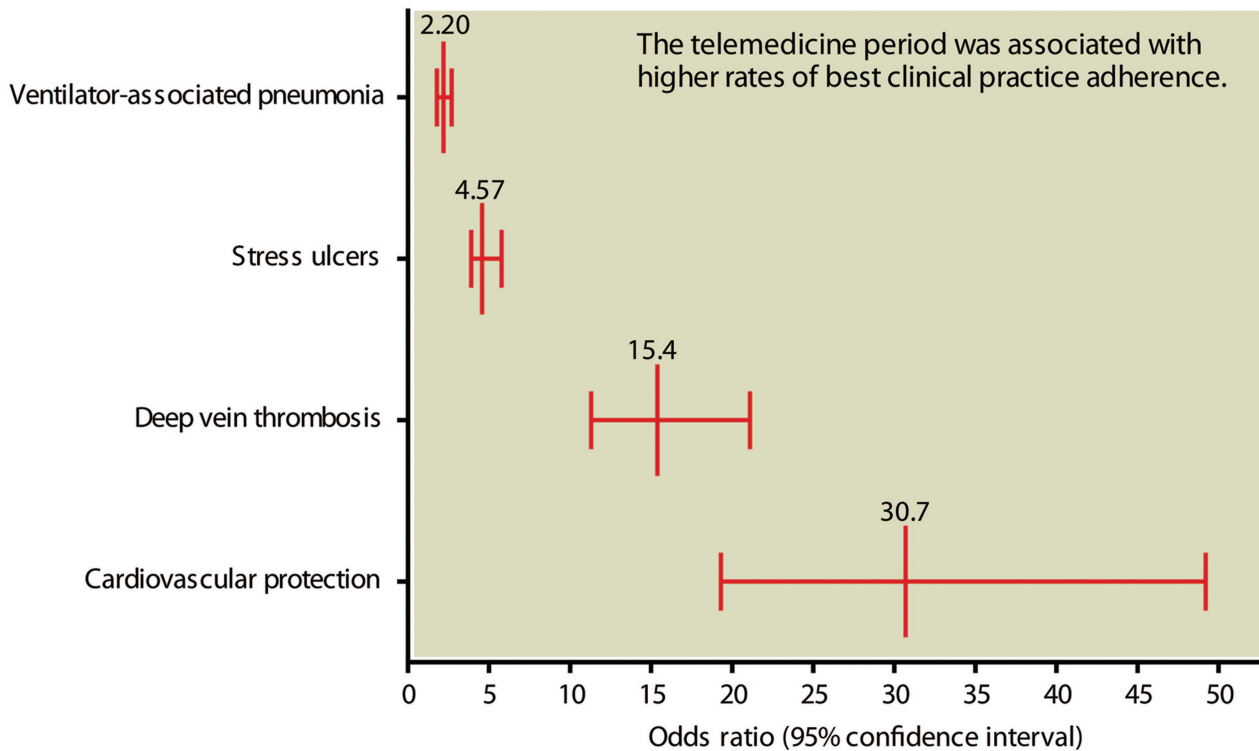
Hospital mortality, length of stay, and preventable complications among critically ill patients before and after tele-ICU reengineering of critical care process. *JAMA* 2011; 305: 2175–83

Telemedicine to a moving ambulance improves outcome after trauma in simulated patients. *J Trauma* 2011; 71:49–55

In order to improve patient care, telemedicine is being used in multiple patient care settings, both inside and outside hospitals. These two studies evaluated the potential benefit of telemedicine in two separate settings: a tele-intensive care unit (tele-ICU) and ambulances with simulated trauma victims. In both cases, health care professionals located remotely worked in collaboration with bedside caregivers providing care to patients.

In the first study, a prospective clinical practice study design evaluated the association of a tele-ICU intervention with patient outcomes. In-hospital (13.6% *vs.* 11.8%; $P = 0.05$) and ICU mortality rates (10.7% *vs.* 8.6%; $P = 0.003$) significantly decreased after implementation of tele-ICU. Length of stay in





hospital (13.3 days *vs.* 9.8 days; $P < 0.001$) and in ICU (6.4 days *vs.* 4.5 days; $P < 0.001$) were significantly shorter after implementation of tele-ICU. The tele-ICU intervention period was associated with higher rates of best clinical practice adherence compared with the preintervention period (*see fig.*).

The second study evaluated telemedicine in a moving ambulance using human patient simulation of three trauma scenarios. Vital signs were significantly improved in the telemedicine group (lowest SaO_2 : 84 *vs.* 78; lowest systolic blood pressure: 70 *vs.* 53; highest heart rate: 144 *vs.* 159; $P < 0.001$). Recognition rates for key signs, processes, and critical interventions were significantly higher in the telemedicine group ($P < 0.003$). Guidance by telemedicine also allowed for emergency medical teams to properly perform rescue interventions like needle thoracostomy.

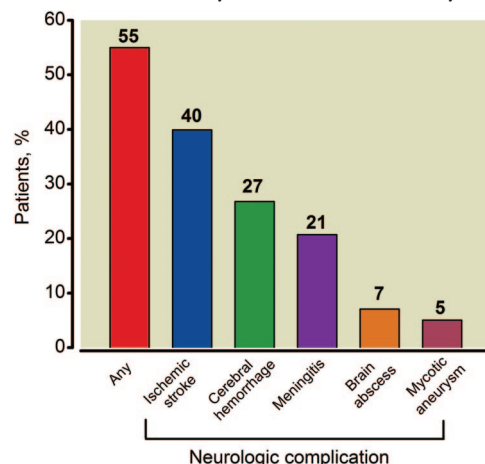
Interpretation

Telemedicine is developing rapidly in many domains of health care. However, skepticism about its value in patient care remains. These two papers show the potential benefit of telemedicine in the ICU and using simulation in a moving ambulance. Use of tele-ICU (care process shared by bedside clinicians and off-site support team personnel) provided a benefit on patient outcome, reducing mortality, length of stay, and major complications. Use of telemedicine also showed improvement in correction of hypovolemia in trauma patients and the ability of procedurally naive emergency medical teams to properly perform rescue interventions.

These studies provide a valuable basis for future work that will examine how telemedicine should be implemented in clinical practice in the prehospital and hospital settings.

Neurologic complications and outcomes of infective endocarditis in critically ill patients: The ENDOcardite en REAnimation prospective multicenter study. *Crit Care Med* 2011; 39:1474–81

Infective endocarditis is occurring more frequently in elderly patients. This prospective multicenter study (the ENDOcardite en REAnimation Study Group) was conducted to assess infective endocarditis in critically ill patients and the impact of neurologic complications on patient outcomes. Of the 198 patients included with left-sided infective endocarditis, 55% experienced at least one neurologic complication (*see fig.*). Glasgow Coma Scale less than 10, *Staphylococcus aureus* infective endocarditis, and severe comorbidities before admission were associated with 3-month mortality after multivariate analysis.



Interpretation

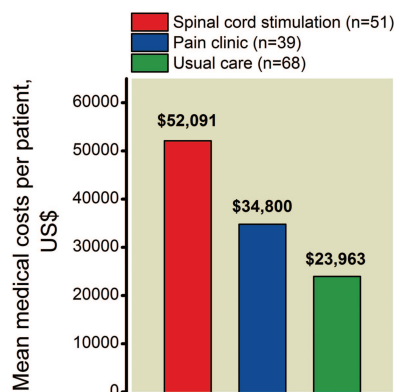
This large prospective multicenter cohort study demonstrates the severity and frequency of neurologic complications, primarily stroke, of left-sided endocarditis in critically ill patients. Less than one-third of these patients survived with functional independence. Further information is needed on the appropriate timing for surgery for critically ill patients with endocarditis having experienced neurologic complications.

Pain Medicine

Timothy J. Brennan, Ph.D., M.D., Editor

Costs and cost-effectiveness of spinal cord stimulation (SCS) for failed back surgery syndrome: an observational study in a workers' compensation population. *Spine* 2011; doi: 10.1097/BRS.0b013e31822a867c

Failed back surgery syndrome is often treated with spinal cord stimulation. However, relatively few randomized clinical trials have been conducted to support its use. A prospective cohort study was previously conducted for failed back surgery syndrome in three groups: spinal cord stimulation trial with or without permanent device implant, pain clinic evaluation, and usual care. The primary outcome, a composite measure of pain, disability, and opioid medication use, was not different among groups. This secondary analysis was conducted to estimate the cost-effectiveness of spinal cord stimulation among these workers' compensation recipients with failed back surgery syndrome. Spinal cord stimulation did not reduce medical costs in this patient population compared with either pain clinic evaluation or usual care (*see fig.*). This held true even after adjustment for baseline covariates.



Interpretation

This study performed a cost-benefit analysis of previously generated data of spinal cord stimulation in workers' compensation patients with failed back surgery syndrome. Spinal cord stimulation in this population was not cost-effective.

Autoimmunity against the β_2 adrenergic receptor and muscarinic-2 receptor in complex regional pain syndrome. *Pain* 2011; doi: 10.1016/j.pain.2011.06.012

Treatment of complex regional pain syndrome (CRPS) is hampered because of a lack of understanding of the pathophysiology of this painful condition. This study assessed potential antibody targets in the serum of control subjects ($n = 10$) or patients with CRPS ($n = 20$). Functionally active autoantibodies against the muscarinic-2 and the β_2 adrenergic receptors were found in serum from patients with CRPS. No correlation was found between the presence of functional active autoantibodies and any clinical data (*e.g.*, gender, age, CRPS duration, or pain score).

Interpretation

The etiology and pathogenesis of CRPS are not fully understood. These data, demonstrating autoantibodies against the muscarinic-2 receptor and β_2 adrenergic receptor, indicate a possible autoimmune etiology. Future studies should replicate these findings. Perhaps treatment strategies for CRPS could be directed toward autoimmune mechanisms in patients with autoantibodies and CRPS.