EVIDENCE-BASED INFORMATION FOR HOSPITALISTS, INTENSIVISTS, AND ACUTE CARE CLINICIANS

HOSPITAL MEDICINE ALERT

AHC Media LLC Home Page—www.ahcmedia.com

CME for Physicians—www.cmeweb.com

AHC Media LLC

INSIDE

Can We Make Intubation a Safer Procedure for Patients?

ABSTRACT & COMMENTARY

By Andrew M. Luks, MD

Pulmonary and Critical Care Medicine, University of Washington, Seattle

Dr. Luks reports no financial relationship to this field of study.

This article originally appeared in the May 2010 issue of Critical Care Alert. *It was edited by David J. Pierson, MD, and peer reviewed by William Thompson, MD. Dr. Pierson is Professor, Pulmonary and Critical Care Medicine, Harborview Medical Center, University of Washington, Seattle, and Dr. Thompson is Staff Pulmonologist, VA Medical Center; Associate Professor of Medicine, University of Washington; they both report no financial relationships relevant to this field of study.*

Synopsis: *This two-phase, prospective, multicenter study demonstrated that implementation of an intubation management protocol reduced the incidence of severe hypoxemia and cardiovascular collapse during endotracheal intubation when compared to standard practice, but did not improve other patient outcomes such as ICU mortality or duration of mechanical ventilation.*

Source: Jaber S, et al. An intervention to decrease complications related to endotracheal intubation in the intensive care unit: A prospective, multiple-center study. *Intensive Care Med* 2010;36:248-255.

Endotracheal intubation is a procedure fraught with multiple, potentially life-threatening complications. Given that "care bundles" have been associated with improved management of various critical care problems including severe sepsis and ventilator sedation and weaning, Jaber and colleagues sought to determine whether implementation of an intubation management protocol would decrease the incidence of intubation-related complications.

To investigate this question, they conducted a two-phase intervention study involving all ICU endotracheal intubation procedures, except those performed for cardiac arrest, at three different

VOLUME 5 • NUMBER 4 • JUNE 2010 • PAGES 25-32

NOW AVAILABLE ONLINE
www.ahcmedia.com

Financial Disclosure:

Hospital Medicine Alert's physician editor, Kenneth P. Steinberg, MD, has no relevant financial relationship related to the material presented in this issue.

hospitals. During a six-month control phase, intubation was performed by the clinician caring for the patient without use of a protocol. This was followed by a four-month lead-in period during which an intubation management bundle was developed and all ICU staff received training in the bundle practices and a six-month intervention period during which all intubations were performed using the management bundle. The bundle comprised a total of 10 interventions including the presence of two operators, fluid administration prior to intubation (500 mL normal saline or 250 mL of hydroxyethyl starch), preparation of long-term sedation, preoxygenation for three minutes using non-invasive positive pressure ventilation (NIPPV), rapid sequence intubation using etomidate or ketamine with succinylcholine, cricoid pressure, confirmation of tube placement by capnography, norepinephrine for low diastolic pressure post-intubation, initiation of long-term sedation and selection of initial ventilator settings (tidal volume 6-8 mL/kg IBW; F_IO_2 1.0; PEEP < 5 cm H_2O; and respiratory rate 10-20 breaths/min). During each study period, they recorded the number of severe life-threatening complications (death, cardiac arrest, hypotension that persisted > 30 minute or required vasopressor support, severe hypoxemia) and mild-to-moderate complications (intubation requiring > 3 attempts, > 10 minutes, or need for another operator; esophageal intubation, gastric aspiration, arrhythmia requiring intervention, severe agitation, or dental injury). Other outcome measures included the duration of mechanical ventilation, the number of ventilator-free ICU days, ICU length of stay, and vital status upon ICU discharge.

There were 121 intubations during the control period and 123 intubations in the intervention period, with the two groups being well matched in terms of reasons for intubation and other clinical factors. Among those patients intubated during the intervention period, 75% of the total recommended number of procedures were followed by practitioners. Intubation during the intervention phase was associated with a lower incidence of life-threatening (21% vs. 34%; $p = 0.03$) and mild-to-moderate (9% vs. 21%; $p = 0.01$) complications. This result appears to be driven by a large decrease (~ 50%) in the incidence of severe hypoxemia (SpO_2 < 80% during intubation attempts) and cardiovascular collapse during the intervention phase, as there were no statistically significant differences in the incidence of other complications, including cardiac arrest or death, esophageal intubation, aspiration, agitation, or dental injury. With regard to the other outcome measures, there were no differences in the duration of mechanical ventilation or ICU stay, the number of ventilator-free days, or ICU mortality between the two patient groups.

■ COMMENTARY

Care bundles are becoming an increasingly prevalent part of ICU practice as we now have bundles for a large number of processes including ventilator management, ventilator weaning, sedation, and treatment of sepsis, pneumonia, and myocardial infarction. Given the risks associated with endotracheal intubation and the potential for life-threatening complications, any practice that decreased such risk would be a worthwhile intervention, and the study by Jaber et al suggests there may be opportunities for improvement on this front. Although the incidence of many types of complications (e.g., esophageal intubation, gastric aspiration) was not decreased, they did show a significant decrease in the incidence of severe hypoxemia and hemodynamic instability, two important outcomes.

One of the interesting phenomena of evidence-based practice in critical care and other aspects of medicine is that when a study demonstrates a positive result, the practices used in that study are often adopted wholesale with little modification. An excellent example of this is the positive end-expiratory pressure-inspired oxygen fraction "ladder" that is frequently used in management of hypoxemia in patients with the acute respiratory distress syndrome. Although there is no physiologic basis for the ladder, it has been widely adopted at many institutions because it was the procedure used in the original ARDS Network study. While the study by Jaber and colleagues supports the notion of having an intubation bundle, there are aspects of their procedures that may not be ideal and should be re-evaluated before adoption of such a bundle at other institutions. Their protocol, for example, called for starting individuals on a tidal volume of 6-8 mL/kg predicted body weight, even though there is no evidence to support these tidal volumes in all individuals and such low tidal volumes at the initiation of mechanical ventilation may lead to atelectasis and worsening oxygenation beyond the

Hospital Medicine Alert, ISSN 1931-9037, is published monthly by AHC Media LLC, 3525 Piedmont Rd., NE, Bldg. 6, Suite 400, Atlanta, GA 30305.

MANAGING EDITOR: Leslie Hamlin.
EXECUTIVE EDITOR: Russ Underwood.
DIRECTOR OF MARKETING: Schandale Kornegay.
GST Registration Number: R128870672.

Periodicals Postage Paid at Atlanta, GA 30304 and at additional mailing offices.

POSTMASTER: Send address changes to ***Hospital Medicine Alert,*** P.O. Box 740059, Atlanta, GA 30374.

Back Issues: $42. Missing issues will be fulfilled by customer service free of charge when contacted within one month of the missing issue's date.

AHC Media LLC

Subscriber Information

Customer Service: 1-800-688-2421.
Customer Service E-Mail: customerservice@ahcmedia.com
Editorial E-Mail: leslie.hamlin@ahcmedia.com

Subscription Prices

United States
1 year with free AMA Category 1 credits: $249
Add $17.95 for shipping & handling.
(Student/Resident rate: $125)

Multiple Copies
Discounts are available for group subscriptions, multiple copies, site-licenses or electronic distribution. For pricing information, call Tria Kreutzer at 404-262-5482.

Canada
Add GST and $30 shipping.

Elsewhere
Add $30 shipping.

Accreditation

AHC Media LLC is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

AHC Media LLC designates this educational activity for a maximum of *20 AMA PRA Category 1 Credits™*. Physicians should only claim credit commensurate with the extent of their participation in the activity.

This CME activity is intended for hospitalists, intensivists, and acute care clinicians. It is in effect for 36 months from the date of the publication.

Questions & Comments
Please call **Leslie Hamlin,** Managing Editor, at (404) 262-5416 or e-mail at leslie.hamlin@ahcmedia.com between 8:30 a.m. and 4:30 p.m. ET, Monday-Friday.

short time frame analyzed in this study. They also call for a respiratory rate of 10-20 breaths/min, a number that is likely adequate for many patients but would lead to severe hypoventilation in patients with severe metabolic acidosis, particularly in light of the low tidal volumes in the protocol. In addition, there were items that were omitted from the protocol that might be of benefit. One could imagine, for example, adding an element to the protocol about airway assessment and mandating the availability of Eschmann stylets or ultrasound-guided laryngoscopy for any patients with unfavorable airway characteristics.

Given these concerns about the particular protocol elements, it is best to view the study by Jaber and colleagues as establishing "proof of concept" rather than providing a detailed roadmap we should all follow. What is needed prior to widespread adoption of these protocols is to refine the procedures contained within the protocol to ensure we are delivering optimal care. ■

Admitted from the ED

ABSTRACT & COMMENTARY

By Dean L. Winslow, MD, FACP, FIDSA
Chief, Division of AIDS Medicine,
Santa Clara Valley Medical Center;
Clinical Professor, Stanford University School of Medicine
Dr. Winslow serves as a consultant for Siemens Diagnostics and is on the speaker's bureau for GSK and Cubist.
This article originally appeared in the May 2010 issue of Infectious Disease Alert. *It was edited by Stan Deresinski, MD, FACP, and peer reviewed by Timothy Jenkins, MD. Dr. Deresinski is Clinical Professor of Medicine, Stanford University; Associate Chief of Infectious Diseases, Santa Clara Valley Medical Center, and Dr. Jenkins is Assistant Professor of Medicine, University of Colorado, Denver Health Sciences Center. Dr. Deresinski serves on the speaker's bureau for Merck, Pharmacia, GlaxoSmithKline, Pfizer, Bayer, and Wyeth, and does research for Merck, and Dr. Jenkins reports no financial relationships relevant to this field of study*

Synopsis: *In a prospective, observational study, > 50% of patients identified and treated for severe sepsis in the emergency department (ED) had negative cultures; 18% of patients had a noninfectious diagnosis that mimicked sepsis.*

Source: Heffner AC, et al. Etiology of illness in patients with severe sepsis admitted to the hospital from the emergency department. *Clin Infect Dis*. 2010;50:814-820.

A prospective, observational study of patients 18 years of age and older treated with goal-directed therapy of sepsis in the ED was conducted at a large county hospital in North Carolina. Inclusion criteria included two or more criteria for systemic inflammation and evidence of hypoperfusion. Clinical data were prospectively collected for two years. Blinded observers used standardized criteria to determine the final cause of hospitalization.

A total of 211 patients were enrolled in the study. Of those, 95 (45%) had positive culture results and 116 (55%) had negative cultures. Overall mortality was 19%. Patients with positive cultures were more likely to have active malignancy, have a vascular line, be a resident of a nursing home, have UTI as a primary source, and were less likely to have a pulmonary source.

Of the patients negative by culture, 51 (44%) had clinical evidence of infections, with pneumonia being the most common in 38 patients. Nine patients had atypical infections, including *C. difficile* disease (5), cryptococcosis (2), TB (1), and viral encephalitis (1). Thirty-seven patients (32%) had noninfectious mimics. The most common diagnoses included inflammatory colitis, hypovolemia, medication effect, adrenal insufficiency, acute MI, pulmonary edema, pancreatitis, diabetic ketoacidosis, and small bowel obstruction. In 19 cases (16%), the cause of the sepsis picture on presentation was indeterminate.

■ COMMENTARY

While this was a relatively small single-center study, I felt it was an interesting and important paper. I frequently lead the morning report with the medicine house staff at our own county hospital in San Jose, CA, and enjoy being challenged by the diagnostic possibilities present in patients who present to our ED acutely ill and require admission to the hospital. The finding of noninfectious causes of a surprisingly large number of cases of patients admitted to the hospital for "sepsis" is an important reminder to keep a broad differential diagnosis in mind in caring for such critically ill patients. This further reinforces the importance of infectious diseases clinicians remaining skilled as internists (or pediatricians) as they approach the management of these complicated patients.

As a side note, the second author on this paper, Dr. Jim Horton, is Chief of the ID Division at Carolinas Medical Center. Jim and I trained together in New Orleans many years ago. He is a great clinician and one of the finest individuals I've ever known. He invited me to give medicine grand rounds at his hospital in 2008, where I had an opportunity to meet his colleagues and tour the wards. It was apparent that CMC is a wonderful hospital that provides outstanding care to the people of Charlotte. ■

Outcomes for Plasma Exchange to Treat TTP

ABSTRACT & COMMENTARY

By Andrew S. Artz, MD
Division of Hematology/Oncology, University of Chicago
Dr. Artz reports no financial relationships relevant to this field of study.
This article originally appeared in the May 2010 issue of Clinical Oncology Alert. *It was edited by William B. Ershler, MD, and peer reviewed by V.R. Veerapalli, MD. Dr. Ershler works for INOVA Fairfax Hospital Cancer Center, Fairfax, VA; Director, Institute for Advanced Studies in Aging, Washington, DC, and Dr. Veerapalli is is Staff Clinician, INOVA Fairfax Cancer Center, Fairfax, VA; both report no financial relationships relevant to this field of study.*

Synopsis: *The risk of relapse after effective therapy with plasma exchange for thrombotic thrombocytopenic purpura (TTP) has not been well-characterized. Among 376 patients with an initial episode of TTP treated with plasma exchange, overall survival was around 68%, with a survival of 78% among the subset with idiopathic TTP. Survival did not differ on those having a low (< 10%) ADAMTS13 level. Relapse was greater for those with a low ADAMTS13 level at the time of presentation.*

Source: Hovinger J, et al. Survival and relapse in patients with thrombotic thrombocytopenic purpura. *Blood.* 2010; 115:1500-1511.

The classic pentad of anemia, thrombocytopenia, neurologic abnormalities, renal abnormalities, and fever historically defined thrombotic thrombocytopenic purpura (TTP). TTP may be divided into idiopathic where no apparent underlying cause exists and secondary TTP related to a variety of disorders such as hematopoietic transplant, pregnancy, infection, drug, autoimmune or cancer. The realization of very low ADAMST13 levels in a substantial number of patients further clarified pathophysiology.

Plasma exchange has dramatically improved survival from around 10% to 70%–80%.[1] With an available treatment, the diagnostic criteria were loosened to require only microangiopathic hemolytic anemia and thrombocytopenia, leading to better recognition. More effective treatment has also presented the problem of relapse. In this paper, the authors report on the experience of the Oklahoma TTP registry to better characterize outcomes related to TTP.

The registry enrolled 398 consecutive patients with a diagnosis of TTP or HUS for whom plasma exchange (PEX) was requested in a 58-county region covering 2.3 million people. ADAMTS13 activity was measured by both quantitative immunoblotting and a fluorogenic assay. Of these, 376 met eligibility criteria. ADAMTS13 was available in 261 subjects. The median follow-up was 4.7 years. Of these, 148 of 361 (41%) had idiopathic TTP. Among the 59% with secondary TTP, the most common causes in decreasing frequency were: drug, autoimmune, infection, bloody diarrhea, pregnancy, and stem cell transplant. The ADAMTS13 level was < 10% in 60 (23%) and > 10% in 201 (77%) patients. Of patients with low levels, most were in the idiopathic TTP group.

Overall survival was 69%. Survival was 80% for idiopathic TTP. Secondary TTP related to pregnancy/post-partum TTP fared extremely well, realizing survival of 93%. In contrast, less than 30% of patients after stem-cell transplant and infection-related TTP survived. Interestingly, survival did not change over the 20-year time period using plasma exchange. Relapse was significantly more common for patients with an ADAMTS13 < 10% among those surviving (and, thus, available for follow-up). The five patients who relapsed with baseline ADAMTS13 activity < 10% had unique characteristics. One was re-exposed to the drug, leading to relapse, two patients had lupus with features overlapping with TTP, one patient had a low ADAMTS 13 that evolved over time, and another had a low level on one of the two assays.

Among the 47 surviving patients who had ADAMTS13 < 10%, only male sex predicted for relapse. Relapses in those with low ADAMTS13 activity occurred in the first year (63%), with a cumulative incidence of relapse at 7.5 years of 41%. In recent years, ADAMTS13 activity was periodically during remission for those with low activity at the time of presentation. Since December 2003, 13 patients with ADAMTS 13 activity < 10% received rituximab, generally for refractory or recurrent disease.

■ COMMENTARY

Oncologists are often asked to assist in the diagnosis and management of patients who have thrombotic thrombocytopenic purpura (TTP). The substantial improvement in mortality from plasma exchange demands early diagnosis and treatment and prompt initiation of treatment for TTP. Diagnosis only requires microangiopathic hemolytic anemia and thrombocytopenia. Data on outcomes from plasma exchange and relapse rates in responders have been limited. In this study, the authors were able to perform a population-based study derived from patients in a large area in Oklahoma, serviced by a single provider of plasma exchange. Over 20 years, 376 consecutive patients were studied who received TTP for an initial episode of TTP. Idiopathic TTP occurred in 41% whereas secondary TTP, related to a defined condition, accounted for the majority. The survival rate of patients with idiopathic TTP was 80%, similar to prior reports.[1] ADAMTS13 levels were available from more recent patients. Around half (47%) of the patients with idiopathic TTP had levels < 10% at presentation, although some patients with secondary TTP

also had low levels. Thus, low ADAMTS13 is neither sufficient nor necessary for diagnosing idiopathic TTP. However, low ADAMTS13 level at presentation had a much higher risk of relapse compared to those with higher levels at presentation. Among those with low ADAMTS13 at presentation, 34% relapsed with a cumulative incidence of relapse at 7.5 years of 41%. Relapses were clustered within one year of initial diagnosis, indicating the need for close monitoring after remission, particularly during the first year. Interestingly, six patients received rituximab maintenance to avoid relapse, and none have relapsed. For those with ADAMTS13 levels > 10% at presentation, relapses rarely occurred; only 4% of 136 surviving patients relapsed, all within two years.

This large study of a large cohort of TTP patients treated with plasma exchange reveals that secondary TTP may be more common than idiopathic TTP. Reassuringly, plasma exchange enables reasonable survival of 80% for those presenting with idiopathic TTP. This study defies the common notion that low ADAMTS13 are pathognomonic for idiopathic TTP; some patients with low levels had secondary TTP and many patients classified as idiopathic TTP had levels > 10%. Lower levels of ADAMTS13 at presentation may predict for relapse once in remission. However, the exact monitoring strategy and intervention for this subset (e.g., rituximab) remain undefined. ■

References

1. Rock GA, et al. Comparison of plasma exchange with plasma infusion in the treatment of thrombotic thrombocytopenic purpura. Canadian Apheresis Study Group. *N Engl J Med*. 1991;325:393-397.

Don't Treat Superficial Thrombophlebitis Superficially

ABSTRACT & COMMENTARY

By Allan J. Wilke, MD

Professor and Chair, Department of Integrative Medicine, Ross University (Bahamas) Limited, Freeport, Grand Bahama, The Bahamas

Dr. Wilke reports no financial relationship to this field of study.

This article originally appeared in the May 2010 issue of Internal Medicine Alert. *It was edited by Stephen A. Brunton, MD, and peer reviewed by Gerald Roberts, MD. Dr. Brunton is Adjunct Clinical Professor, University of North Carolina, Chapel Hill, and Dr. Roberts is Assistant Clinical Professor of Medicine, Albert Einstein College of Medicine, New York, NY. Dr. Brunton serves on the advisory boards of Amylin, Kowa, Novo Nordisk, and serves as a speaker for Boehringer Ingelheim and Novo Nordisk. Dr. Roberts reports no financial relationships relevant to this field of study.*

Synopsis: *Superficial venous thrombosis is not a benign condition and deserves close attention.*

Source: Decousus H, et al. Superficial venous thrombosis and venous thromboembolism: A large, prospective epidemiologic study. *Ann Intern Med* 2010;152:218-224.

In a prospective, observational study, these French vascular specialists enrolled 844 adults who presented to their primary care physicians (PCP) with symptomatic lower-limb superficial venous thrombosis (SVT). They excluded patients whose thrombi were shorter than 5 cm on compression ultrasonography, who were 10 days or less postoperative, who had sclerotherapy in the last 30 days, and who could not be followed up. The patients were evaluated immediately for deep vein thrombosis (DVT) by lower limb compression ultrasound (US) or, if symptomatic, for pulmonary embolism (PE). Patients without either (isolated SVT) were followed with a second lower limb US 8-14 days after initial presentation and at a visit at 3 months. The primary outcome was a confirmed thromboembolic event during the 3 months, defined as any lower limb DVT, asymptomatic recurrent SVT, asymptomatic SVT extension, or PE at the second US or any symptomatic event at the follow-up visit. The secondary outcome was mortality at 3 months.

The average age of the enrolled patients was 65. They were predominantly female (65%). The median time from presentation to their PCP to the vein clinic was 6 days. The long saphenous vein was involved 66% of the time. At enrollment, 210 (25%) patients had a DVT (198) and/or PE (33).

Six hundred thirty-four patients had an isolated SVT. Anticoagulation (oral or subcutaneous) was initiated in 540, and 584 were prescribed elastic compression hose. Sixty underwent vein stripping or ligation. Thirty-four subjects were excluded per protocol and 14 were lost to follow-up at 3 months. Of the remaining 586, 58 had a thromboembolic event (12 asymptomatic, 46 symptomatic). Seven were proximal DVTs and 3 were PEs. Two patients died, one from a probable PE, the other from metastatic cancer. Risk factors for a thromboembolic complication at 3 months, identified by multivariate analysis, were: being male (hazard ratio [HR], 2.63, 95% confidence interval [CI], 1.42-4.86), having a history of thromboembolism (HR, 2.18; 95% CI, 1.15-4.12), having a cancer history (HR, 3.12; 95% CI, 1.15-8.47), and not having varicosities (HR, 2.06; 95% CI, 1.01-4.25).

■ COMMENTARY

First, let's address some caveats. The patients' primary care physicians referred them to the researchers. Were there patients who presented to their PCPs who were not referred? If there were, presumably, their symptoms and signs were milder and did not progress, but we don't know. Although this is a large study, and I think we can trust its conclusions,

it was halted before the predetermined number (1200) of patients needed were enrolled because enrollment was so slow. The CIs for the risk factors' HRs may have been more impressive if enrollment had been complete. The researchers excluded "small" SVTs, those shorter than 5 cm. Can we assume that small SVTs don't progress or are more benign? The study was funded by two pharmaceutical concerns and three French medical societies, but the authors state that none of the funding sources had any input into the study design.

What lessons should we take from this study? First, patients with an SVT will have a one in four chance of having a coincident DVT or PE. Second, in 3 months, despite anticoagulation and compression hose, one in 10 patients with an isolated SVT will have a complicating thromboembolic event. You might consider screening patients with large, symptomatic SVTs with compression US and be alert to signs and symptoms of PE. Since this was not a study of treatment, it's difficult to say what to do about isolated SVTs. It's possible that there may have been more complications if the patients had not been anticoagulated. At the very least, it would be prudent not to dismiss SVTs, to advise our patients about the symptoms of possible sequelae, and to follow them closely. ■

Daily Multidisciplinary ICU Rounds Improve Patient Outcomes

ABSTRACT & COMMENTARY

By David J. Pierson, MD

This article originally appeared in the May 2010 issue of Critical Care Alert.
It was peer reviewed by William Thompson, MD.

Synopsis: *In this large retrospective cohort study of more than 100,000 patients in 112 hospitals, after correction for illness severity and other factors, daily rounds by a multidisciplinary care team were associated with lower mortality in the ICU, regardless of whether an intensivist model of physician staffing was in use.*

Source: Kim MM, et al. The effect of multidisciplinary care teams on intensive care unit mortality. *Arch Intern Med* 2010;170:369-376.

Kim and associates conducted a population-based, retrospective cohort study of medical patients admitted to acute care hospitals throughout the state of Pennsylvania between July 2004 and June 2006. They linked a statewide hospital organizational survey with hospital discharge data and used multivariate logistic regression to look for independent relationships between daily multidisciplinary ICU rounds and 30-day patient mortality. They used data from each hospital's ICU that treated the largest number of adult, noncardiac, nonsurgical patients, and thus excluded pediatric ICUs and patients with primary cardiac, neurological, or surgical diagnoses. ICUs were classified according to whether physician staffing was by primary intensivist management, mandatory intensivist consultation, optional intensivist consultation, or absence of any intensivist. Whether a given hospital had multidisciplinary ICU rounds was determined by a yes or no answer to the question, "Does the ICU have daily multidisciplinary ICU rounds consisting of the physician, nurse, and other health care professionals (e.g., social worker, respiratory therapist, pharmacist)?" Based on the responses, hospitals were classified into four categories: 1) low-intensity staffing without multidisciplinary care teams; 2) low-intensity staffing with multidisciplinary care teams; 3) high-intensity staffing with multidisciplinary care teams; and 4) high-intensity staffing without multidisciplinary care teams.

Altogether, 471,112 patients were admitted to ICUs in 169 Pennsylvania hospitals during the study period. Kim et al excluded 55 hospitals (135,923 patients) that did not provide complete survey data, and also, because of their small number, the two hospitals (7699 patients) in category 4 above (high-intensity staffing but no multidisciplinary care teams). Further exclusion of patients with nonmedical diagnoses left 107,324 patients in 112 hospitals as the study cohort. Of these, 54 hospitals (48%) were in category 1, 36 (32%) were in category 2, and 22 (20%) were in category 3.

There was considerable heterogeneity among the hospitals, with those in category 3 (high-intensity staffing with multidisciplinary care teams) tending to be larger, teaching hospitals caring for sicker patients with more comorbidities. Accordingly, unadjusted in-hospital mortality was highest (16.4%) in those hospitals. However, after adjusting for patient and hospital characteristics, multidisciplinary care was associated with significant reductions in the odds of death (odds ratio [OR], 0.84; 95% confidence interval [CI], 0.76-0.93; $P = 0.001$). Stratified by intensivist physician staffing, the lowest odds of death were in high-intensity units with multidisciplinary care teams (OR, 0.78; 95% CI, 0.68-0.89; $P < 0.001$), followed by ICUs with low-intensity staffing and multidisciplinary care teams (OR, 0.88; 95% CI, 0.79-0.97; $P = 0.01$), as compared to low-intensity hospitals without multidisciplinary care teams. These findings persisted with examination of different patient subgroups, including those with sepsis, the requirement for mechanical ventilation, and the greatest severity of illness.

■ COMMENTARY

Numerous studies have shown that the presence of trained intensivists is associated with improved ICU outcomes, in-

cluding mortality. This study shows that this benefit is at least in part due to multidisciplinary ICU teams in units where this model of patient care is present. That is, for medical ICU patients, all other factors being equal (e.g., primary diagnosis, severity of acute illness, and comorbidities), the likelihood of survival is better if they are managed in a unit in which the physician rounds daily with the nurse and others such as a clinical pharmacist, respiratory therapist, and/or social worker.

As the authors point out, the reasons for this association are uncertain. However, there are a number of likely explanations. Multidisciplinary rounds may reduce practice variation among individual physicians, facilitate management according to accepted best practices, and foster the implementation of evidence-based treatments (such as lung-protective ventilation for acute lung injury), the use of checklists (such as for central line insertion), and the use of protocols (such as for sedation and ventilator weaning). Pharmacist participation in rounds reduces medication errors and other drug-related adverse events. And rounding together on a daily basis undoubtedly improves communication among the different members of the ICU team.

Although the continuous presence of a trained intensivist is accepted as an ideal for ICU care, fewer than half of all units in the United States currently have such staffing. The present study demonstrates that, regardless of whether the high-intensity intensivist staffing model is in effect, daily multidisciplinary care rounds are associated with better patient outcomes. It thus suggests that implementing multidisciplinary ICU care could reduce mortality in units that do not currently use it. ■

Frail Elderly and Cardiac Surgery

ABSTRACT & COMMENTARY

By Michael H. Crawford, MD

Dr. Crawford is Professor of Medicine, Chief of Cardiology, University of California, San Francisco

Dr. Crawford is on the speaker's bureau for Pfizer.

This article originally appeared in the May 2010 Clinical Cardiology Alert. *It was peer reviewed by Ethan Weiss, MD. Dr. Weiss is Assistant Professor of Medicine, Division of Cardiology and CVRI, University of California, San Francisco.*

Dr. Weiss reports no financial relationships relevant to this field of study.

Source: Lee DH, et al. Frail patients are at increased risk for mortality and prolonged institutional care after cardiac surgery. *Circulation*. 2010;121:973-978.

Although age is a risk factor for morbidity and mortality with cardiac surgery, chronologic age does not always reflect biological age. Although frailty has been shown to predict falls, hospitalization, institutionalization, and mortality in geriatric populations in the community, it has not been systematically studied in patients undergoing surgery. Thus, these investigators from Canada identified 157 frail patients undergoing cardiac surgery. Frailty was defined as having one of the following three characteristics: lack of independence in activities of daily living (64 patients), impaired ambulation (124), and dementia (22). The frail patients represented 4% of those undergoing cardiac surgery. On average, frail patients were older than non-frail patients, although the age ranges were similar (71 years, 61-78 vs. 66 years, 57-74 years). Frail patients were more likely to be female and have more comorbidities, which increases the risk of surgery. Logistic regression analysis showed that frailty was an independent predictor of in-hospital and two-year mortality (OR = 1.8 and 1.5) and discharge to an institution (OR = 6.3). The authors concluded that an assessment of frailty improves preoperative risk assessment in cardiac surgery and should be considered in decisions regarding processes of care.

■ COMMENTARY

As the U.S. population becomes increasingly older, frailty has emerged as a condition that impacts prognosis in general surgery and other procedures, but this is the first report of its impact on cardiac-surgery outcomes. There is no accepted definition of frailty, but most clinicians would liken it to art—"I know it when I see it." These investigators described it as a biologically reduced resistance to stress that is characterized by decreased activity, poor endurance, and the need for help in activities of daily living (dependence). They included dementia as a criterion because of other data showing that it impacts outcomes and leads to reduced activity and dependence.

They set a low bar for frailty, requiring only one of three factors: impaired ambulation, dependence, and dementia. Yet, they showed that frailty, by this definition, independently predicted mortality and discharge to an institution rather than home. Interestingly, the majority of patients classified as frail met the criterion of impaired ambulation, which is not infrequent. Although frail patients were older on average, the influence of frailty was independent of age. Several factors are independent predictors of mortality post-cardiac surgery, but only three had higher odds ratios than frailty (OR = 1.8): urgent surgery (OR = 5.1), renal failure (OR = 2.3), and congestive heart failure (OR = 2.2). In the prediction of need for institutionalization, frailty had the highest OR (6.3), followed by urgent surgery (4.5). Other factors had ORs of 2.0 or less.

These findings have implications for the management of patients being considered for cardiac surgery. The consent process should include this additional risk, since it is not accounted for in the STS or Euroscore risk models that are often used. Also, frail patients should be strongly considered for other management strategies rather than traditional cardiac surgery. ■

CME Questions

30. *True or False?* **In the case series of septic patients admitted from the ED by Heffner et al, the majority of patients with sepsis had positive blood cultures.**

a. True

b. False

31. According to the study by Jaber et al, the use of an intubation management bundle comprised of 10 interventions led to:

a. a lower incidence of severe hypoxemia during intubation events.

b. a shorter incidence during mechanical ventaliation.

c. improved survival.

d. a decreased incidence of esophageal intubation.

32. Based on the recent study by Kim et al on ICU staffing models:

a. multidisciplinary ICU rounds were not shown to be beneficial.

b. multidisciplinary ICU rounds were only beneficial in ICUs with high-intensity (intensivist) staffing models.

c. multidisciplinary ICU rounds were not beneficial in ICUs with low-intensity (non-intensivist) staffing models.

d. multidisciplinary ICU rounds were associated with lower odds of death, regardless of physician staffing model.

Answers: 30. (b); 31. (a); 32. (d)

CME / Objectives

Upon completion of this educational activity, participants should be able to:

- discuss pertinent safety, infection control and quality improvement practices;
- explain diagnosis and treatment of acute illness in the hospital setting; and
- discuss current data on diagnostic and therapeutic modalities for common inpatient problems. ■