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Critical Review

Journal Scan

Comments by International Reviewers

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Infection Risk From Femoral vs Jugular Venous Catheters

Critical Care Medicine - December 30, 2013 - Vol. 19 - No. 8

Femoral venous catheters may carry the same risk of infection as jugular venous catheters in critically ill patients.

Article Reviewed

Jugular Versus Femoral Short-Term Catheterization and Risk of Infection in ICU Patients: Causal Analysis of 2 Randomized Trials. Timsit JF, Bouadma L, et al: Am J Respir Crit Care Med; 2013;188 (November 15): 1232-1239.

Objective

To evaluate the risk of infection and catheter-tip colonization with femoral versus internal jugular central venous catheters.

Design

Secondary analysis from 2 previous studies designed to assess the effect of chlorhexidine-impregnated dressings on the incidence of catheter-related bloodstream infections (CR-BSI).

Methods

Both studies enrolled ICU patients from hospitals in France. The present study analyzed data only from internal jugular and femoral vein sites. Catheters were managed via a protocol similar to that of Centers for Disease Control guidelines for catheter maintenance. Catheters were removed when no longer needed or if CR-BSI was suspected. Catheter-tip culture was performed with a quantitative culture technique. Insertion-site skin colonization was assessed semiquantitatively by pressing an agar-coated, chlorhexidine-neutralizing plate to the skin. If a CR-BSI was suspected, peripheral blood cultures were obtained. A special blinded committee classified the event as a CR-BSI or colonization. A Cox model for clustered data was constructed to determine the effect of catheter site on colonization and CR-BSI.

Results

2128 patients involving 2527 catheters and 19,481 catheter-days were analyzed (55.4% femoral, 44.6% internal jugular). Patients with femoral catheters were sicker, and median time of catheter duration was longer (7 vs 5 days). There was no difference in CR-BSI. Catheter colonization was not different between the femoral and internal jugular vein sites overall, although there was an increase in femoral site colonization after the fourth day. There was a decrease in colonization for females at the internal jugular site. Dressing disruptions were higher at the femoral site. Skin colonization at catheter removal was higher at the internal jugular vein site. There was no difference between sites when impregnated dressings were used.

Conclusions

Internal jugular and femoral central venous catheters carry a similar risk of CR-BSI and skin colonization.

Reviewer's Comments

The subclavian site is clearly preferred for central venous access, but fewer than half of ICU patients receive subclavian catheters because of either real or perceived disadvantages (risk of pneumothorax, bleeding, etc). We are often forced to choose "the lesser of 2 evils," namely, internal jugular or femoral. There are a number of factors that must be weighed in this decision, and risk of infection is high on the list. The present study suggests that infectious risk may be similar between the sites, especially if the catheter remains in place <5 days. Use of chlorhexidine-impregnated dressings may also reduce skin colonization and, perhaps ultimately, infection. The overall rate of infection in this study was low (0.8%), so it may have been underpowered

to detect a difference. This study did not assess the risks of other complications with the femoral site (reduced mobility, deep venous thrombosis), so it must be interpreted in the broader context of site selection.(Reviewer–Brian T. Garibaldi, MD).

The Bad Blood of Transfusion Medicine

Critical Care Medicine - December 30, 2013 - Vol. 19 - No. 8

A restrictive, compared to a more liberal, transfusion strategy has been shown to decrease the number of blood transfusions in elderly mechanically ventilated patients without worsening clinical outcomes.

Article Reviewed

Restrictive Versus Liberal Transfusion Strategies for Older Mechanically Ventilated Critically Ill Patients: A Randomized Pilot Trial. Walsh TS, Boyd JA, et al: Crit Care Med; 2013;41 (October): 2354-2363.

Background

A restrictive transfusion strategy improves outcomes in critically ill patients, but elderly patients with respiratory failure may need extra oxygen-carrying capacity to supply adequate oxygen to their tissues.

Objective

To compare the effect of a restrictive versus liberal transfusion strategy on outcomes in elderly critically ill ventilated patients.

Design

Open-label randomized trial.

Participants

100 patients in 6 ICUs aged >55 years already ventilated for >4 days, needing at least another 24 hours of ventilation, and having a hemoglobin (Hgb) <9.0 g/dL.

Methods

The primary endpoint was difference in Hgb levels between groups. Clinical outcomes, such as mortality and ventilator-free days, were secondary outcomes.

Interventions

Patients in the liberal arm received single-unit transfusions when their Hgb fell <9.0 g/dL with a target of 9.0 g/dL to 11.0 g/dL compared to a transfusion threshold of 7.0 g/dL and a goal of 7.0 g/dL to 9.0 g/dL for the restrictive group. The strategy was continued for the longer of either 14 days or ICU discharge. With significant bleeding, clinicians could transfuse as clinically indicated.

Results

Almost one-third of the patients had ischemic heart disease and two-thirds had already received at least 1 transfusion prior to enrollment. The restrictive group received a median of 1 less unit of red-blood cell (RBC) transfused (2 units vs 3 units; P =0.002), with 9% fewer patients receiving a transfusion (40% vs 49%). The mean Hgb was almost 1.5 g/dL higher in the liberal strategy group (9.6 g/dL vs 8.2 g/dL; P <0.0001). There was no difference in any of the secondary outcomes, including ICU length of stay, hospital length of stay, ventilator-free days, or change in sequential organ failure assessment score. Hospital mortality was numerically lower in the restrictive strategy group, but it was not statistically significant (19% vs 24%; relative risk, 0.76; 95% confidence interval, 0.48 to 1.2).

Conclusions

A restrictive transfusion strategy resulted in lower mean Hgb values and less transfusions but similar clinical outcomes as a more liberal transfusion strategy in older, mechanically ventilated patients.

Reviewer's Comments

Despite new blood preparation and storage techniques, the results of this study, although limited to elderly mechanically ventilated patients, are very similar to those from the Transfusion Requirements in Critical Care study, which was completed more than a decade ago. Once again, a higher transfusion threshold did not improve outcomes, and it may have worsened them. This has now been shown in general ICU patients, in patients following cardiac surgery, and in critically ill patients with upper gastrointestinal bleeds. Limitations to this study include its small size and the definition of "elderly" extending to as young

as 55 years; however, all available data indicate transfusing PRBCs to optimize oxygen delivery in all critically ill patients is not beneficial. The real advance in transfusion medicine will occur when we obtain the ability to measure the oxygen delivery and/or demand in each individual patient at the bedside. (Reviewer–Todd W. Rice, MD, MSc).

Induced Hypothermia Not Bene cial in Severe Bacterial Meningitis

Critical Care Medicine - December 30, 2013 - Vol. 19 - No. 8

Induced hypothermia for 48 hours fails to improve neurological outcomes in patients with bacterial meningitis and may worsen mortality.

Article Reviewed

Induced Hypothermia in Severe Bacterial Meningitis: A Randomized Clinical Trial. Mourvillier B, Tubach F, et al: JAMA; 2013; (October 8): epub ahead of print.

Background

The morbidity and mortality of bacterial meningitis remain high, with about 20% of patients dying and another large proportion surviving with significant neurological injury. Induced hypothermia has benefit in other conditions with global cerebral ischemia, but its effect in bacterial meningitis remains unknown.

Objective

To determine if induced hypothermia would improve the functional outcome of comatose patients with bacterial meningitis.

Design

Open-label, multicenter, randomized controlled trial.

Participants

98 adults with suspected or proven meningitis with a Glasgow Coma Scale score of < 9 from 49 ICUs in France.

Methods

The primary endpoint was Glasgow Outcome Scale score 3 months after randomization assessed by a blinded physician via telephone. Only mild or no disability was scored as a favorable outcome. Three-month mortality, hearing impairment, and muscle strength were secondary outcomes.

Interventions

Induced-hypothermia patients were cooled to 32 degrees Celsius to 34 degrees Celsius for 48 hours followed by passive rewarming. Patients in both groups were treated with appropriate antibiotics, tight glycemic control, and mean arterial pressure >70 mm Hg. A total of 87% of patients in both groups received steroids.

Results

After enrollment of 98 of a planned 276 patients, the data and safety monitoring board stopped the study due to higher mortality in the hypothermia group (51% vs 31%; P =0.04). *Streptococcus pneumoniae* was the causative agent in 77% of cases. A total of 37% of patients in the hypothermia group had shock at baseline compared to only 20% in the control group (P =0.14). Mean temperatures 24 hours after randomization were 33.3 degrees Celsius versus 37.0 degrees Celsius in the hypothermia and control groups, respectively. At 3 months, an unfavorable neurological outcome occurred in 42 of 49 patients in the hypothermia arm (86%) compared to 36 of 49 (73%) in the control (P =0.13). After multivariable adjustment, mortality remained higher in the hypothermia group at 3 months, although not statistically significant (hazards ratio, 1.76; P =0.10).

Conclusions

Induced hypothermia did not improve favorable neurological outcomes in patients with severe bacterial meningitis and may have worsened mortality.

Reviewer's Comments

Given its success in post-cardiac arrest patients, hypothermia has become an exciting treatment modality. Its use has started to spread to other disease processes, including some studies looking at its use in neurological injuries, drownings, and fulminant hepatic failure. In the not-so-distant

past, sepsis represented a relative contraindication to hypothermia, but recently this has thought to be less of an issue. This study in patients infected with bacterial meningitis demonstrated no benefit, and even potential harm, with hypothermia. The fact that patients who underwent cooling overall had worse outcomes is concerning that maybe this is sepsis related. These data demonstrate that although hypothermia may be good post-cardiac arrest, it clearly is not a panacea, and we should exercise caution implementing it in patients who are infected. (Reviewer–Todd W. Rice, MD, MSc).

Lung Ultrasound Frequently Changes Management in Mechanically Ventilated Patients

Critical Care Medicine - December 30, 2013 - Vol. 19 - No. 8

When performed for specific clinical questions or unexplained alterations in arterial blood gas results, lung ultrasound has an impact on clinical decision-making in critically ill patients receiving mechanical ventilation.

Article Reviewed

Impact of Lung Ultrasound on Clinical Decision Making in Critically Ill Patients. Xirouchaki N, Kondili E, et al: Intensive Care Med; 2013; (October 25): epub ahead of print.

Background

Lung ultrasound (LU) is a noninvasive tool that provides rapid and accurate diagnostic information in mechanically ventilated patients. The impact of this modality on medical decisions in the ICU has not been examined.

Objective

To examine the impact of LU on decision-making among critically ill patients receiving mechanical ventilation.

Design

Single-center, prospective, interventional trial.

Participants

189 mechanically ventilated patients in a combined medical-surgical ICU.

Methods

Patients were enrolled when a single operator was available and the primary physician requested LU due to unexplained alteration in arterial blood gas or suspicion of 1 of 5 specific pathologic conditions (pneumothorax, significant pleural effusion, unilateral atelectasis, pneumonia, diffuse interstitial syndrome). The LU operator reported imaging findings, but he/she did not play a role in decision-making. LU was performed using a validated protocol. The clinical yield of LU for the specific diagnosis was calculated as the percentage of studies that confidently excluded the suspected diagnosis or revealed positive findings with diagnostic implications. The primary physician labeled findings as expected or unexpected. Impact of LU on decision-making was assessed by calculating a net reclassification improvement.

Results

LU was performed 253 times in 189 patients. A total of 108 (42.7%) studies were performed due to unexplained change in blood gas and 145 (57.3%) due to a suspected pathologic condition. The net reclassification improvement was 85.6%, and management changed directly due to LU findings in 119 cases (47%). LU findings supported diagnoses not suspected by the primary physician in 53 (21%) cases.

Conclusions

LU impacts clinical decision-making when performed for specific clinical questions or unexplained alterations in arterial blood gas results in critically ill patients receiving mechanical ventilation.

Reviewer's Comments

Although prior research has demonstrated the diagnostic utility of bedside LU in critically ill patients, this study attempts to evaluate the impact of LU on medical decision-making. The high percentage of management changes reported to be due to ultrasound findings is impressive, and the frequent findings consistent with unsuspected diagnoses are very intriguing. In addition, performing

LU for 5 specific suspected diagnoses or blood-gas abnormalities is a unique characteristic of this study design, as compared to routine LU in patients with respiratory failure. The non-randomized design and uncontrolled nature of the study, however, are major limitations that cannot be overlooked. In addition, this study was performed at a single center with significant experience using LU, such that routine chest x-rays are no longer obtained in this ICU. Therefore, these results are not generalizable to other centers. Although LU is a powerful bedside tool in experienced hands, the results of this study must be taken in the context of these major limitations. (Reviewer–Jakob I. McSparron, MD).

Using Prone Positioning at High PEEP Levels

Critical Care Medicine - December 30, 2013 - Vol. 19 - No. 8

Using prone positioning at high positive end-expository pressure levels protects against marked rises in tidal hyperinflation, decreases cyclic recruitment/derecruitment, and increases alveolar recruitment.

Article Reviewed

Effects of Prone Positioning on Lung Protection in Patients With Acute Respiratory Distress Syndrome. Cornejo RA, Diaz JC, et al: Am J Respir Crit Care Med; 2013;188 (August 15): 440-448.

Background

A recent large randomized controlled trial reported that prone positioning markedly improved mortality in mechanically ventilated patients with acute respiratory distress syndrome (ARDS). The mechanisms by which this led to better outcomes is unclear.

Objective

To examine how the combination of prone positioning and positive end-expository pressure (PEEP) in mechanically ventilated patients with ARDS impacts alveolar recruitment, tidal hyperinflation, and cyclic recruitment/derecruitment.

Participants

24 adult mechanically ventilated patients (for 24 to 72 hours) who fulfilled ARDS criteria.

Methods

Measurements were obtained in both the ICU and in the CT scanner. All patients were paralyzed, deeply sedated, and underwent lung-protective ventilation (V_T=6 mL/kg). In the ICU, respiratory mechanics and oxygenation were measured after 20 minutes of ventilation at a PEEP of 5 and 15 cm H_2O. A recruitment maneuver (RM) of 45 cm H_2O was performed to standardize volume history before each change in PEEP. In the CT scanner, static images to assess alveolar recruitment were taken in both prone and supine positions at PEEP 5 and 15 and during an RM. Dynamic images (to assess tidal hyperinflation and cyclic recruitment/derecruitment) were taken both supine and prone at 5 and 15 cm H_2O PEEP. The various lung compartments were categorized by CT density, and "high recruitability" was defined as having >14% of potentially recruitable lung volume in the supine position. The sequencing of positions and PEEP levels were randomized.

Results

Raising PEEP to 15 cm H_2O in either position improved oxygenation and overall compliance while decreasing nonaerated tissue at the expense of increased tidal hyperinflation. Compared to supine, prone positioning resulted in significantly less tidal hyperinflation and nonaerated tissue at PEEP 15. The combination of prone positioning and PEEP 15 led to significantly decreased cyclic recruitment/derecruitment. In the supine position, a PEEP of 15 cm H_2O increased tidal hyperinflation significantly, and this was significantly attenuated by prone positioning. A total of 14 of 24 patients had high lung recruitability. They responded better to increasing PEEP to 15 (better compliance, less cyclic recruitment/derecruitment). For low recruitability patients, prone positioning significantly reduced nonaerated tissue.

Conclusions

Using prone positioning at high PEEP levels reduces tidal hyperinflation, decreases cyclic recruitment/derecruitment, and increases alveolar recruitment.

Reviewer's Comments

This study supplements our understanding of the physiologic effects of prone positioning on lung mechanics and ventilator-induced lung injury in ARDS patients. One criticism on ARDS trials is that patients are often very heterogeneous. In trials looking at an open lung strategy, there were concerns that the final results were negative because there was a subpopulation of PEEP-responsive patients and another group of nonresponders. Perhaps prone positioning makes these groups more homogeneous and, thus, amplifies the effects of an open lung strategy. (Reviewer–Timothy J. Scialla, MD).

Does Arterial Line Infection Rate Rival Frequency of Central Line Infection?

Critical Care Medicine - January 30, 2014 - Vol. 19 - No. 9

Arterial catheter-related bloodstream infections occur with a similar frequency to that of central venous catheter-related bloodstream infections.

Article Reviewed

Arterial Catheter-Related Bloodstream Infection: Incidence, Pathogenesis, Risk Factors and Prevention. Safdar N, O'Horo JC, Maki DG: J Hosp Infect; 2013; 85 (November): 189-195.

Background

Despite widespread arterial catheter use, limited data report the risk of arterial catheter-related bloodstream infection (CRBSI) or provide insight into its pathogenesis.

Objective

To examine the epidemiology, microbial pathogenesis, and risk factors surrounding arterial CRBSI.

Design

Prospective study.

Participants

542 patients (834 arterial catheters, 3273 catheter-days) who also participated in 2 prospective randomized trials of CRBSI prevention methods (a chlorhexidine-alcohol solution for cutaneous antisepsis or a chlorhexidine-impregnated sponge dressing).

Methods

Investigators routinely obtained quantitative cultures of insertion site skin, catheter segments, hub, and infusate at the time of catheter removal. Restriction-fragment DNA subtyping defined concordance between catheter and peripheral blood organisms. A univariate analysis explored risk factors for arterial CRBSI.

Results

109 catheters (13%) were colonized, and causative bacteremia occurred in 11 cases (1.3%; 3.4 per 1000 catheter-days). Extraluminal colonization caused 63% of CRBSIs. Univariate analysis identified duration of catheter placement >6 days as a risk factor for CRBSI (RR, 4.3; 95% CI, 1.2 to 15.6). The rate of arterial CRBSI was similar to the rate of non-cuffed central venous (CV) CRBSI in the contemporaneous randomized trials (2.7%, 5.9 per 1000 catheter-days).

Conclusions

Arterial CRBSIs occur with comparable frequency to CV CRBSIs and should be included in the differential diagnosis of sepsis or bacteremia. Extraluminal colonization is an important pathogenic mechanism of arterial CRBSI. Arterial catheters should be removed as early as possible.

Reviewer's Comments

Arterial CRBSIs may be underappreciated in the ICU. When they do occur, CRBSIs increase ICU length of stay and carry a high attributable mortality. This prospective study used rigorous microbiological methodology to determine that the risk of arterial CRBSI is on par with the risk of CV CRBSI. The authors report a point estimate for arterial CRBSI risk but do not provide a confidence interval (CI); based on their figures, a 95% CI of 0.7% to 2.4% surrounds the arterial CRBSI incidence estimate of 1.3% (modified Wald method). It should be noted that the reported risk of CV CRBSI (2.7%; 5.9 per 1000 catheter-days) is on the high end of published values. Only 11 arterial CRBSIs occurred in their sample, which precluded multivariate analysis. Their

univariate data have wide CIs and do not inform which risk factors for arterial CRBSI are most prominent other than duration of catheter placement >6 days. Their finding that extraluminal colonization caused the majority of arterial CRBSIs confirms that an alternative anatomic site should be selected when replacing arterial catheters. This article contradicts the notion that arterial catheters are an uncommon cause of bacteremia, although more robust data are still needed. Arterial catheters should be a suspected source in cases of sepsis or bacteremia without another compelling etiology and should be removed as soon as possible. (Reviewer–Benjamin D. Singer, MD).

Is It Time to Throw Away Gowns in the UCI?
Critical Care Medicine - January 30, 2014 - Vol. 19 - No. 9

Universal contact isolation does not reduce acquisition of methicillin-resistant *Staphylococcus aureus* (MRSA) or vancomycin-resistant *Enterococcus*, but it may decrease MRSA acquisition in ICUs with a high incidence of MRSA colonization.

Article Reviewed

Universal Glove and Gown Use and Acquisition of Antibiotic-Resistant Bacteria in the ICU: A Randomized Trial. Harris AD, Pineles L, et al: JAMA; 2013;310 (October 16): 1571-1580.

Background

Nosocomial infections with methicillin-resistant *Staphylococcus aureus* (MRSA) or vancomycin-resistant *Enterococcus* (VRE) are associated with poor patient outcomes and high costs of care.

Objective

To determine if universal contact isolation (UCI; gown and gloves for all patients in the ICU) reduces acquisition of MRSA and VRE colonization during an ICU stay.

Design

Cluster randomized, prospective controlled trial.

Methods

20 ICUs (medical, surgical, and medical-surgical) were compared. MRSA and VRE swabs were obtained from patients at admission and at discharge. Primary (combined) end point was acquisition of either MRSA or VRE. Secondary end points were acquisition of MRSA or VRE, a health care-associated infection (HAI), and adverse events.

Results

Use of UCI did not decrease the combined end point of acquisition of either MRSA or VRE, but it decreased rates of MRSA acquisition alone. No difference in the development of HAI was observed in either group. UCI increased the frequency of handwashing, but it decreased entry into each patient's room.

Conclusions

Despite a high compliance with UCI, routine use of gowns and gloves did not reduce the acquisition of either MRSA or VRE (as a composite end point), but it did reduce MRSA colonization (as a single end point).

Reviewer's Comments

Hospitals, regulatory agencies, and advocates for health care improvement have been searching for the magic bullet to reduce HAIs, especially those associated with resistant organisms such as VRE and MRSA. This study asks whether routine use of gowns and gloves in all patients reduces the acquisition of VRE or MRSA during an ICU stay. Routine use of gowns and gloves did not reduce acquisition of VRE or MRSA. This seems like a victory for those of us who hate donning gowns and gloves. However, UCI *did* reduce MRSA acquisition alone. While there were no differences in rates of HAIs, the study may not have been powered to detect these differences. Since intervention groups had higher baseline rates of MRSA than did control groups, this finding may more generalizable to ICUs with higher rates of admission MRSA colonization. Also, the reduction in rates of MRSA acquisition may have been related to decreased contact with providers/hour or increased compliance with hand washing, both of which might affect acquisition of MRSA as an isolated intervention. There were no cost/benefit analyses of costs associated with implementation of

UCI or patient/family/provider satisfaction analyses. These factors might also affect implementation of UCI, particularly with studies demonstrating that use of gowns and gloves increase a patient's sense of isolation. While I'd like to throw out routine use of gowns and gloves in favor of efforts aimed at increased hand washing in ICUs with modest to high rates of MRSA colonization, that move is premature. (Reviewer–Alison S. Clay, MD).

De-Escalation of Broad-Spectrum Antibiotics Decreases Mortality in Sepsis

Critical Care Medicine - January 30, 2014 - Vol. 19 - No. 9

De-escalating broad-spectrum antibiotics based on culture results decreases mortality in septic patients.

Article Reviewed

De-Escalation of Empirical Therapy Is Associated With Lower Mortality in Patients With Severe Sepsis and Septic Shock. Garnacho-Montero J, Gutiérrez-Pizarraya A, et al: Intensive Care Med; 2014;40 (January): 32-40.

Background

The Surviving Sepsis Campaign 2012 guidelines recommend empiric broad-spectrum antibiotics in the initial management of patients with severe sepsis or septic shock, and de-escalation of antibiotics to the most targeted regimen based on culture data. These recommendations are not based on robust clinical evidence, however, as randomized controlled trials have not been performed to rigorously assess their risks and benefits.

Objective

To assess the effects of de-escalating antibiotics on short- and longer-term mortality after culture results were available in patients with severe sepsis or septic shock.

Design

Prospective observational trial at a single academic medical center from 2008 to 2012.

Discussion

712 patients with severe sepsis (n=278) or septic shock (n=434) were evaluated during the 4-year study period. In total, 84 patients died before culture results were available and were excluded from analyses. Culture results were available for 76.7% of the 628 patients included in analysis. After culture results were available (on average 72 hours after admission), de-escalation of antibiotics was done for only 219 (34.9%) of patients. The respective in-hospital mortality rates for patients for whom antibiotics were de-escalated, not changed, or escalated were 27.4%, 32.6%, and 42.9% (P =0.006 for between-group differences). These differences were similar for ICU mortality and 90-day mortality. After correcting for potential confounders, de-escalation was found to be associated with decreased mortality as compared to not de-escalating antibiotic therapy (adjusted OR, 0.58; 95% confidence intervals [CI], 0.36 to 0.93). This association was also true for patients who received adequate initial empiric antibiotic therapy (403 patients), as de-escalation carried an adjusted OR of 0.54 (CI, 0.33 to 0.89). Propensity score-adjusted logistic regression corroborated these results, as the propensity score-adjusted OR for de-escalation was 0.57 (CI, 0.38 to 0.94).

Conclusions

De-escalation of antibiotics when culture results are known is safe and may result in decreased mortality for patients with severe sepsis and septic shock.

Reviewer's Comments

Overuse of broad-spectrum antibiotics increases health care costs and encourages drug resistance. However, it is unexpected that it might also kill the patients being treated. Knowledge of these adverse effects has not substantively changed practice, and overuse of broad-spectrum antibiotics remains common. Perhaps this study can lead some to change their practice and rationally de-escalate antibiotics when culture results indicate it is safe to do so. Although this study is an observational trial with risk of unmeasured confounders, it does add to the growing literature demonstrating increased mortality associated with failure to de-escalate antibiotics

in patients with severe sepsis and septic shock. Considered from a different perspective, this and other studies demonstrate that failure to de-escalate may cause harm and increase mortality in our critically ill patients with sepsis.(Reviewer–Jeremy B. Richards, MD, MA).

High Intraoperative Fluid Balance Associated With Increased Postoperative Mortality

Critical Care Medicine - January 30, 2014 - Vol. 19 - No. 9

High intraoperative fluid balance is associated with increased frequency of postoperative complications, including mortality.

Article Reviewed

The Effect of Excess Fluid Balance on the Mortality Rate of Surgical Patients: A Multicenter Prospective Study. Silva JM Jr, de Oliveira AM, et al: Crit Care; 2013;17 (December 10): R288.

Background

The optimal strategy for intraoperative fluid management is unknown. Since the type and means of administering fluids has been shown to affect outcomes in other clinical settings, determining the effects of intraoperative fluid balances on postoperative outcomes is important.

Objective

To determine the effects of intraoperative fluid balance on postoperative clinical outcomes, including organ dysfunction and mortality.

Design/Methods

This was a multicenter prospective study in 4 ICUS at 3 hospitals in Brazil. Exclusion criteria included palliative surgery, limited life expectancy, renal disease, advanced congestive heart failure (NYHA class IV heart failure or an ejection fraction of <30%), and diabetes, among others.

Results

479 patients who underwent surgery and were admitted to an ICU were enrolled in the study. Patients who died after surgery (8.7% of the cohort) had a higher intraoperative fluid balance than patients who did not die (non-survivors 1.95 L) (range of 1.4 to 3.4 L) versus survivors 1.4 L [1.0 to 1.6 L]). Not unexpectedly, patients who died were in general sicker than patients who survived, with higher ASA and SAPS-3 scores, both of which were statistically significantly higher in patients who died. In addition, patients with an intraoperative fluid balance of >2.0 L had a statistically significantly longer ICU length of stay than patients who received <2.0 L ($P<0.001$). Postoperative infectious, neurological, respiratory, and cardiovascular complications were also statistically significantly higher in patients who received >2.0 L intraoperatively. These unadjusted observations were confirmed by multivariate regression analyses, as a high intraoperative fluid balance was associated with an adjusted OR for death of 1.024 (confidence intervals, 1.007 to 1.041; $P=0.006$).

Conclusions

High intraoperative fluid balance is associated with increased mortality, increased ICU length of stay, and increased postoperative complications.

Reviewer's Comments

This study is interesting, as the authors assessed intraoperative fluid balance and not the total quantity of fluid provided during surgery. The specific calculation was the sum of crystalloids and/or colloids infused, minus urine output and estimated insensible losses (based on the type and duration of surgery performed.) Of note, estimated blood loss was explicitly not included in the determination of intraoperative fluid balance due to "variations that may occur among observers in computing blood loss." Not including estimated blood loss both makes sense (there is wide variation in this value between practitioners) and limits the study's results (massive hemorrhage would be nice to know about in considering intraoperative fluid balance.) There are other issues with this study, including the exclusion of several patient populations such as diabetics, and the universal use of colloids, as all patients received approximately 500 cc of colloids intraoperatively for unclear reasons. Acknowledging this and other

limitations, this is still an intriguing study, and further work to more rigorously characterize best practices for optimal intraoperative fluid management strategies are clearly needed.(Reviewer–Jeremy B. Richards, MD, MA).

Rapid Fingerprinting of Pathogens With Mass Spectrometry

Critical Care Medicine - January 30, 2014 - Vol. 19 - No. 9

Partnering rapid identification of pathogens by mass spectrometry with an antimicrobial stewardship team may improve clinical outcomes in bloodstream infection.

Article Reviewed

Impact of Rapid Organism Identification Via Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Combined With Antimicrobial Stewardship Team Intervention in Adult Patients With Bacteremia and Candidemia. Huang AM, Newton D, et al: Clin Infect Dis; 2013;57 (November): 1237-1245.

Background

Rapid identification of pathogens during bloodstream infection (BSI) is associated with improved patient outcomes. Emerging technologies, including mass spectrometry by matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF), have shown promise for providing accelerated pathogen identification. Antimicrobial stewardship teams (ASTs) that provide real-time advice to clinicians on positive cultures are also reported to yield better outcomes than standard laboratory reporting.

Objective

To determine whether rapid MALDI-TOF identification of pathogens, partnered with AST intervention, yields better microbiological and clinical outcomes in BSI than conventional laboratory reporting.

Design

Single-center, pre-post quasi-experimental study.

Participants

501 adult patients with bacteremia or candidemia.

Methods

Patients with BSI identified by MALDI-TOF over a 3-month period (September to November 2012) were compared to a historical control group with conventional pathogen identification from the same 3 calendar months during the previous year. Positive gram stains were reported in real-time for both groups; during the MALDI-TOF period, an AST provided real-time culture alerts and antibiotic recommendations.

Results

The MALDI-TOF with AST strategy was associated with a reduction in time to pathogen identification (55.9 vs 84.0 hours; P <0.001), as well as in time to effective (20.4 vs 30.1 hours; P =0.021) and optimal (47.3 vs 90.3 hours; P <0.001) antibiotic therapy. On univariate analysis, there were also reductions in mortality (14.5% vs 20.3%), recurrent bacteremia (2.0% vs 5.9%), and length of intensive care unit stay (8.3 vs 14.9 days).

Conclusions

MALDI-TOF mass spectrometry identification of pathogens, partnered with AST intervention, decreased time to pathogen identification and to effective antibiotic therapy, and improved clinical outcomes.

Reviewer's Comments

Similar to other emerging methods for rapid pathogen identification, such as peptide nucleic acid-fluorescence in situ hybridization (PNA-FISH) and nucleic acid microarrays, MALDI-TOF mass spectrometry shows great promise for improving microbiologic and clinical outcomes during infection. While PNA-FISH has been more extensively studied, MALDI-TOF is much less labor-intensive and allows facile identification of a much broader array of pathogens, suggesting it may be the more easily acquired technology. The findings of the present study are consistent with those of 3 prior observational studies of MALDI-TOF. It is difficult to know the relative degree to which MALDI-TOF versus AST affected outcomes in this trial; indeed

the investigators found that clinician acceptance of an AST intervention was independently associated with a trend toward reduced mortality on multivariate analysis. In addition, this non-randomized, historically controlled trial is subject to several possible biases. Nonetheless, taken together with past reports, this study strongly suggests that AST initiatives, partnered with best practices for rapid pathogen identification, should be optimized and strongly encouraged as standard of care. (Reviewer–Michael B. Fessler, MD).

Focused US Increases Diagnostic Accuracy for Acute Respiratory Symptoms

Critical Care Medicine - January 30, 2014 - Vol. 19 - No. 9

Focused ultrasonography aids in diagnosing potentially life-threatening illness in patients presenting to the emergency department.

Article Reviewed

Focused Sonography of the Heart, Lungs, and Deep Veins Identifies Missed Life-Threatening Conditions in Admitted Patients With Acute Respiratory Symptoms. Laursen CB, Sloth E, et al: Chest; 2013;144 (December 1): 1868-1875.

Background

In patients with acute but nonspecific respiratory symptoms, diagnostic accuracy is essential to quickly institute appropriate therapy. Moreover, delayed diagnosis slows therapy and worsens outcomes. Sonography might be a useful extension of the initial clinical exam in such patients.

Objective

To evaluate the ability of focused ultrasonography (US) to identify potentially life-threatening illnesses at presentation of acute respiratory illness.

Design

Prospective observational study.

Participants

Patients presenting to a single university medical center in Denmark over a 6-month period.

Methods

Emergency department (ED) patients with tachypnea, hypoxia, dyspnea, cough, and chest pain were eligible if they were aged >18 years and had focused US within 1 hour of presentation. ED physicians made a primary assessment based on routine history, physical, and diagnostic testing. Subsequently, all included patients underwent 3 US evaluations: focused assessed transthoracic echocardiography, focused lung US, and limited compression ultrasonography whose descriptions are outlined in the paper. The US exams were performed by a single investigator. Primary assessment was compared to US assessment diagnoses, and the gold standard was a chart audit after discharge.

Results

139 of 342 screened patients were included. Primary assessment yielded the correct diagnosis 59.6% of the time. Isolated focused US identified 44.3% of the correct diagnoses; however, the focused US also identified 26 patients (19%) with a predefined potentially life-threatening diagnosis that was missed on the primary assessment. In total, 73% of these potentially life-threatening diagnoses were confirmed by chart audit. The focused US was performed in 12 minutes (interquartile range, 11 to 14 minutes), and a complete exam was achieved on 96% of patients. For focused US, the positive predictive value was 76.7% and the negative predictive value was 100% in determining predefined life-threatening diagnoses.

Conclusions

Focused US of the heart, lungs, and deep veins is a fast, accurate way to determine potentially life-threatening illnesses in patients with acute respiratory illness.

Reviewer's Comments

This is another study that supports the use of ultrasonography in patients with acute illness. Although the single test does not perform as well as a primary clinical assessment, focused US was able to diagnose significant illness where recognition otherwise may have been delayed. The US test was fast to perform, but the single operator had extensive

experience. This may limit generalizability of the findings, which are critically dependent on the skill of the ultrasonographer and perhaps the lack of skill of the ED physicians. This investigation suggests that, with proper training and experience, focused US as part of a primary assessment of patients with acute respiratory illness augments diagnostic accuracy and may identify potentially life-threatening illness early. However, it was an uncontrolled and purely observational study. The conclusions are limited; US was fast and accurate. Its impact on clinical outcomes remains speculative. (Reviewer–Jeffrey B. Hoag, MD, MS).

Can We Afford ECMO?

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Extracorporeal membrane oxygenation is an extremely resource-intensive salvage therapy that remains in clinical practice without the support of good clinical evidence.

Article Reviewed

Resource Use Trends in Extracorporeal Membrane Oxygenation in Adults: An Analysis of the Nationwide Inpatient Sample 1998-2009. Maxwell BG, Powers AJ, et al: J Thorac Cardiovasc Surg; 2013;(October 31): epub ahead of print.

Background

Extracorporeal membrane oxygenation (ECMO) is a well-established but expensive salvage therapy for respiratory failure. The costs and trends in use warrant consideration.

Objective

To examine the temporal trends and costs associated with ECMO use in the U.S.

Design

Health insurance database study.

Participants

Patients receiving ECMO in the U.S. between 1998 and 2009.

Methods

The Nationwide Inpatient Sample (NIS) database was examined for trends in ECMO use over study period. The NIS provides insurance-based data on approximately 20% of all U.S. admissions.

Results

The study included 8753 admissions involving ECMO. Costs associated with ECMO increased from $109 million in 1998 to $765 million in 2009. The per-patient charges and length of stay increased over this time as well as in-hospital mortality, which rose from 33% in 1998 to 53% in 2009. These changes seemed related to changes in case-mix, a lower proportion of post-cardiomyotomy cases, and more cases involving cardiogenic shock, respiratory failure, and lung transplant. Mean post-cardiotomy hospital charges were $273,429 ± $31,361 whereas charges in the setting of heart transplant were $722,123 ± $57,494 and lung transplant were $702,973 ± $50,502. Overall in-hospital mortality associated with ECMO cases was 51% and discharges to location other than home were common at 58.6%, and were highest at 78.9% in association with lung transplantation.

Conclusions

The dramatic increase in health care expenditures associated with ECMO was not entirely attributable to increases in volume. Changes in case-mix have resulted in higher costs and worse outcomes.

Reviewer's Comments

In light of the Affordable Care Act, there is increasing attention paid to the costs of health care. The current study is timely; ECMO may be unaffordable care. Enthusiasm for ECMO as a salvage therapy for refractory lung failure surged after the controversial CESAR trial was published in 2009. It is therefore likely that the temporal trends described in this paper continued or accelerated. Currently, ECMO should be considered a very expensive therapy outside of evidence-based medicine. While potentially promising, the optimal role of ECMO remains to be determined.(Reviewer–Robert Michael Reed, MD).

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