Nasogastric vs Nasoduodenal Feeding in ICU--Information Is Mixed

**Duodenal Versus Gastric Feeding in Medical Intensive Care Unit Patients: A Prospective, Randomized, Clinical Study.**

Hsu C-W, Sun S-F, et al:

Crit Care Med 2009; 37 (June): 1866-1872

In this small, single center, randomized trial in a medical ICU, nasoduodenal feeding achieved better nutrition and led to less vomiting and VAP compared to nasogastric feeding.

**Background:** There is controversy in the literature regarding whether nasoduodenal or nasogastric feeding is more effective and provides better clinical outcome in critically ill patients in the intensive care unit (ICU).

**Objective:** To determine if nasoduodenal feedings provide better nutritional support and outcomes compared to nasogastric feedings.

**Design:** Prospective, randomized clinical trial.

**Participants/Methods:** Consecutive patients admitted to a medical ICU, who required enteral nutrition, were randomized over a 2-year period. Feeding tubes were placed by resident physicians with position confirmed by radiograph; the tubes were either nasoduodenal or nasogastric. Tube feeding was advanced per protocol with periodic evaluation of residual volumes. Blood sugars were controlled by insulin infusion.

**Results:** Over the 2-year period, a total of 121 patients were randomized to the 2 groups. Patients fed by the nasoduodenal route had higher mean caloric intake (+236 calories), higher mean protein intake, and achieved target nutrition rate sooner than those fed by the nasogastric route. Patients fed by the nasogastric route had a higher rate of vomiting (12.9% vs 1.75%; \( P = 0.01 \)) and ventilator-associated pneumonia (VAP) (24.2% vs 8.5%; \( P = 0.01 \)). There was no difference in ICU length of stay or in-hospital mortality between the 2 groups.

**Conclusions:** In this randomized-controlled trial in a medical ICU, nasoduodenal feeding achieved better nutrition and had fewer complications compared to nasogastric feeding. The authors recommend larger trials to confirm the clinical benefits and the lower VAP rates.

**Reviewer’s Comments:** The prior literature on optimal feeding tube location in critically ill patients has been mixed; 2 meta-analyses reached different conclusions. One showed no benefit to duodenal feeding, while the other revealed better nutrition and lower pneumonia rates. This study suggests that nasoduodenal feeding may be better. Yet, the trial was small, at a single center, the nutritional benefits were small (+200 calories/day), and the lower VAP rate did not impact length of ICU stay or mortality. What to do? For now, realize that nasoduodenal feeding might be better and safer, but we should not spend substantial time or resources ensuring duodenal placement before starting tube feeds; if it ends up in the duodenum with bedside placement, fantastic; if not, the nasogastric route is fine. (Reviewer-Bradley A. Sharpe, MD).

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Keywords: Enteral Feeding, Nutritional Support, VAP

Print Tag: Refer to original journal article
Background: Expert opinion dominates rate control recommendations for atrial fibrillation (AF); calcium channel blockers, β-adrenergic blockers, or digoxin are considered first-line agents. Amiodarone is often used in hospitalized settings to affect rate control.

Design/Participants: Randomized, open-label, prospective study of 150 eligible patients admitted to a Hong Kong hospital with symptomatic AF (<48 hours' duration), rapid ventricular response (pulse >120 bpm), and hemodynamic stability.

Methods: Patients were randomly assigned 1 medication (diltiazem, amiodarone, or digoxin) in a 1:1:1 distribution. The primary end point target was time to rate control (heart rate <90, sustained for ≥4 hours).

Results: No statistical difference existed between each group's demographics. Heart rate control occurred within 3 hours for the diltiazem group compared to 6 hours for the digoxin group and 7 hours for the amiodarone cohort (P <0.0001). Restoration of sinus rhythm was similar between all groups, but symptoms were better in those receiving diltiazem, and their hospitalizations were statistically shorter (3.9 days vs 4.7 days in the amiodarone and digoxin groups, respectively; P =0.023).

Conclusions: Diltiazem was superior to either digoxin or amiodarone for rate control in acute, symptomatic, AF with rapid ventricular rate.

Reviewer's Comments: In this comparison study, diltiazem offered 2 major time advantages over digoxin and amiodarone in patients with acutely symptomatic AF: (1) time-to-rate control, and (2) time to discharge. These advantages are sufficient to warrant close notice, even if the patient population (Chinese) and duration of hospitalization for AF (median hospital stay was >4 days) are dissimilar to American counterparts. The authors of this study state that the reason that they didn't proceed with comparing intravenous β-blockers to diltiazem, amiodarone, or digoxin was the potential to cause disproportionate hypotension and also that ultra-short acting forms of β-blockers, such as esmolol, may not be widely available or may be restricted to certain wards. This study would have been a lot stronger had β-blockers been included, since there is a very high rate of AF in patients with concomitant underlying coronary disease and/or heart failure in whom this drug class offers longer-term benefits. Notwithstanding, using digoxin as monotherapy for AF with rapid ventricular rate is rarely appropriate given the lack of dynamic rate control with exercise, which often predicates the concomitant use of an additional agent. Therefore, this study chose an arm (digoxin) over a different arm (β-blockers) that could have made this study a landmark. Still, this trial appears to invalidate the use of the newer antiarrhythmic, amiodarone as a first-line agent, confirming current guideline use of a calcium channel blocker in these settings. (Reviewer-Jason Persoff, MD).

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Keywords: Acute Atrial Fibrillation, Ventricular Rate Control, Diltiazem, Amiodarone, Digoxin

Print Tag: Refer to original journal article
Incidentally discovered PFOs seem to have no significant short- or long-term consequences, with no resulting benefits to closure. In fact, there may be some increased risk of perioperative stroke with their closure.

**Background:** Patent foramen ovale (PFO) has long been hypothesized to be a source of cryptogenic stroke, which has led to questions about the frequency and the indications for PFO closure.

**Objective:** To determine the frequency of closure of PFOs incidentally found during surgery and to determine the impact of elective closure on short-term and long-term mortality.

**Design/Participants:** The intraoperative TEEs of patients undergoing cardiovascular surgery at Cleveland Clinic between 1995 and 2006 were reviewed. During this time, a total of 41,578 cardiothoracic surgeries were performed and screened for a new intraoperative diagnosis of PFO by TEE.

**Methods:** The primary outcomes of perioperative stroke and all-cause in-hospital mortality were measures for all patients with an intraoperative TEE, both those who were incidentally found to have PFO and those who were not. Hospital length of stay, ICU length of stay, and time on secondary cardiopulmonary bypass were secondary measures. Differences in outcomes between those found to have PFO and those without PFO were measured, as well as the differences between those who received elective closure for PFO and those who did not. Established risk factors for stroke were included as potential confounders in propensity score analysis.

**Results:** Over the 11 years of the study, the rate of incidental diagnosis of PFO remained constant at 17%, but the rate of repair increased over time. After propensity score matching, those with newly diagnosed PFO and those who were not. Hospital length of stay, ICU length of stay, and time on secondary cardiopulmonary bypass were secondary measures. Differences in outcomes between those found to have PFO and those without PFO were measured, as well as the differences between those who received elective closure for PFO and those who did not. Established risk factors for stroke were included as potential confounders in propensity score analysis.

**Conclusions:** Incidental discovery of PFO during cardiothoracic surgery does not affect in-hospital morbidity or mortality, nor does it impact long-term survival. Surgical closure, however, may increase the risk of in-hospital stroke without an apparent effect on long-term mortality.

**Reviewer's Comments:** This article is impressive and important. Not because many of us will face the decision to close a PFO intraoperatively, but because it represents the very best of the scientific method at work. It takes a long held hypothesis based on biological plausibility (an otherwise asymptomatic PFO is a risk factor for paradoxical stroke) and uses evidence to call it into question. One can also look at this through a cost effectiveness lens. We were spending more OR time, more resources, and more money to fix something that just was not broken. (Reviewer-Michelle Mourad, MD).

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Keywords: PFOs, Closure, Elective Closure, Mortality

Print Tag: Refer to original journal article
Small improvements in HRQOL related to higher target hemoglobin levels with erythropoietin-stimulating agents for patients with chronic kidney disease may not be clinically significant.

**Background:** Erythropoietin-stimulating agents (ESAs) are often used to treat anemia associated with chronic kidney disease (CKD). One cited goal of targeting higher hemoglobin levels in treatment is to improve health-related quality of life (HRQOL). The association between hemoglobin levels and HRQOL needs to be better understood in order to balance treatment goals with safety concerns.

**Objective:** To examine the impact of target hemoglobin levels (high, >12.0 g/dL vs low/intermediate, 9.0 to 12.0 g/dL) on HRQOL in patients with CKD and anemia receiving ESAs.

**Design:** Systematic review and meta-analysis.

**Participants/Methods:** A systematic review of all randomized controlled trials (RCTs) of HRQOL for patients with CKD treated with ESAs for goal low/intermediate versus high hemoglobin levels and a meta-analysis of the impact of hemoglobin targets on Standard Form (SF)-36 scores was performed. The SF-36 is a validated 36-item questionnaire that assesses 8 HRQOL domains including physical function, physical role, pain, general health, vitality, social function, emotional role, and mental health. Eligible RCTS included ≥30 patients in each treatment group, patients ≥18 years old, with anemia and CKD (both dialysis-dependent and nondialysis dependent), use of erythropoietin (alpha and beta) or darbopoetin, a control arm, and reported HRQOL using a validated measure. The primary outcome was change from baseline HRQOL.

**Results:** Of the 231 potentially relevant studies, 11 met inclusion criteria. Trials ranged from 78 to 1432 patients, and 5 of the trials included patients undergoing dialysis. HRQOL was the primary end point in 2, and the SF-36 was used in 9 studies. Mean weighted differences in HRQOL ranged from -3.0 in the emotional role domain favoring the low/intermediate hemoglobin group to +3.2 in vitality, favoring high-goal hemoglobin. The authors found small significant improvements in 3 SF-36 domains including vitality (3.2-point increase), physical function (2.9-point increase), and general health (2.7-point increase) among patients treated with ESAs with target hemoglobin levels >12.0 g/dL; however, none of these changes was considered clinically significant (defined as a ≥5 point change for each domain).

**Conclusions:** Targeting higher hemoglobin levels in ESA treatment for patients with CKD and anemia leads to some small, statistically significant improvements in HRQOL that may not be clinically significant.

**Reviewer's Comments:** This is an important review of the available literature regarding the impact of ESA target hemoglobin levels, and it is a relevant topic for hospitalists. The authors demonstrate that available data are variably and poorly reported, and that results, while slightly confusing, are not compelling enough to change ESA treatment targets. The rationale for targeting higher hemoglobin levels in ESA use needs to be a goal other than HRQOL improvements. (Reviewer-Anneliese M. Schleyer, MD).

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Keywords: Erythropoietin, Chronic Kidney Disease, HRQOL, Anemia

Print Tag: Refer to original journal article
Utilizing band ligation rather than sclerotherapy for the initial management of variceal bleeding may decrease the risk of nonvariceal rebleed.

**Background:** Randomized controlled trials have shown nonselective beta-blockers (BB) plus isosorbide mononitrate (IsMn) to be equivalent to endoscopic variceal band ligation (EBL) for secondary prevention of variceal bleeding (VB). No studies have evaluated whether EBL improves the efficacy of BB + IsMn alone.

**Objective:** To determine whether the addition of EBL to pharmacotherapy improves clinical outcomes and whether changes in hepatic venous pressure gradient (HVPG) correlate with clinical outcomes.

**Design:** Multicenter, randomized, controlled trial.

**Participants:** 160 cirrhotic patients (18 to 75 years old) with proven VB successfully treated with vasoactive drugs, antibiotics, and endoscopy. The many exclusion criteria included pregnancy, hepatocellular carcinoma, renal failure, advanced liver disease and contraindications to BB or IsMn.

**Methods:** 78 patients were randomized to nadolol + IsMn (drug group) and 80 to nadolol + IsMn + EBL (drug + EBL group). All patients underwent sclerotherapy or EBL for control of the index bleed. Nadolol+IsMn were added in a sequential fashion and uptitrated to the maximum dose or tolerance. HVPG was measured in all subjects prior to randomization and 14 days after the addition of medications. Patients in the drug + EBL group underwent banding within 7 days, which was repeated every 10 to 14 days until eradication. Surveillance occurred at 1, 6, and 12 months post eradication and then yearly. Subjects were followed closely in the clinic and with serial ultrasounds until death, transplantation, 2 years, or study completion (mean follow-up was 14.4 months in the drug group and 15.3 months in the drug + EBL group).

**Results:** Baseline characteristics were similar between groups. Active bleeding on initial endoscopy was treated more often with sclerotherapy, found to independently predict rebleeding. In the drug + EBL group, variceal eradication occurred in 60 of the 80 patients, with recurrence in 20 of the 60 patients. There were no significant differences between the 2 groups in rate of rebleeding from any source (primary end point), severity of rebleeding (based on transfusion requirements, application of rescue therapy, or bleed-related mortality) or probability of hepatic complications. Adverse events occurred more frequently in the drug+EBL group (61% vs 32%; *P* <0.01). Patients with an HVPG <12 or a decrease of >20% with medications ("responders") rebled less frequently, confirming prior studies.

**Conclusions:** The addition of EBL to pharmacotherapy did not significantly affect recurrent bleeding or mortality and increased the risk of adverse events. These findings held true regardless of the HVPG responder status. It was hypothesized that a drug + EBL strategy incurs additional cost.

**Reviewer's Comments:** This well-done study suggests that the *either/or* approach (BB + IsMn or EBL) is preferable to an additive strategy for prevention of recurrent VB. This study does not address the benefit of ligation with BBs alone or the benefit in populations with lower medication compliance. Hospitalists may not select or perform these procedures directly, but should be familiar with this study, given the prevalence of liver disease and upper GI bleeding in the hospitalized population. (Reviewer-Jennifer Best, MD).

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Keywords: Variceal Bleeding, Upper Gastrointestinal Bleeding, Cirrhosis

Print Tag: Refer to original journal article
New Guidelines for Line Infections--Keep Them Handy

Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America.

Mermel LA, Allon M, et al:

Clin Infect Dis 2009; 49 (July 1): 1-45

Inpatient physicians should utilize this comprehensive and thorough reference when managing catheter-related bloodstream infections.

Background: The use of central lines (intravascular catheters) is increasing, and management decisions regarding removal and antibiotic therapy have become more complex.

Objective: To provide a comprehensive clinical practice guideline for the management of intravascular catheter-related infections.

Design/Methods: The literature was reviewed from January 2001 to June 2008 to update the previous Infectious Diseases Society of America (IDSA) guidelines for the management of catheter-related infections, which was published in 2001. Specific guidelines were provided for common clinical questions regarding catheter-infections and graded based on the strength of the evidence and quality of the recommendation.

Results: The article provides guidance on the management of cultures, empiric therapy, catheter removal, and organism-specific therapies for catheter-related infections. For cultures, clinicians should obtain one peripheral and one culture from the central line if possible and, ideally, would use time to positivity or quantitative cultures (better sensitivity and specificity to diagnose a true catheter infection). Vancomycin should be first-line empiric therapy for most suspected catheter-related infections. Gram-negative coverage should be added empirically in the setting of neutropenia or severe illness with sepsis, or if the patient is colonized with gram-negative pathogens. In general, catheters of all kinds should be removed in the setting of infection with Staphylococcus aureus, Pseudomonas aeruginosa, Candida species, or documented endocarditis, or if blood cultures remain positive for >72 hours despite appropriate antibiotics. For all catheter-related bloodstream infections with S. aureus, patients should have a transesophageal echocardiogram to rule out endocarditis, ideally performed 5 to 7 days after the onset of bacteremia.

Conclusions: The management of catheter-related bloodstream infections is complex, and hospitalists should use these guidelines to aid in management.

Reviewer’s Comments: These guidelines are an impressive resource that answers (as allowed by the evidence) many common and important questions faced by inpatient physicians who manage catheter-related bloodstream infection. Summarizing all the key points is not possible, but I encourage those who manage these infections to keep a copy of this available and use it often. It is the best summary and expert guidelines available on the subject. (Reviewer-Bradley A. Sharpe, MD).

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Keywords: Catheter-Related Bloodstream Infection, Staphylococcus aureus, Clinical Practice Guideline

Print Tag: Refer to original journal article
How Does Telmisartan Affect Renal Outcome?

Effect of Telmisartan on Renal Outcomes: A Randomized Trial.
Mann JFE, Schmieder RE, et al:
Ann Intern Med 2009; 151 (July 7): 1-10

In high-risk vascular, ACE-intolerant patients without proteinuria, ARBs do not improve renal outcomes compared to placebo.

Background: In patients with diabetes and nephropathy, angiotensin-receptor blockers (ARBs) decrease the rate of increase of serum creatinine and dialysis initiation, but their renal effects in patients without proteinuria is less clear.

Objective: To assess the impact of telmisartan on renal function in patients with vascular disease without microalbuminuria who are intolerant of angiotensin-converting enzyme (ACE) inhibitors.

Design: Multicenter, multinational, randomized trial. Data were collected as part of a prespecified analysis of the Telmisartan Randomised Assessment Study in ACE Intolerant Subjects with Cardiovascular Disease.

Participants/Methods: Patients aged ≥55 years with cardiovascular disease (coronary, peripheral vascular, or cerebrovascular disease) or diabetes without macroalbuminuria who were ACE intolerant were randomly assigned to receive telmisartan 80 mg/day or placebo and were followed up, on average, for almost 5 years. ARB-intolerant patients or those with heart failure or baseline serum creatinine >3.0 g/dL were excluded. The composite outcome was dialysis or doubling of creatinine. Analyses were conducted on a time-to-event basis.

Results: 5926 patients from 630 centers in 40 countries were included. Baseline characteristics were similar between groups; 28% had an estimated glomerular filtration rate (GFR) <60 mL/min per 1.73 m2. No statistically significant differences were found in the composite outcome of dialysis or creatinine doubling in the ARB versus placebo groups (1.96% vs 1.55%; HR, 1.29; P = 0.20); however, creatinine doubling was greater with telmisartan (1.9% vs 1.21%; HR, 1.59; P = 0.03), particularly in patients with normal baseline GFR. Mortality did not differ between groups (P = 0.49). Compared with placebo, telmisartan reduced the development and progression of albuminuria (32% vs 63%; P < 0.001.) Baseline GFR decreased slightly more in the telmisartan group (mean decrease, 3.20 mL/min vs 0.26; P < 0.001), with reduction occurring primarily in the first 6 weeks.

Conclusions: In high-risk vascular, ACE-intolerant patients without macroalbuminuria, telmisartan had no statistically significant effect on the composite outcome of dialysis or creatinine doubling compared to placebo. However, it increased creatinine doubling alone, the clinical significance of which is unclear.

Reviewer’s Comments: This is a well-designed, very large study with relevance for hospitalists. Study results support what is known from other trials. Since ARBs in these high-risk vascular patients did not affect the need for dialysis compared to placebo, cardiovascular benefit (not renal) should determine the decision to utilize them. Although telmisartan reduced the development of proteinuria and its progression, the implications of this as a marker for renal disease are unclear, as the GFR remained stable and changed less in both groups than might be expected with the natural history in vascular patients. Interestingly, this study was funded by the manufacturer of telmisartan. (Reviewer-Anneliese M. Schleyer, MD).

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Keywords: Angiotensin-Receptor Blockers, Dialysis, Kidney Disease, Albuminuria

Print Tag: Refer to original journal article
When aortic dissection is on the differential diagnosis list, a low D-dimer in the first 24 hours of symptom onset could help exclude dissection as a cause of chest pain.

**Background:** Quantitative D-dimer is a widely available assay that may be abnormally elevated in acute aortic dissection.

**Objective:** To evaluate the diagnostic performance of D-dimer testing in patients suspected of having aortic dissection.

**Design/Participants:** Prospective, multicenter study of 222 patients in whom the clinician had a high-enough suspicion clinically for acute aortic dissection (AAD) to order an imaging study to determine if AAD was present.

**Results:** 87 patients were confirmed to have AAD, whereas the remainder had other diagnoses (acute coronary syndrome, pulmonary embolism, or other uncertain diagnosis). In patients in whom AAD is suspected clinically, a D-dimer of <500 ng/mL carries a negative predictive value of 95% in the first 24 hours of symptoms. However, an elevated D-dimer does not delineate between disease processes (ie, pulmonary embolism vs AAD).

**Conclusions:** A quantitative D-dimer assay can rule out AAD 95% of the time when levels are <500 ng/mL in the first 24 hours of chest pain onset when the clinician has a suspicion of AAD.

**Reviewer's Comments:** AAD is a dreaded diagnosis with a high mortality and a high potential for litigation if not found early and surgically treated aggressively. Since AAD presents nonspecifically with chest pain that could be attributed to many causes, clinicians' tendencies are to treat most chest pain as cardiac in origin until proven otherwise. However, that strategy could lead to fatal consequences in patients with AAD, especially if high-dose antiplatelet and anticoagulant therapy are used early. This study, which is notable for its international patient population and prospective data gathering, nevertheless was small in number (only 220 total patients in whom AAD was clinically suspected), but apparently was statistically robust enough to use D-dimer as an exclusionary tool. In short, for patients with chest discomfort of <24 hours' duration that piques a clinician's interest as possibly being due to AAD, a low quantitative D-dimer (<500 ng/mL) is effective for excluding AAD 95% of the time. At larger institutions where CT angiography, MR angiography, and transesophageal echocardiography are available, the false-positive rate of the D-dimer test may spell much more expense than benefit. (Reviewer-Jason Persoff, MD).

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Keywords: D-Dimer, Acute Aortic Dissection

Print Tag: Refer to original journal article
Outpatient practices without a clear system for informing patients of abnormal tests are failing to communicate test results to patients.

**Background:** Failure to notify patients of abnormal test results may cause delays in care and lead to patient harm. Little is known about the frequency with which outpatient physicians fail to communicate or document communication of test results or the practice patterns that may increase this risk.

**Objective:** To understand the frequency with which abnormal test results fail to be communicated to patients or that communication is not documented appropriately in the chart. The authors examined the role of strict process for managing abnormal tests and their medical records system in a practice failure rate.

**Design:** 5434 charts of patients aged 50 to 69 years from 23 practices were reviewed for abnormal tests results. For each abnormal test that, according to the chart, did not seem to be communicated to the patient, the physicians were asked whether they had informed the patient. The physicians were also asked about their process for dealing with abnormal test results and about their health information management systems.

**Methods:** Reviewers gave the practice process a "process score" ranging from 0 to 5 according to how well it addressed optimal guidelines for dealing with abnormal test results. The physicians’ process score was then correlated with the rate of failure to inform or document informing patients of abnormal tests.

**Results:** Failure to inform or document informing patients occurred in 7.1% of cases of abnormal test results. Higher process scores were correlated with lower failure rates. Failure rates also correlated with the type of health information management systems available at that practice. Mixed paper and electronic charting systems were associated with higher failure rates than only paper (OR, 1.92; \( P = 0.03 \)) or completely electronic records (OR, 2.37; \( P = 0.007 \)). There was no measurable difference in failure rates between completely paper or completely electronic records.

**Conclusions:** A poor process for managing test results leads to lower documentation and communication of abnormal results. This has implications for both patient care and physician liability.

**Reviewer’s Comments:** Although clearly failing to communicate and document communication of abnormal tests is a problem for outpatient practices, it is likely even more common and problematic in the hospital setting. Due to multiple tests being sent at once, ailing or altered patients, absent family members, and discharge prior to the return of test results all might lead to poor communication of abnormal test results in the hospital setting. While primary care physicians are working to find “system” solutions to flag and communicate outpatient tests, hospitalists must find ways to catalog what abnormal tests are important, catalog what important tests are pending, and then find a way to reliably communicate this information to outpatient physicians. (Reviewer-Michelle Mourad, MD).

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**Keywords:** Abnormal Test Results, Patient Communication

**Print Tag:** Refer to original journal article
Watch Fluids Closely in ALI From Septic Shock

The Importance of Fluid Management in Acute Lung Injury Secondary to Septic Shock.
Murphy CV, Schramm GE, et al:
Chest 2009; 136 (July): 102-109

In patients with acute lung injury from septic shock, clinicians should achieve adequate early resuscitation but generally be more conservative with intravenous fluids later in the disease course.

Background: Acute lung injury (ALI) is a known complication of septic shock. Some evidence suggests that patients with ALI from septic shock should receive aggressive fluids early in their disease but less fluid later on.

Objective: To determine the relationship between early adequate resuscitation and conservative late fluid management in patients with ALI from septic shock.

Design: Retrospective cohort study.

Methods: From 2003 to 2006, patients from 2 academic medical centers were included if they had acute lung injury (ALI) from septic shock (using standard definitions for both). Adequate early resuscitation, following early goal-directed therapy guidelines, was defined as an initial fluid bolus of ≥20 mL/kg (approximately 1 to 2 L bolus) and achievement of a central venous pressure of ≥8 mm Hg within 6 hours. Conservative late fluid management was defined as even-to-negative fluid balance measured on at least 2 consecutive days within the first 7 days of the illness. Multivariate analyses were used to determine the influence of fluid management on outcomes.

Results: 212 patients with ALI from septic shock were included. A total of 146 patients (69%) achieved the goals for adequate early resuscitation, whereas 121 patients (57%) met the criteria for conservative late fluid management. After multivariate analysis, both failure to achieve adequate early resuscitation and failure to meet the criteria for conservative late fluid management were independently associated with an increased risk of hospital mortality (OR, 4.94 and 6.13, respectively; both $P<0.001$). Overall, hospital mortality was lowest in patients who achieved both adequate early and conservative late fluid management.

Conclusions: This retrospective cohort study from 2 academic medical centers revealed that appropriate fluid management may independently affect outcomes in patients with ALI from septic shock. These and previous data argue that, in this patient population, we must achieve early adequate resuscitation (in the first 6 hours) but then be more conservative with fluids later in the disease.

Reviewer's Comments: This reasonably well-done retrospective study adds to prior data on optimal fluid management in patients with ALI from septic shock. I am concerned about confounders that could not be controlled; for example, why were patients given more fluids up front and/or managed more conservatively later since there was not a guideline in place at the time? However, I am convinced these findings are likely real. In patients with septic shock, we should follow the evidence supporting early goal-directed therapy and be aggressive with fluids. Then, once patients with ALI and septic shock are hemodynamically stable, we should be more conservative in their fluid management, generally keeping them even or slightly dry each day. (Reviewer-Bradley A. Sharpe, MD).

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Keywords: Septic Shock, Acute Lung Injury, Fluid Management

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