With Anaphylaxis, Think Epinephrine Now, Not Later!

Emergency Department Diagnosis and Treatment of Anaphylaxis: A Practice Parameter.

Campbell RL, Li JTC, et al:

Ann Allergy Asthma Immunol 2014; 113 (December): 599-608

Steroids and anti-histamines are secondary to epinephrine when treating anaphylaxis.

**Objective:** To develop evidence-based guidelines and best practices associated with anaphylaxis.

**Discussion:** Anaphylaxis is likely if (1) acutely, there is skin/mucosal involvement and either respiratory compromise or hypotension/end-organ dysfunction; (2) rapid development of ≥2 of the following in the face of an allergen: skin/mucosal involvement, respiratory compromise, hypotension/end-organ involvement or persistent gastrointestinal symptoms; or (3) hypotension after exposure to a known allergen for that particular patient within minutes to hours. With that presumed diagnosis, the panel made the following summary statements: (1) Don't rely on the presence of shock to make the diagnosis of anaphylaxis. (Strong Recommendation; C Evidence); (2) Triage as quickly and safely as possible anyone with manifestations consistent with anaphylaxis in order to deliver epinephrine. (Strong Recommendation; C Evidence); (3) Place patient in supine position. (Moderate Recommendation; C Evidence); (4) Consider supplemental oxygen in all cases. (Moderate Recommendation; D Evidence); (5) Consider alternative diagnoses and obtain a serum tryptase level. (Moderate Recommendation; C Evidence) Tryptase is a biomarker for mast cell degranulation and can confirm diagnosis. (6) Determine whether the patient is in a high-risk category for fatal anaphylaxis in order to guide therapy and disposition. (Moderate Recommendation; B Evidence); (7) Administer epinephrine IM as initial anaphylaxis therapy in the anterolateral thigh. (Strong Recommendation; B Evidence); (8) If initial epinephrine therapy is unsuccessful, consider IV epinephrine in a monitored setting; 1:1,000,000 infusion of a 1mg (1 mL) of a 1:1000 concentration of epinephrine in 1000 mL of normal saline (NS; 1.0µg/min) and titrate from 1 to 10µg/minute; for children, 0.1µg/kg/minute is recommended; (9) IO is acceptable if an IV cannot be established. (Moderate Recommendation; D Evidence); (10) Prepare for aggressive airway management with evidence of impending airway compromise. (ie, stridor, hoarseness; moderate recommendation; C evidence); (11) With circulatory collapse, administer large volumes of NS IV/IO. (Strong Recommendation; B Evidence); (12) Administer vasopressors (glucagon in the face of beta-blockers) if epinephrine and fluids don't reverse the hypotension. (Moderate Recommendation; B Evidence); (13) Inhale beta-agonists in case there is a bronchospastic component. (Moderate Recommendation; B Evidence); (14) Consider extracorporeal membrane oxygenation should all traditional management techniques fail. (Moderate Recommendation; D Evidence); (15) Antihistamines and steroids are adjunctive therapy and should not be given prior to epinephrine. (Strong Recommendation; B Evidence); (16) Identify triggers of anaphylaxis. (Moderate Recommendation; C Evidence); (17) Observe patients for at least 4 to 8 hours, longer if risk factors are present. (Moderate Recommendation; C Evidence); (18) Prescribe auto-injectable epinephrine and instructions prior to discharge. (Strong Recommendation; C Evidence); (19) If discharged, instruct patient to see allergist. (Moderate Recommendation; C Evidence).

**Reviewer's Comments:** If the infusion mentioned above is not immediately available and there is the threat of cardiovascular collapse, consider 50 µg (0.5 mL of 1:10,000) pushed slowly, as per panel. (Reviewer-Paul P. Rega, MD, FACEP).

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Keywords: Anaphylaxis

Print Tag: Refer to original journal article
Think Syringe, Not Fingers for Reduction of Non-Traumatic TMJ Dislocation


Gorchynski J, Karabidian E, Sanchez M:


A new, no-touch technique for reduction of temporomandibular joint dislocation works best for unilateral pathology.

Background: As anyone who has done it knows, the traditional intraoral manual reduction technique for temporomandibular joint (TMJ) dislocations is time consuming, difficult, commonly requires conscious sedation, offers the potential for operator injury, and is occasionally ineffective.

Objectives: To describe a new "syringe" technique for emergency department (ED) reduction of acute nontraumatic TMJ dislocations.

Design: Prospective, non-comparative study.

Participants: 31 patients from a convenience sample population from 2 affiliated academic EDs.

Methods: All acute nontraumatic TMJ dislocations were reduced utilizing the authors' novel syringe technique. Demographics, mechanism, duration of dislocation, and reduction time were collected. The only piece of equipment required for the technique is a 5-mL or 10-mL syringe. Selection of syringe size varies with each patient, and depends upon the distance between the upper and lower molars or gums and the patient's ability to open the mouth on the affected side to accommodate the syringe size. The patient is placed in a sitting position, and the physician places the appropriate syringe between the posterior upper and lower molars or gums on the affected side. The patient is instructed to gently bite down and grasp the syringe and then asked to roll the syringe back and forth, which results in reduction of the dislocated TMJ. The syringe technique is thus a completely hands-free technique that only requires the syringe to be placed once between the posterior molars which then slide over the syringe and glide the anteriorly displaced condyle back into its normal anatomical position. Procedural sedation or intravenous analgesia is not required.

Results: The two most common mechanisms for acute TMJ dislocations were due to chewing (n=19; 61%) and yawning (n=8; 29%). Of patients, 30 had a successful reduction (97%), with the majority reduced in <1 minute (77%). The single failure was the only patient presenting with bilateral TMJ dislocations, who was unable to hold the syringe effectively. There were no recurrent dislocations at 3-day follow-up.

Conclusions: The "syringe" technique safely, quickly, and effectively reduces acute nontraumatic TMJ dislocation in the ED.

Reviewer's Comments: The technique utilizes the patients' own jaw muscle strength to glide the condyle back to its normal anatomical position without any additional external or intraoral forces applied by the physician. Some very good anatomic illustrations in this article support the logic behind this novel maneuver. Easy to remember, which is a good thing since these cases aren't the most common to come through the door. On the other hand, try not to forget that the one failure was a bilateral dislocation; most likely your fingers will always remain at risk for those! (Reviewer-Steve Abrams, MD).

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Keywords: Temporomandibular Joint, Dislocation, Syringe Technique

Print Tag: Refer to original journal article
While the ARISE study failed to show a benefit of early goal-directed therapy, it demonstrated the feasibility of early antibiotic administration for sepsis.

**Background:** Early goal-directed therapy (EGDT) for severe sepsis was enthusiastically adopted in 2001 based upon a single-center study. In 2014, the Protocolized Care for Early Septic Shock (ProCESS) study failed to confirm this benefit of EGDT across 31 U.S. emergency departments (EDs).

**Objective:** To determine the generalizability of protocolized EGDT to the treatment of septic shock.

**Design:** Multicenter, randomized controlled trial (the Australasian Resuscitation in Sepsis Evaluated study) performed in 51 centers across Australia, New Zealand, Finland, Hong Kong, and Ireland. Centers did not use sepsis protocols prior to study participation.

**Participants:** 1588 patients with sepsis and either refractory hypotension or blood lactate ≥4.0 mmol/L.

**Methods:** After antibiotics were administered, patients were randomized to either EGDT (as administered by a study team, following the 2001 Rivers EGDT protocol) or usual care for 6 hours. Primary outcome was 90-day mortality; numerous secondary outcomes were measured.

**Results:** Randomization took place a median of 2.7 to 2.8 hours after ED presentation. In the time leading up to randomization, groups received similar volumes of IV fluid (approximately 2.5 L/person in each group) and similar "door-to-antibiotic" times (mean, 70 minutes for EGDT and 67 minutes for usual care). In the 6 hours after randomization, patients in the EGDT group received slightly more IV fluid (1.96 L vs 1.71 L) and were more likely to receive vasopressors (66.6% vs 57.8%), packed red blood cell transfusions (13.6% vs 7.0%), and dobutamine (15.4% vs 2.6%); all differences \( P < 0.05 \). The EGDT group successfully reached central venous pressure, mean arterial pressure, and oxygen delivery goals 90% of the time. Despite this separation between groups, no differences in 90-day mortality (18.6% in EGDT, 18.8% in usual care) or in any other prespecified outcome (including indices of organ dysfunction) were observed.

**Conclusions:** EGDT did not improve outcomes in patients with septic shock.

**Reviewer's Comments:** This is the second multicenter study to refute the value of EGDT for sepsis. Indeed, it's tempting to gawk at the rapid fall of what was once a central tenet of critical care. However, the most interesting finding in ARISE might be what happened before patient randomization even occurred. Patients received their first dose of antibiotics within 70 minutes of ED arrival! This staggering efficiency reflects decades of improvements in ED and ICU processes of care, allowing sepsis to be both rapidly identified and emergently treated. Indeed, early antibiotics are well-known to improve sepsis survival, potentially explaining the low overall mortality of the study. So while it's tempting to discard the "Rivers Study" in 2014, we should be appreciative of the contribution of EGDT to decades of progress in administering critical care to patients.

(Reviewer-Eric P. Schmidt, MD).

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Keywords: Early Goal-Directed Therapy, Antibiotics, Processes of Care

Print Tag: Refer to original journal article
Head CT for Peripheral Vertigo Helps Physician Feel Better, Not Patient

**Missed Strokes Using Computed Tomography Imaging in Patients With Vertigo: Population-Based Cohort Study.**

Grewal K, Austin PC, et al:

Stroke 2015; 46 (January): 108-113

Head CT scan for peripheral vertigo remains a popular, yet problematic, imaging selection.

**Background:** Vertigo may be a manifestation of a posterior fossa stroke. MRI may be difficult to obtain in many emergency departments (EDs), but non-contrast head CT has been shown to be a poor choice for detecting ischemic strokes in general, and posterior fossa events in particular. Despite expert recommendations, ED utilization of CT imaging for the dizzy patient is rampant. The use of a potentially insensitive, low-yield test could result in false reassurance for the physician, while leaving the patient with missed, untreated, central cause of vertigo.

**Objective:** To determine the proportion of ED patients with a diagnosis of peripheral vertigo who received CT imaging in the ED and to examine whether strokes were missed using CT imaging.

**Design:** Population-based retrospective cohort study evaluating patients over a 5-year period.

**Participants:** 41,794 patients discharged from an ED with a diagnosis of peripheral vertigo.

**Methods:** Patients undergoing CT imaging ("exposed") were propensity-matched with patients who did not ("unexposed"). If patients were discharged from the ED, CT imaging was presumed to have been negative for a brain stem/cerebellar stroke. The authors compared incidence of stroke within 30, 90, and 365 days of ED discharge between groups in order to determine whether the exposed group had a higher frequency of early strokes versus the unexposed group.

**Results:** Among patients, 8596 (20.6%) underwent ED head CT imaging, and 99.8% of these patients were matched to a control. Among exposed patients, 25 (0.29%) were hospitalized for stroke within 30 days versus 11 (0.13%) among matched, non-exposed patients. Relative risk of a 30- and 90-day stroke for exposed versus unexposed patients was 2.27 and 1.94, respectively. There was no difference between groups at 1 year. Strokes occurred at a median of 32.0 days (interquartile range, 4.0 to 33.0 days) in exposed patients, compared with 105 days (interquartile range, 11.5 to 204.5 days) in unexposed patients.

**Conclusions:** In an ED cohort, one fifth of patients diagnosed with peripheral vertigo received imaging that is not recommended in guidelines, and that imaging was associated with missed strokes.

**Reviewer's Comments:** In other words, if the doc evaluating a dizzy patient was sufficiently worried by certain characteristics or findings to proceed to CT imaging prior to discharging the patient, then the imaging simply provided the doc with the illusion of a thorough investigation while the patient walked (or weaved) homeward to a phase of greatly increased danger. Given that 4 million people present annually with dizziness, these results suggest a huge number of potentially missed events. Until hospitals system-wide prioritize vertigo patients for expedited MRI, EM physicians will continue to use an insensitive test because it is the only test easily obtained in the ED. (Reviewer-Steven B. Abrams, MD).

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Keywords: Vertigo, Cerebrovascular Disease, Stroke, Posterior Fossa, Diagnostic Imaging

Print Tag: Refer to original journal article
How Deadly Is Angioedema and Is It Getting Deadlier?

Kim SJ, Brooks JC, et al:
Ann Allergy Asthma Immunol 2014; 113 (December): 630-634

There is documentation that indicates the annual number of emergency department visits for angioedema in the United States is >108,000.

Background: Angioedema (AE) is a condition characterized by rapid-onset swelling of various parts of the body -- from genitalia to throat. It can be hereditary (HAE) or acquired (AAE) and the specific condition that is of major cause for concern is when the swelling precipitates acute airway obstruction. While the frequency of both etiologies may be considered low, there has been an increase in the number of cases regardless of the cause. There is documentation that indicates the annual number of ED visits for angioedema in the U.S. is >108,000.

Objective: To assess the number of deaths in the U.S. due to angioedema and correlate it with various demographic data.

Design: Retrospective analysis of 5758 deaths in which angioedema was listed as a contributing cause from 1979 to 2010.

Methods: All U.S. death certificates (1979 to 2010) were analyzed in order to identify all cases where angioedema was a contributing cause. Results were analyzed in the context age, sex, and race.

Results: While the age-adjusted death rate for HAE decreased 0.28/1,000,000 persons annually to 0.06/1,000,000, the death rate from general angioedema jumped from 0.24 (95% CI, 0.21 to 0.27) to 0.34 (95% CI, 0.31 to 0.37). Most HAE deaths occurred as hospital in-patients and death rates increased with patient age. Over the study period, there were only 136 death certificates (8%) where a drug was related to the angioedema. Of deaths where angioedema was associated with angiotensin-converting enzyme (ACE) inhibitors (n=18), African-Americans constituted 55%. For non-specific, general angioedema-related deaths, 21% were discovered in an outpatient setting, in an ED, or were dead on arrival. Of cases, 18 were directly attributed to ACE inhibitors.

Conclusions: Angioedema-associated deaths are rare. However, while the incidence of all types of angioedema-deaths is getting lower, the incidence of non-HAE angioedema deaths is increasing and may be attributable to ACE inhibitors usage.

Reviewer’s Comments: The number of deaths attributed to angioedema may be notoriously unreliable since the Centers for Disease Control coding rules don’t recognize this condition as a valid cause of death. In any case, I’d like to see current data about angioedema deaths in the ED. My guess is that many clinicians do not recognize the difference between routine allergic-type angioedema that can be treated with epinephrine, steroids, etc. versus angioedema associated ACE inhibitors (bradykinin-related). (Reviewer-Paul P. Rega, MD, FACEP).

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Keywords: Angioedema, Hereditary, Acquired

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What to Make of Troponin Levels in Patients With CKD

Role of Troponin in Patients With Chronic Kidney Disease and Suspected Acute Coronary Syndrome: A Systematic Review.

Stacy SR, Suarez-Cuervo C, et al:

Ann Intern Med 2014; 161 (October 7): 502-512

For patients with chronic kidney disease, usefulness of troponin levels in evaluation of acute coronary syndrome is limited by widely ranging sensitivity and specificity but can aid in prognosis.

Background: In patients with chronic kidney disease (CKD), troponin levels are frequently elevated making interpretation of these biomarkers in the setting of possible acute coronary syndrome (ACS) particularly challenging.

Objective: To assess the role of troponin in patients with CKD in the diagnosis of ACS and its impact on subsequent management and prognosis.

Design: Systematic review through May 2014.

Methods: Multiple databases were queried for peer-reviewed studies that investigated troponin in patients with CKD and either suspected or confirmed ACS. When the outcome was focused on management or prognosis, included studies were required to have direct comparisons between patients with normal and elevated troponin levels. Primary outcome of interest was sensitivity, specificity, and predictive values for the diagnosis of ACS. There was also interest in the impact of troponin levels on management decisions and important clinical outcomes, including mortality and major adverse cardiovascular events.

Results: 23 studies met inclusion criteria; 14 reported on the diagnostic performance of troponin measure, and 12 reported on the prognostic value of elevated troponin. There were significant differences in individual studies, including size (range, 31 to >31,000 patients), troponin assay used (troponinT [TnT] vs troponin I [TnI]), and severity of CKD (ranging from inclusion of CKD 1 to dialysis patients). In addition, the definition of ACS was not standardized, making for a complex analysis. When used in the diagnosis of ACS, sensitivity for TnT ranged from 71% to 100% and from 43% to 94% for TnI. Specificity was not any better, (31% to 86% for TnT and 48% to 100% for TnI). In addition, changes in troponin level did not accurately identify those patients with ACS. There were no relevant studies that examined the impact troponin had on management. Troponin did seem to have some prognostic value, with elevated levels associated with increased short-term mortality and cardiovascular events.

Conclusions: In patients with CKD, the usefulness of troponin in the evaluation of ACS is limited by widely ranging sensitivity and specificity but can aid in prognosis.

Reviewer’s Comments: Every day in hospitals around the world, we struggle with determining the importance of an elevated troponin level. This is especially true in patients with CKD. Unfortunately, this systematic review of relevant trials does not really help us very much. As the sensitivity and specificity from different studies have such a wide range, one cannot be confident in either ruling in or ruling out ACS in patients with CKD with troponin alone. The one thing we can be relatively sure of is that an elevated troponin level is a modest predictor of more problems to come, but does not really direct us on how to avoid them. (Reviewer-Mark E. Pasanen, MD, FACP).

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Keywords: Troponin, Biomarker, Chronic Kidney Disease, Renal Failure, Acute Coronary Syndrome

Print Tag: Refer to original journal article
1 of 5 ED Patients Treading Elective Cholecystectomy Path Walks in Circles

Success of Elective Cholecystectomy Treatment Plans After Emergency Department Visit.

Bingener J, Thomsen KM, et al:


Referral for elective cholecystectomy is frequently thwarted by emergent rehospitalization.

**Background:** For the many patients presenting to the emergency department (ED) with abdominal pain and symptoms suggestive of biliary disease, differentiation between those presenting emergently with acute cholecystitis versus those with severe biliary colic can be challenging. Patients discharged to outpatient follow-up from the ED with presumed colic or actual undiagnosed acute cholecystitis may suffer additional pain and repeat ED visits until definitive surgical therapy, all of which is resource intensive and may increase morbidity.

**Objective:** To better characterize which patients are at risk of failing the treatment pathway to elective cholecystectomy after ED discharge for biliary tract disease.

**Design:** Retrospective review.

**Methods:** Patients who were discharged from the ED and underwent elective cholecystectomy without an interval re-presentation to the ED were compared with those who were discharged and returned to the ED within 30 days.

**Results:** 9291 patients with evaluable records undergoing cholecystectomy presented at this medical center over the study interval. Of these, 3138 patients (34%) presented to the ED within 30 days before surgery; among this group, 1625 patients were directly admitted from the ED for urgent cholecystectomy and 1513 patients were discharged after the ED visit. Patients who were discharged after the ED visit were younger (mean age 49 vs 54 years, \( P < 0.001 \)), had shorter ED length of stay (mean 5.9 vs 7.2 hours, \( P < 0.001 \)), lower white blood cell (WBC) count (mean [SD] WBC 9.3 [3.4] vs 11.1 [4.6]; 35% vs 54% with leukocytes \( \geq 10 \), \( P < 0.001 \)), lower neutrophil count (40% vs 61% with neutrophils \( \geq 7 \), \( P < 0.001 \)), lower pulse rates (28% vs 34% with pulse \( \geq 90 \), \( P < 0.001 \)), and lower temperature (8% vs 15% with temperature \( \geq 37.5^\circ C \), \( P < 0.001 \)) than patients admitted immediately. Of 1513 patients who were discharged from the ED, 467 (31%) experienced \( \geq 1 \) return ED visits, and 303 (20%) were admitted from 1 of the repeat visits: 256 after the second visit, 39 after the third visit, and 8 after \( \geq 4 \) visits within 30 days before cholecystectomy. Of discharged patients, 164 (11%) continued on the elective cholecystectomy pathway despite repeat ED visits.

**Conclusions:** 1 in 5 patients failed the elective cholecystectomy pathway after ED discharge, leading to additional patient distress and use of resources; further risk factor assessment may help design efficient care pathways.

**Reviewer's Comments:** System failure. The best thing, the most economical thing, the safest thing with these patients is to bring them in and operate. Surgeons put too much reliance on sonography, with cholelithiasis trumping cholecystitis and leading to discharge as "colic" time after time, even though the negative predictive value of sonogram is well established to be poor. (Reviewer-Steven B. Abrams, MD).

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Keywords: Cholecystectomy, Cholecystitis, Biliary Tract Disease, Utilization

Print Tag: Refer to original journal article
Continuous aerosolized albuterol can be delivered safely and effectively in non-intensive care unit settings.

**Background:** Continuous aerosolized albuterol (CAA) is effective in the pediatric population who present with an acute asthma exacerbation. The question that has not been sufficiently answered is whether other areas in the hospital may also be appropriate settings for CAA administration.

**Objective:** To evaluate the use of CAA in a non-intensive care unit (ICU) setting.

**Design:** Retrospective analysis from July 2011 to June 2013 of 3003 patients who met study criteria.

**Methods:** 1298 patients (43%) received CAA. Children were aged 2 to 18 years. Those who presented with an acute episode of asthma received standard therapy including steroids and 1 hour of CAA and ipratropium bromide. They also may have received IV magnesium sulfate and additional therapies. With stabilization, the study cohort was transferred to a non-ICU setting to receive CAA and continuous monitoring (systemic steroids, hourly assessments, and 1:4 nursing). CAA dosing consisted of 7.5 mg/hour (5 to 10 kg body weight); 11.25 mg/hour (10 to 20 kg body weight); 15 mg/hour (>20 kg body weight). Outcomes studied included duration of CAA therapy, percentage of clinical deterioration while on CAA, complication rate (eg, arrhythmia and hypokalemia), and any factors associated with clinical deterioration or prolonged CAA (>24 hours).

**Results:** Initiation of CAA was statistically more likely ($P < 0.001$) in those patients with the following characteristics: older age, black race, lower initial oxygen saturation, and higher initial age-standardized heart and respiratory rates. Median duration of CAA was 14.4 hours. Within the study group, 26% (n=340) required CAA for >24 hours. Among this CAA population, 5% deteriorated (n=70), and 3% had hypokalemia or an arrhythmia (n=33). Of those that deteriorated clinically, 53 required an ICU admission, 49 received enhanced respiratory support (but no intubations), or both (n=32). Those who presented with comorbid pneumonia or received IV magnesium or subcutaneous terbutaline in the emergency department were more likely to receive prolonged therapy and deteriorate clinically.

**Conclusions:** CAA can be delivered safely and effectively in non-ICU settings and there are certain clinical and demographic data that may identify specific patient populations who may require more intensive therapy in an ICU setting.

**Reviewer's Comments:** This study helps the emergency physician in triaging which patients on CAA would be better managed in an ICU and which ones may do quite well in a non-ICU setting. (Reviewer-Paul P. Rega, MD, FACEP).
Is There a Golden Hour in Septic Shock Resuscitation Tarnished by Vasopressors?

Waechter J, Kumar A, et al:

Crit Care Med 2014; 42 (October): 2158-2168

The early initiation of vasoactive drugs may worsen outcome in septic shock, even if concurrent with early, aggressive fluid resuscitation.

**Background:** Fluids and vasoactive agents are both used to treat septic shock, but little is known about how they interact or the optimal sequence for administration.

**Objective:** To determine how hospital mortality is influenced by the interaction of fluids and pressors.

**Design:** Retrospective review.

**Methods:** The authors employed multivariate logistic regression and adjusted for potential confounders in order to evaluate the association between hospital mortality and selected variables representing the initiation of vasoactive agents and volumes of IV fluids administered at 0 to 1, 1 to 6, and 6 to 24 hours after onset. The study was an international endeavor set in the intensive care units of 24 hospitals in 3 countries.

**Results:** The study evaluated records from 2849 patients who survived >24 hours after onset of septic shock, admitted between 1989 and 2007. Fluids and pressors had strong, statistically significant, interacting associations with mortality ($P<0.0001$). Mortality was lowest when pressors were begun 1 to 6 hours after onset in patients receiving >1.0 L of fluids in the initial hour after shock onset, >2.4 L in hours 1 to 6, and 1.6 to 3.5 L in hours 6 through 24. On average, less fluid was given early if vasoactive drugs were begun within the first hour, possibly due to higher blood pressures achieved with pressors leading clinicians to give less fluids; in addition, pharmacologic vasoconstriction in the presence of absolute or relative hypovolemia could further impair organ perfusion, contributing to increased mortality. However, even higher fluid volume categories co-administered with vasoactive support begun in the first hour after onset was associated with significantly higher hospital mortality (46.0% vs 24.7%, $P<0.0001$). Thus, even with optimal (high) early fluid volumes, very early initiation of vasoactive drugs was associated with worse outcome.

**Conclusions:** The focus during the first hour of resuscitation for septic shock should be aggressive fluid administration in preference to early administration of vasoactive agents; starting vasoactive agents in the first hour may be detrimental, and not all of this adverse association results from less fluid being given as a consequence of early initiation of vasoactive agents.

**Reviewer’s Comments:** Have these authors identified a new “golden hour?” There is a reason why it's called "fluid resuscitation" and not "vasoactive-chemical-titrated-to-blood-pressure-resuscitation." I’d think this is old news in emergency departments. I’ll always point out to the medical residents that a can of soda is about 350 ccs, and that it's not a particularly good idea to give patients the equivalent of one can every 2 hours as part of an inept "aggressive" strategy. One well-taken point here is to remember to keep the fluids pouring in once the pressors are up, and not dial it down. (Reviewer-Steve B. Abrams, MD).

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Keywords: Sepsis, Septic Shock, Fluid Resuscitation, Vasopressor Therapy

Print Tag: Refer to original journal article
Is PEG More Effective Than Lactulose for Hepatic Encephalopathy?

Lactulose vs Polyethylene Glycol 3350-Electrolyte Solution for Treatment of Overt Hepatic Encephalopathy: The HELP Randomized Clinical Trial.
Rahimi RS, Singal AG, et al:


Polyethylene glycol improves hepatic encephalopathy despite minimal effects on serum ammonia.

**Background:** Hepatic encephalopathy (HE), while a common problem in the ICU, remains poorly understood. Lactulose (titrated to several bowel movements per day) is often employed as a treatment for HE, with the intent to decrease ammonia production by gut bacteria. However, even before recognition of the effectiveness of lactulose, other laxatives were successfully used to treat HE, which raises the question of whether lactulose's effectiveness arises from its effects on ammonia or its function as a cathartic.

**Objective:** To compare lactulose with another cathartic (polyethylene glycol 3350-electrolyte solution [PEG]) as a treatment for HE.

**Design:** Single-center, randomized study performed at Parkland Memorial Hospital in Dallas, Texas.

**Participants:** 50 patients with cirrhosis and admitted for acute HE were included. Exclusion criteria included hemodynamic instability or previous treatment with rifaximin.

**Methods:** All patients were allowed to have (per clinician discretion) a single dose of lactulose prior to study enrollment. Patients were randomized to a 24-hour treatment with lactulose (20 to 30 grams oral/NG or 200 grams rectally, 3 doses) or PEG (4 L one-time oral or NG dose). At 0 and 24 hours, HE severity was graded according to a validated Hepatic Encephalopathy Scoring Algorithm (HESA). Serial ammonia levels were measured. Patients were then followed to determine time to HE resolution.

**Results:** Both regimens were tolerated well, with no differences in NG tube placement between groups. The lactulose group had a significant (53%) drop in serum ammonia at 24 hours, while there was only a mild (18%) change in the PEG group. Surprisingly, the PEG group had significantly better outcomes, with improved HESA scores at 24 hours and a 1-day earlier resolution of HE. Patients generally favored the PEG treatment, often preferring its "salty" taste over the "sweet" taste of lactulose.

**Conclusions:** PEG treatment was superior to lactulose treatment for the management of acute HE.

**Reviewer's Comments:** While it's often taught that ammonia is a key contributor to HE pathogenesis, the data supporting this are in fact very limited. As PEG improved outcomes without substantially changing ammonia levels, it seems that lactulose's cathartic qualities may be more important than any ability to affect ammoniagenesis. While this study is thought-provoking, there are several limitations. This is a study of acute, inpatient HE management; indeed, the daily use of 4L of PEG as a treatment of chronic HE would be problematic. Furthermore, the generalizability of this single-center study is unknown. Regardless, this paper serves to remind us how little we truly understand about HE. (Reviewer-Eric P. Schmidt, MD).

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Keywords: Cirrhosis, Overt Hepatic Encephalopathy, Treatment, Lactulose

Print Tag: Refer to original journal article
Nontraumatic Thoracic Aortic Dissection Rare, Thus Physicians Left Unguided

Diercks DB, Promes SB, et al:
Ann Emerg Med 2015; 65 (January): 32-42.e12

Physicians remain mostly unguided navigating between the risks of missing the diagnosis and the burden of over-testing for a clinical rarity.

**Background:** Thoracic aortic dissection is one of the most catastrophic and highly lethal cardiovascular diseases encountered in the emergency department. Being relatively rare, acute aortic dissection is a difficult disease to diagnose because of the absence of a good evidence base upon which to formulate recommendations.

**Objective:** To describe a clinical policy from the American College of Emergency Physicians addressing 5 key clinical questions in the evaluation and management of patients with suspected acute nontraumatic thoracic aortic dissection, offering evidence-based recommendations.

**Design:** Systematic review of the literature. **Discussion:** Question 1: In adult patients with suspected acute nontraumatic thoracic aortic dissection, are there clinical decision rules that identify a group of patients at very low risk for the diagnosis of thoracic aortic dissection? Answer: No. There are no topline (Level A or B) recommendations. For level C, the physician is encouraged not to use existing clinical decision rules alone. The normal chest radiograph in particular is cited as unsupported in the literature for offering any useful negative-predictive value, especially in isolation. The decision to pursue further workup for acute nontraumatic aortic dissection should be at the discretion of the treating physician. Question 2: In adult patients with suspected acute nontraumatic thoracic aortic dissection, is a negative serum D-dimer sufficient to identify a group of patients at very low risk for the diagnosis of thoracic aortic dissection? Answer: Absolutely not. A number of conditions in patients with a proven thoracic aortic dissection may result in a low or false-negative D-dimer value: chronicity, time from symptom onset, presence of thrombosis or intramural hematoma, short length of dissection, and young age of patient. Question 3: Is the diagnostic accuracy of a CT angiogram at least equivalent to transesophageal echocardiogram or magnetic resonance angiogram to exclude the diagnosis of thoracic aortic dissection? Answer: Indeed it is, with a firm level B recommendation. Question 4: Does an abnormal bedside transthoracic echocardiogram (TTE) establish the diagnosis of thoracic aortic dissection? Answer: Level B - it does not, but Level C cautions thusly - if TTE does suggest dissection, obtain immediate surgical consultation or transfer to a higher level of care. Bottom line is no help if negative. Question 5: Does targeted heart rate and blood pressure lowering reduce morbidity or mortality? Answer: No downside to reducing blood pressure and pulse if elevated, but there are no specific targets that have demonstrated a reduction in morbidity and mortality.

**Conclusions:** The rarity of thoracic aortic dissection is reflected in a paucity of high-level evidence upon which to base recommendations.

**Reviewer's Comments:** We continue to tread a fine line between the significant risks of missing the diagnosis and the considerable clinical and financial burden of over-testing for an uncommon condition. (Reviewer- Steven B. Abrams, MD).

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Keywords: Thoracic Aortic Dissection, Aortic Disease, Transthoracic Echocardiogram, D-Dimer

Print Tag: Refer to original journal article
In both adults and children, a 3-position scanning algorithm improves the visualization of the appendix on US as compared to CT.

**Background:** When evaluating for acute appendicitis, the most notable advantage of using graded-compression sonography rather than CT is its lack of ionizing radiation, especially for younger patients. However, the ability to detect the appendix via US is decreased when compared with CT. In North America, studies have shown the ability to detect the appendix varies greatly, especially when a patient does not have appendicitis. Sonographic scanning in the coronal plane in the left posterior oblique (LPO) position has been shown to be helpful in locating a retrocecal appendix. Routinely adding the LPO position scan may be beneficial when evaluating the appendix since a retrocecal appendix is found in 25% to 65% of patients. Additionally, a new acoustic window may be created by rescanning a patient in the supine position after LPO scanning (a "second-look" supine scan).

**Objective:** To determine the effectiveness of graded-compression sonography by using a 3-step algorithm in evaluating for acute appendicitis.

**Design:** Retrospective study of patients of all ages, including children, undergoing evaluation for suspected acute appendicitis.

**Methods:** One group of patients (n=419; mean age, 17 years) underwent conventional graded-compression sonography to evaluate for acute appendicitis during a 6-month study interval. The second group (n=486; mean age, 16 years) also underwent graded-compression sonography to evaluate for acute appendicitis using the new 3-position scanning algorithm (supine, LPO, second-look supine). PACS was searched for an accompanying CT performed within 7 days of the US. Study exclusion criteria were body mass index >30, peritonitis on physical examination, and history or laboratory findings concerning for appendiceal perforation.

**Results:** Rate of visualization of the appendix increased from 31.0% in group 1 to 52.5% in group 2, while postsonography CT use decreased from 31.3% to 17.7%, respectively. US was used to make the diagnosis of appendicitis in 63.8% of patients in group 1 and in 85.7% of patients in group 2. Sensitivity for diagnosing acute appendicitis was 57.8% in group 1 versus 76.5% in group 2. Accuracy was similar for both groups at 93.0% and 95.4%, respectively.

**Conclusions:** In both adults and children, the 3-position scanning algorithm increases the rate of appendiceal visualization and the likelihood of making a diagnosis of appendicitis by US.

**Reviewer's Comments:** Limitations to this study include (1) retrospective design and (2) the fact that the LPO scanning view was not evaluated by itself. In my opinion, this study highlights the importance of patient positioning when performing US and how the use of >1 position can greatly add to visualizing the appendix. *(See image for this review at practicalreviews.com.)* (Reviewer-Humaira Chaudhry, MD).
Why Can’t I Give My Mom’s Quilt to My Newborn Granddaughter?


Shapiro-Mendoza CK, Colson ER, et al:

Pediatrics 2015; 135 (January): 10-17

Sudden infant death syndrome is on the decline in the United States, but unintentional sleep-related suffocation and use of infant bedding is still problematic.

**Background:** Sudden infant death syndrome (SIDS) is on the decline in the U.S. (66.3/100,000 live births in 2000 to 52.7/100,000 in 2010). Currently the leading cause of infant mortality from injury is unintentional sleep-related suffocation. In 2000, the death rate from this type of trauma was 7.0/100,000 live births. In 2010 it jumped to 15.9/100,000. The hazard can be anything and everything that is in and around the infant when in bed: blankets, quilts, pillows, etc. Since 1996, the American Academy of Pediatrics has recommended that soft objects and bedding such as these be removed from the infant’s sleep area. Still, the percentage of infants who are placed in these dangerous settings is largely unknown.

**Objective:** To document the use of bedding in the infant sleep area and to evaluate any trends.

**Design:** Retrospective analysis of 18,952 participants.

**Methods:** Data from 1993 to 2010 were collected from the National Infant Sleep Position Study. This is an annual, cross-sectional phone survey of a random sample of households with infants aged <8 months. Participants were asked the typical demographic information as well as infant sleeping practices (eg, sleeping with items such as pillow and sleeping with a blanket other than a thin receiving blanket). Average response rate was estimated to be 71%.

**Results:** Use of bedding (blankets [37.6%], quilts [19.9%]) dropped from 85.9% (1993 to 1995) to 54.7% (2008 to 2010). Use of bedding was particularly noteworthy for infants of teen-age mothers (83.5%). In addition, use of bedding was more common among infants who slept in adult beds, on their sides, and on a shared surface.

**Conclusions:** During the period from 2007 to 2010, the strongest predictors (adjusted odds ratio, >1.5) for infants sleeping with bedding were: young mothers, non-white race/ethnicity, and lacking a college education. While the use of bedding among infants is dropping, it is still problematic. Understanding trends and targeting certain populations with education may help improve the situation.

**Reviewer’s Comments:** The authors have no clue as to why there remains a high prevalence of bedding use in this population. However, we face the brunt of the problem when these babies come in to the emergency department cold and blue. Can the problem go away completely? Not when one lives in a cold-water flat and there is one space-heater to heat four rooms. (Reviewer-Paul P. Rega, MD, FACEP).

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Keywords: Bedding Suffocation

Print Tag: Refer to original journal article
Normotensive patients with intermediate lactate levels may warrant aggressive therapy.

**Background:** In patients with presumed sepsis, the current threshold for initiating early goal-directed therapy in the absence of hypotension is a serum lactate >4.0 mmol/L. It is undetermined whether patients with an intermediate range lactate, particularly in the absence of hypotension, might derive benefit from the initiation of an aggressive resuscitation protocol.

**Objective:** To evaluate the prognostic significance of intermediate blood lactate levels (2.0 to 3.9 mmol/L) in non-hypotensive emergency department (ED) patients with suspected infection, emphasizing patients without hypotension.

**Design:** Systematic review.

**Methods:** The authors included studies, regardless of language or publication type, if they were observational studies of adults admitted through the ED, with a diagnosis of systemic inflammatory response syndrome (SIRS), sepsis, or infection-related diagnosis with available lactate and hemodynamic data.

**Results:** The authors identified 20 potential publications, of which only 8 were suitable for inclusion. Intermediate lactate elevation was found in 11,062 patients with suspected or confirmed infection, of whom 1,672 (15.1%) died. Subgroup analysis of 10,442 normotensive patients indicated 1,561 deaths, for a mortality rate of 14.9%, with rates varying across individual studies as low as 3.2% and as high as 16.4%. When comparing prospective versus retrospective studies, mortality results were similar (11.9% vs 10.6%), which in the authors opinion argued against significant bias within the retrospective studies and more importantly against all effects being driven by the single large retrospective cohort. Additional data mining suggested that patients with an intermediate lactate and hypotension had a 28-day mortality that was approximately double (24.3%) than of those with normotension.

**Conclusions:** Intermediate lactate elevation is associated with a moderate to high risk of mortality, even among patients without hypotension. This suggests that physicians should consider close monitoring and aggressive treatment for such patients.

**Reviewer’s Comments:** Subgroup analysis within a systematic review is tricky. Much like subgroup analysis of any well-designed study, it is best considered hypothesis-generating, and not proof of principle. The final word on lactate is still to be written, and the words to date are bewildering and controversial. Some patients with intermediate lactate are going to fall off a cliff, and some will not. Patients for whom lactate is drawn and followed tend to get better care, bringing up the usual dilemmas -- is the lactate level a marker or a physician stimulus, and is it the absolute level or rate of change that matters or most, and if the latter, what is the target delta that we should be aiming for? As a practical, economic issue, nobody is going goal-directed for normotensive patients with lower lactate levels; they represent an enormous population. (Reviewer-Steven B. Abrams, MD).

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Keywords: Lactate, Sepsis, Early Goal-Directed Therapy

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ATVs and Kids -- A Fatal Obsession

Age-Based Risk Factors for Pediatric ATV-Related Fatalities.
Denning GM, Harland KK, Jennissen CA:

Pediatrics 2014; 134 (December): 1094-1102

All terrain vehicles present a significant risk of injury to children and adolescents (12 times greater than that for adults).

Background: All-terrain vehicles (ATVs) present a significant risk of injury to children and adolescents. That risk is 12 times greater than that for adults. In the U.S., approximately one third of all ATV injuries and one fourth of all ATV deaths occur in children under aged <16 years.

Objective: To determine the major contributors of ATV-related deaths in children and older teenagers.

Design: Retrospective and descriptive analysis (1985 to 2009) of 3240 pediatric fatalities (aged <18 years).

Methods: Data were collected from the Consumer Product Safety Commission. The period from 1985 to 1989 was tagged as the baseline.

Results: Pediatric deaths over the subsequent 4-year periods were lower relative to baseline until 2001 to 2004 when there was a significant increase. Looking at age, the groups with the highest proportion of deaths were aged 14 years (14%) and 15 years (13%). For children aged <6 years, the proportion of fatal crashes with multiple riders was twice as high as in other age groups. In this same 6-year-old age group, an adult operator was involved in 60% of crashes (adults were also involved in one third of crashes involving the 6 to 11 year-old age groups). When children aged 6 years were passengers, they had a significantly lower proportion of wearing helmets. However, when they were the drivers riding alone, they had the highest proportion of helmet use (52%). There was a direct association between engine size and fatalities. Over the study, adult-sized ATVs were involved in 95% of fatalities among age groups for whom these vehicles were not recommended. While adolescents aged 16 to 17 years had the greatest proportion of fatalities on roadways, nearly 40% of fatalities in those aged 6 years occurred on roadways. The bulk of roadway fatalities were related to collisions with other vehicles or other objects. However, the majority of fatalities in those aged <6 years and those aged between 6 and 11 years was associated with non-collision events (rollovers, falling off, etc). Head injuries were seen in >60% of pediatric victims, especially among passengers. However, among pediatric fatalities, helmets reduced the likelihood of a traumatic brain injury by 58%. Alcohol was involved in 19% of collisions.

Conclusions: There are variable risk factors associated with age differences in pediatric ATV fatalities.

Reviewer's Comments: Passage of new laws, enforcing existing ones, and providing better parental and user education should mitigate much of these needless deaths. (Reviewer-Paul P. Rega, MD, FACEP).

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Keywords: All-Terrain Vehicles, Trauma

Print Tag: Refer to original journal article
Heart failure results in 1,000,000 emergency department visits annually, a number absolutely certain to increase in concert with an aging population.

**Background:** Acute heart failure (AHF) results in one million emergency department (ED) visits annually, and an aging population coupled with improved survival from cardiovascular diseases is expected to further increase HF prevalence.

**Objective:** To briefly review latest developments and pertinent research gaps relevant to ED management and disposition of patients with acutely decompensated HF. **Discussion:** (1) "Heart failure" is a diagnosis that is in fact complicated to determine. Multiple studies suggest that there is no historical or physical examination finding that achieves sensitivity and specificity of ≥70% for the diagnosis of AHF. Prior heart failure is the most useful historical finding. Jugular venous distension, positive hepatojugular reflux, and an S3 gallop are the only exam findings with high likelihood ratios. CXR is useful when positive, but may be normal in 20% of acute decompensations. (2) Natriuretic peptide testing is extremely useful and supports clinician judgment. (3) Point-of-care cardiac ultrasonography is emerging as a valuable and reliable modality for determining the etiology of dyspnea, assessing left ventricular function and volume status, and identifying pericardial effusion. (4) ED treatment is utterly unemphasized in expert recommendations from the American College of Cardiology/American Heart Association, and little has changed regarding AHF treatment in the ED since the 1970s, highlighting the absence of robust ED clinical trial data and ill-defined standard practice. (5) Contemporary expert opinion suggests reappraisal of a “diuretics only” treatment paradigm to incorporate other clinical parameters into the initial management and classification of AHF. Elevated systolic BP may be an especially important target, because a sizable proportion of patients with hypertensive AHF present with volume redistribution rather than volume overload as their predominant phenotype. In such patients, congestion is due to increased afterload with rapid onset of dyspnea and flash pulmonary edema representing a classic presentation. This approach would require greater utilization of vasodilators or inotropes. Specific BP targets await identification. (6) Consensus guidelines have addressed AHF risk stratification among hospitalized or specialty groups, offering no objective instruction for ED disposition. As there are no validated decision tools identifying low-risk ED patients with limited susceptibility to post-discharge events, >80% of patients treated in the ED for AHF are admitted. (7) There is an urgent need for clinical trials conducted in the ED to improve the evidence base and drive optimal initial therapy for AHF. (8) Should ongoing and future studies suggest that early phenotype-driven therapy improves in-hospital and post-discharge outcomes, ED treatment decisions will need to evolve accordingly.

**Conclusions:** The potential impact of future studies that incorporate risk-stratification into ED disposition decisions cannot be overestimated.

**Reviewer’s Comments:** Predictive instruments are needed to stratify which patients are safe for ED discharge. AHF is the next big target in emergency care. (Reviewer-Steven B. Abrams, MD).

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Keywords: Congestive Heart Failure, Brain Natriuretic Peptide

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Emergency Medicine  
Volume 42 Number 5: January 30, 2015  
Quiz Code: 33103P

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Quiz Questions

1. Tryptase is a biomarker for mast cell degranulation and can confirm the diagnosis of anaphylaxis.  
   Circle one: True False
2. The syringe technique for reduction of temporomandibular joint dislocation is most effective for bilateral dislocation.  
   Circle one: True False
3. Early goal-directed therapy does not improve sepsis mortality, but does decrease indices of organ failure.  
   Circle one: True False
4. In an emergency department population of patients diagnosed with peripheral vertigo, 20% received imaging that is not recommended in guidelines, according to a recent study by Grewal et al.  
   Circle one: True False
5. Whites have the highest proportion of deaths secondary to angiotensin-converting enzyme inhibitor-induced angioedema.  
   Circle one: True False
6. In patients with chronic kidney disease, changes over time in troponin level accurately identify those with acute coronary syndrome.  
   Circle one: True False
7. In a retrospective review, Bingener et al states 1 of 5 five patients referred for elective cholecystectomy after emergency department care require emergent rehospitalization.  
   Circle one: True False
8. Continuous aerosolized albuterol can be delivered safely and effectively in non-intensive care unit settings.  
   Circle one: True False
9. Initiation of vasopressors within the first hour of resuscitation for septic shock is associated with increased mortality.  
   Circle one: True False
10. Lactulose and oral polyethylene glycol equally decrease serum ammonia and improve hepatic encephalopathy.  
    Circle one: True False
11. A normal chest radiograph has clinically meaningful negative-predictive value for the presence of thoracic aortic aneurysm.  
    Circle one: True False
12. When evaluating the appendix via US, a scan of the patient in the left posterior oblique position is helpful for locating the retrocecal appendix.  
    Circle one: True False
13. In 2010, the rate of unintentional sleep-related suffocation in the United States was 11.2 per 100,000 live births.  
    Circle one: True False
14. In normotensive patients with suspected infection, intermediate lactate elevation is associated with a moderate to high risk of mortality.  
    Circle one: True False
15. In the U.S., approximately 75% of all terrain vehicle injuries and 50% of deaths occur in children aged <16 years.  
    Circle one: True False
16. Chest radiographs may be normal in 20% of acutely decompensated heart failure.  
    Circle one: True False
Emergency Medicine
Answers for Volume 42 Number 4: December 30, 2014
Quiz Code: 33041P

1. T Up to 35% of children have experienced syncope.

2. F Intravenous hydroxocobalamin is superior to intravenous administration for treatment of severe cyanide toxicity in a porcine model.

3. F Lactulose and oral polyethylene glycol equally decrease serum ammonia and improve hepatic encephalopathy.

4. F Postinjury secondary abdominal compartment syndrome most commonly arises in the setting of blunt abdominal injury.

5. T Comparison of emergency radiology performance indicators during unusual times of high stress can highlight areas of improvement.

6. T Aggregate data from the Centers of Medicaid & Medicare Services indicate that the average waiting time to see a clinician in an emergency department is 30 minutes.

7. T Age, diabetes and injury severity are risk factors for contrast-induced nephropathy in injured patients with a blunt mechanism.

8. T Laundry detergent pods are a toxic risk to young children.

9. F Adverse events associated with ketamine utilized as an adjunct to morphine for analgesia includes respiratory depression and vomiting.

10. F The bite from a recluse spider (genus Loxosceles) is considered the third most common spider envenomation in North America.

11. T Almost 50% of post-tonsillectomy revisits in the pediatric population are preventable by effective pain management and adequate hydration in the perioperative period.

12. F Intensive blood pressure management in patients with intracerebral hemorrhage is associated with statistically significant benefits versus current guideline-compliant care.

13. T Clarithromycin use is associated with higher rates of hypoglycemia in older diabetic patients treated with sulfonylureas.

14. T The acronym RSS stands for Really Simple Syndication, which can direct content automatically to personal e-readers.

15. T Thiamine is an important chemical in acetylcholine synthesis.

16. F Polymerase chain reaction for pathogen identification is unreliable in the setting of prior antibiotic therapy.