



Resident Journal Review: July-August 2010

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This is a continuing column providing synopses of high-impact journal articles pertinent to EM residents. It is not meant to be an extensive review of the articles, nor is it wholly comprehensive of all the literature published. Rather, it is a short list of potentially useful literature important to the busy EM resident. Residents should read the articles themselves to draw their own conclusions. These papers were selected after a review of twenty-two of the most pertinent journals for emergency medicine. This edition will include articles published over a two month period, between March and April of 2010.

Does end tidal CO₂ monitoring during emergency department procedural sedation and analgesia with propofol decrease the incidence of hypoxic events? A Randomized Controlled Trial. Deitch K, Miner J, Chudnofsky CR, et al. *Ann Emerg Med.* Mar;55(3):258-264.

Procedural sedation is widely used in emergency departments to aid in the treatment of a wide range of conditions. Respiratory depression and hypoxic events are among the most common and potentially damaging adverse events related to this type of sedation. Recently, end tidal CO₂ monitoring has come into favor as an adjunctive method of monitoring for respiratory depression and hypoxia. The authors of this study sought to determine if end tidal CO₂ monitoring during procedural sedation would decrease the incidence of these dreaded complications.

This was a prospective, randomized controlled trial of adult emergency department (ED) patients who were selected for procedural sedation with propofol as determined by the treating physician. In total, 132 patients were randomized to have end tidal CO₂ (ETCO₂) readings available during procedural sedation or to have the procedure performed without physician access to the ETCO₂ monitor readings. All patients received 3 liters of supplemental O₂ via nasal cannula and end tidal CO₂ was monitored via a Capnostream 20 monitor with a nasal-oral cannula. Standard, weight based propofol protocols were employed. Respiratory depression was defined as ETCO₂ level of 50mmHg or greater, change in ETCO₂ greater than 10% from baseline, or loss of waveform for greater than 15 seconds. Hypoxia was defined as oxygen saturation level less than 93% for greater than 15 seconds.

Among the two groups, respiratory depression occurred at similar rates. However, hypoxia was significantly more common in the group without capnography readings (42% vs 25%, 95% CI 1.3-33% p=0.035). In the group with capnography, there were 13% more physician interventions to improve respiratory status (24 of 68 (35%) vs 14 of 64 (22%)); however, this did not reach statistical significance (95% CI -2 – 27). All patients who developed hypoxia first exhibited respiratory depression. Respiratory depression was 100% sensitive and 64% specific in predicting hypoxia.

In this study, the use of capnography decreased the rate of hypoxic events. Furthermore, the 100% sensitivity of respiratory depression (capnographically defined) in predicting hypoxia supports the routine use of these measurements to identify those patients at risk for developing hypoxia. It is important to note that the rate of hypoxia in this study (32.5%) was higher than reported in most other studies, providing a basis for a potentially greater treatment effect and limiting generalizability. Despite this fact, this study provides further support for the use of capnography as an adjunctive measure to prevent serious and common complications of procedural sedation.

Passive leg raising is predictive of fluid responsiveness in spontaneously breathing patients with severe sepsis or acute pancreatitis. Préau S, Saulnier F, Dewavrin F. *Crit Care Med.* 2010; 38(3):819-825.

Rapid infusion of crystalloid and colloid solution is often used to treat symptomatic hypovolemia. Many times it is difficult to assess if volume expansion will actually increase left ventricular stroke volume (SV). Cardiac preload assessment with indices such as central venous pressure does not always correlate with fluid responsiveness. The authors propose that maneuvers such as passive leg raising (PLR) can be used to mimic rapid volume expansion and increase SV if the heart is preload dependent.

This study included non-intubated patients with either sepsis or acute pancreatitis in a single French intensive care unit who were candidates for a fluid challenge based on the presence of at least one clinical sign of inadequate tissue perfusion (i.e. mottled skin, tachycardia, systolic arterial pressure (SAP) <90mmHG or urine output <0.5mg/kg/hr for at least one hour). Exclusion criteria were those in whom intravenous fluid was contraindicated, patients with high-grade aortic insufficiency, patients with poor transthoracic echocardiograms, or if they required non-invasive ventilation. All patients had arterial catheters. All patients had baseline measurements of HR, SAP, diastolic arterial pressure, mean arterial pressure, SV (via bedside transthoracic echocardiography), pulse pressure, and peak velocity of femoral artery flow while in a recumbent position. They then underwent PLR, with their lower limbs elevated 30-45° relative to their trunk and all measurements were retaken. The patient was then placed back in the baseline position for at least five minutes and given 500ml of hydroxyethyl starch over 30 minutes. All measurements were again retaken. Outcome measures were comparative changes in SV, pulse pressure, and femoral artery velocity between PLR and colloid infusion.

There were 34 patients enrolled in the study. Results showed a statistically significant increase in SV after PLR and colloid infusion. This correlated positively with changes in pulse pressure and femoral artery velocity as well. Fluid responsiveness was defined as an increase of ≥15% of the initial SV after colloid infusion. Fourteen (41%) patients were found to be responsive. If a patient had ≥10% increase in SV upon PLR, the sensitivity and specificity of the patient being fluid responsive are 86% and 90%, respectively. Similarly, a change in pulse pressure ≥9% or change in femoral arterial velocity ≥8% correlated with fluid responsiveness.

This study attempts to provide physicians a tool in evaluating fluid responsiveness in the hypotensive patient. Often, patients are given significant amounts of intravenous fluids to increase SV and blood pressure but to no avail. Limitations to this study include the small sample size, inclusion of only non-intubated patients, and

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an overall lack of blinding in those performing the echocardiogram and collecting the data. In addition, needing a skilled sonographer limits the applicability of these findings since one may not be able to determine the change in SV or femoral arterial flow after performing PLR. Monitoring the change in pulse pressure is the most sensible measure amongst the three. Despite these limitations, this paper provides insight on a novel and easy bedside test that can be done to guide the resuscitation of ED patients. Further work on how PLR affects other simple bedside hemodynamic parameters would increase the practical use of this maneuver.

Impact of time to antibiotics on survival in patients with severe sepsis or septic shock in whom early goal-directed therapy was initiated in the emergency department. Gaieski DF, Mikkelsen ME, Band RA, et al. *Crit Care Med.* Apr;38(4):1045-1053.

In 2008, the Surviving Sepsis Campaign recommended the administration of appropriate antimicrobials within one hour of recognition of severe sepsis or septic shock, primarily based on two recent retrospective studies showing poorer outcomes when appropriate antibiotic administration was delayed. Several recent studies have also tried to ascertain the specific time frame for initiation of antibiotics that would lead to improved outcomes. The authors of this study sought to examine the impact of time to antibiotic administration, at various time cutoffs, on survival in patients in whom early goal-directed therapy (EGDT) was initiated in the ED.

This was a retrospective cohort study of 261 patients treated with EGDT. Various data points were recorded including triage time to antibiotic administration (for both initial antibiotics and "appropriate" antibiotics), qualification for EGDT time to antibiotic administration, appropriateness of antibiotic selection, and in-hospital mortality.

In this study, no relationship was found between triage time to initial antibiotic administration and mortality nor from qualification of EGDT time to initial antibiotic administration. However, when considering appropriate antibiotic administration, mortality was significantly decreased when antibiotics were given within one hour of triage (19.5% vs 33.2%, p=0.02) or within 1 hour of qualification of EGDT (25% vs 38.5%, p=0.03) as compared to those receiving antibiotics after the one hour cut-off. Antibiotics were received within six hours of triage in 97.6% of patients.

This study provides further validation for the administration of antibiotics within one hour of arrival in patients with sepsis. Furthermore, according to this study, recommendations for early antibiotics (within one hour) should further stipulate that antibiotic administration must also be appropriate, based on established guidelines for specific etiologies of sepsis. Despite being a

retrospective study, with its inherent limitations, the use of ED EGDT protocols and administration of appropriate antibiotics within one hour were supported by these results.

Patients Education of a Self-Reduction Technique for Anterior Glenohumeral Dislocation of Shoulder. Dudkiewicz I, Arzi H, Salai M. *J Trauma.* Mar 2010; 68(3):620-623.

Anterior glenohumeral joint (shoulder) dislocation is the most commonly treated joint dislocation in the ED. After initial dislocation, subsequent shoulder dislocations are common due to ligamentous instability and laxity. Many patients can often recognize the signs and symptoms of shoulder dislocations and at times are able to reduce the dislocation by themselves. The majority seek medical assistance promptly, but for those with prolonged time of dislocation to reduction the risk for intra-articular damage and traction-neurovascular injuries increases. Numerous techniques have been described; however, the authors here describe a modified Milch technique in which patients can be taught to self-reduce a dislocated shoulder.

The study included 33 consecutive patients with recurrent shoulder dislocations. Each patient was examined to ensure no neurovascular compromise was present and had pre-reduction radiographs to confirm the diagnosis. The patients all started in the supine position and had the dislocated shoulder abducted and externally rotated until the overhead position of the arm was achieved. The patients could use the contralateral hand for support. When the overhead position is achieved, this alignment should allow the shoulder to be reduced. The arm is then gently lowered back to the side of the body while the contralateral hand is placed on the front of the reduced shoulder applying posterior pressure to prevent redislocation. Thirty-two of the 33 patients underwent successful reduction with a mean reduction time of 10 minutes (range: 6-17 minutes). No anesthesia, sedation, or intra-articular injections were used. Of the 33 initial patients, 25 were contacted after one year. Eleven patients had recurrent dislocations, eight used the modified-Milch technique for self-reduction, and seven were successful.

The authors of this paper show that an education session can teach patients how to self-reduce their shoulder dislocation. In addition to reducing the time of dislocation, more rapid pain relief, and reducing the risk of neurovascular injury, self-reduction may decrease the necessity of patients seeking emergency care for this condition. However, patients should also be taught how to recognize failed attempts and to avoid unnecessary delays in treatment. The authors promote that this technique should be used mainly when medical assistance is not readily available such as those in remote or rural locations.

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