



Resident Journal Review: March-April 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 22 of the most pertinent journals for emergency medicine. This edition will include articles published over a two month period, between November and December of 2009.

Systematic review: sodium bicarbonate treatment regimens for the prevention of contrast-induced nephropathy. Zoungas S, Ninomiya T, Huxley R, et al. Ann Intern Med. Nov 3 2009;151(9):631-638.

Contrast-induced nephropathy (CIN) is one of the leading causes of hospital-acquired acute kidney injury. In the emergency department (ED), contrast computer tomography (CT) scans have been employed with dramatically increasing frequency, raising concern that an increasing number of patients will face this potential adverse outcome. Various interventions have been proposed to mitigate this risk. Recently, several systematic reviews, meta-analyses and studies have examined the effect of sodium bicarbonate infusion on CIN with varied results. This review represents the latest of these studies in which the authors sought to perform an exhaustive review of this issue.

The authors conducted a structured search of the literature, along with a manual search of reference lists to identify additional literature. QUORUM guidelines were followed, and studies were assessed using JADAD scores. The search yielded 1,231 articles, of which 23 were included (randomized controlled trials (RCTs) with sodium bicarbonate in one of treatment groups), encompassing 3,563 patients and 396 CIN events. CIN was defined as a 25% increase in baseline serum creatinine measured two to five after administration. Intervention groups varied and included various combinations of sodium bicarbonate, sodium chloride and N-acetylcysteine.

Overall, the summary estimate for relative risk of CIN with use of sodium bicarbonate was 0.62 (95% CI, 0.45-0.86). However, when stratified according to published and unpublished articles, formal statistical testing revealed publication bias, with unpublished studies showing no benefit. Greater estimates of effect were noted in studies that were published before 2008, had fewer participants, fewer events, were of low JADAD quality, and measured CIN within 48 hours of event. Sodium bicarbonate use had no effect on requirement of dialysis, heart failure and mortality. The use of N-acetylcysteine showed no effect.

The summary estimate in this review showed a small benefit for the use of sodium bicarbonate. However, as the authors pointed out, that benefit is brought into question given the publication bias noted. The result was also questioned since the studies were of poor quality, small size, and heterogeneous, especially those showing benefit. Most included studies that included coronary angiography, which uses higher volumes of contrast than CT, rendering conclusions even less relevant for the emergency medicine physician. Thus, no conclusion could be drawn and routine implementation of sodium bicarbonate to prevent CIN is still of uncertain benefit. Larger RCTs with improved quality, including ED relevant uses of contrast, are required.

Acute detection of ST-elevation myocardial infarction missed on standard 12-Lead ECG with a novel 80-lead real-time digital body surface map: primary results from the multicenter OCCULT MI trial. Hoekstra JW, O'Neill BJ, Pride YB, et al. Ann Emerg Med. Dec 2009;54(6):779-788 e771.

Acute myocardial infarction (MI) is an essential differential diagnosis that the emergency medicine provider (EP) must rule out for a wide range of presenting symptoms. Twelve lead electrocardiography (ECG) is arguably the most important diagnostic tool used in the diagnosis of this ubiquitous condition. However, 12 lead ECG is not sensitive for the diagnosis when ST elevation is not present or for right-sided, inferior and posterior wall MI. A novel diagnostic tool, the 80-lead digital body surface map, worn as a vest, has been developed to overcome these challenges and improve the diagnosis of acute MI. The purpose of this study was to characterize the prevalence, management patterns and outcomes of patients having acute coronary syndromes who are identified as having an ST elevation myocardial infarction (STEMI) by 80 lead ECG compared to traditional methods of diagnosis and management.

In this multi-center prospective cohort study, patients with chest pain and high-risk features, such as ECG abnormalities, three or more cardiac risk factors, or known CAD, were included. Of the 1,830 patients enrolled, 91 were diagnosed with 12 lead ECG as a STEMI, 132 were diagnosed with non STEMI (NSTEMI), and the remaining 1,607 were diagnosed with unstable angina, acute coronary syndrome (ACS) or other. Of the patients without a STEMI on 12 lead ECG, 25 additional patients were found to have a STEMI by 80 lead ECG. These patients were treated with a more conservative approach (delayed and conservative coronary catheterization), more consistent with patients with NSTEMI. When compared to 12 lead STEMI patients, 80 lead-only STEMI patients had similar rates of 30 day mortality, recurrent MI, rehospitalization and similar angiographic features. However, 80 lead-only STEMI patients also had similar rates of these outcomes as compared to patients with NSTEMI. Among all patients without a diagnosis of 12 lead STEMI, an 80 lead ECG STEMI was associated with a higher rate of death (OR 11.2 95% CI 1.8 to 67).

Many limitations of this study prevent widespread support for routine use of 80 lead ECG. First, the sample size of 80 lead ECG STEMI patients was small, and the study was not adequately powered to find statistically significant difference in clinical outcomes. Due to time constraints, 68 of the 91 patients with 12 lead STEMI did not undergo an 80 lead ECG, thereby limiting ability to calculate sensitivity and specificity against the standard. Also, cost-benefit analysis was not performed to compare the benefit of finding 25 additional STEMIs with an 80 lead ECG analysis to the significant costs (\$160/disposable suit) of using this tool on each of the 1,830 patients.

continued on page 24



Resident Journal Review - continued from page 22

Since this study was not adequately powered, differences in clinical outcomes were not significant. The question remains if patients found to have a STEMI on 80 lead ECG that is not found on 12 lead ECG would benefit from a time sensitive management approach, similar to 12 lead STEMI patients. Alternatively, is this simply a more expensive diagnostic study (with results that may be obtained using cardiac biomarkers) for a less time-sensitive condition? While EPs should be aware of this potentially useful diagnostic test, more studies are needed prior to widespread use.

Percentage of US emergency department patients seen within the recommended triage time: 1997 to 2006. Horwitz LI, Bradley EH. Arch Intern Med. Nov 9 2009;169(20):1857-1865.

The state of emergency care in the U.S. has been described by the Institute of Medicine (IOM) and others as a "growing national crisis." Increasing numbers of patients seeking care, reduced ED (and hospital) beds, increasing age of patients seeking care, and the resultant effects on patient care, outcomes, and costs are all part of this crisis. The authors of this study examined the trends of one such outcome - the percentage of patients seen within recommended triage times.

Of about 865 million ED visits during the period of 1997 to 2006, a random, stratified sampling of 151,999 visits were extracted from the National Hospital and Ambulatory and Medical Care Survey (NHAMCS), after omitting those with incomplete data. Patient encounters were examined to determine the percentage of patients seen within recommended triage times (time of arrival to time to physician), as it relates to triage category and other independent variables including payer type and ethnicity. Triage categories, according to the NHAMCS data set, were defined as emergent (should be seen within 15 minutes), urgent (15-60 minutes), semi-urgent (1-2 hours), and non-urgent (2-24 hours).

Median wait time for all patients increased 4.6% per year, from 22 minutes to 33 minutes. The percentage of patients seen within the recommended timeframe declined from 80% in 1997 to 75.9% in 2006. The percentage of emergent patients seen within 0-15 minutes declined from 59.2% to 48.0%. For urgent patients, it declined from 84.0% to 76.3%, and for semi-urgent patients from 90.6% to 84.7%. All non-urgent patients were seen within recommended times. Patients who had higher acuity of illness, were ultimately admitted, were Hispanic or black, seen by trainees, or visited urban hospitals were less likely to be seen within the recommended timeframe. No significant interaction was found for payment type.

Alarming, those with the highest acuity had the highest rate of decline in percentage seen within the recommended timeframe. Similar declines were seen among all triage groups. In total, one in four patients was not seen within a recommended timeframe. EPs, communities and politicians must be aware of this important trend in the state of emergency care that may ultimately result in significant impacts on patient care, outcomes and costs. Further resources, policies and interventions are urgently needed to address these trends.

Initiation of inappropriate antimicrobial therapy results in a fivefold reduction of survival in human septic shock. Kumar A, Ellis P, Arabi Y. Chest. Nov 2009; 136(5):1237-1248.

Septic shock is a leading cause of mortality in the ICU and a condition in which the patient's ED care can make a difference. Initiation of inappropriate antibiotics early in a patient's care can delay the time to effective therapy and worsen morbidity and mortality. The authors of this study sought to examine the effects of inappropriate initial antimicrobial therapy on patient survival.

This was a multicenter, retrospective review of 5,715 patients from 22 institutions from Canada, the U.S. and Saudi Arabia. Inclusion criteria included patients with a diagnosis of septic shock and age ≥ 18 years. Septic shock was defined as a documented or suspected infection, persistent hypotension requiring pressors, and two or more SIRS criteria. "Appropriate antibiotic" was defined as effective therapy based on subsequent cultures or, in cases in which the patient had no positive cultures, based on antimicrobial recommendations by the "Clinical Approach to Initial Choice of Antimicrobial Therapy" in the *Sanford Guide to Antimicrobial Therapy 2004 (34th ed.)*. The primary outcome measure was survival to hospital discharge.

Of the 5,725 patients, 82.2% had documented infection by cultures. Appropriate antimicrobial therapy was initiated in 80.1% of these patients. Overall survival to hospital discharge for all patients was 43.7%. Patients with appropriate initial antibiotics had a survival rate of 52%, and those who had inappropriate initial antibiotics had a survival rate of 10.3% (OR 9.45, 95% CI 7.74 to 11.54). Interestingly, those with the highest appropriate antibiotics rates included skin & soft-tissue infections (86.9%) and UTIs (84.8%), and those with the lowest were catheter-associated infections (69.8%) and primary blood infections (68.6%). The greatest benefit from appropriate initial antibiotics was in patients who had septic shock due to *Candida albicans*; survival was 24.6% with appropriate initial therapy compared to 4.6% without.

This study brings attention to the importance of antibiotic choice when treating patients with septic shock in the ED. A weakness of this study is that it is observational. Research involving therapeutics is better served with prospective studies. In observational studies, there are many unmeasured elements that can affect the results. This study does not indicate how long inappropriate antibiotics were administered or how long appropriate therapy was delayed, if started at all. Despite this study's limitations, it reiterates the point that initial antibiotic selection in the ED can have significant effects on patient care and should not be made lightly.

Resuscitation on television: realistic or ridiculous? A quantitative observational analysis of the portrayal of cardiopulmonary resuscitation in television medical drama. Harris D, Willoughby H. Resuscitation. Nov 2009;80(11):1275-1279.

Patient and family preferences for cardiopulmonary resuscitation (CPR) are related to the perceived likelihood of recovery. Previous studies have demonstrated that patients have unrealistic expectations of CPR outcomes and survival to discharge: in some cases overestimating survival to discharge by greater than

continued on page 25



Resident Journal Review - continued from page 24

200%. Television media may play a central role in creating these expectations. The authors of this study sought to compare patient characteristics and outcomes in medical television drama with published resuscitation statistics.

Eighty-eight new episodes of two U.S. based dramas, "Grey's Anatomy" and "ER," and two BBC aired dramas, "Casualty" and "Holby City," aired between July 2008 to April 2009, were reviewed. Age, sex, medical history, cause of arrest, initial rhythm, immediate survival, and survival to discharge were recorded when available.

In 88 episodes, there were 76 cardio-respiratory arrests and 70 resuscitation attempts. Immediate survival was 46%, which compared well to published immediate survival rates of 40-47%. Survival to discharge from hospital and long-term outcomes were rarely shown, making data on these measures unattainable. The average age of patients resuscitated was 36 years compared to a true average age of 65-75 years. Furthermore, there was no age-related difference in resuscitation outcomes noted on television drama. The cause of arrest was major trauma in about a third of patients on television drama in contrast to hospital data that indicate less than 5% of arrests are secondary to major trauma and 85% are

attributable to underlying cardiac or respiratory disease. Accuracy of resuscitation was difficult to determine due to brief depictions of resuscitation.

While immediate survival after resuscitation on television mirrored published reports of actual survival, rarely did television drama provide any portrayal of intermediate to long-term outcomes. Furthermore, most outcomes revealed either full recovery or death, without portraying realistic long-term sequelae. The patient profile also differed significantly, favoring the young and healthy who had experienced major trauma, instead of the older and moribund, experiencing chronic cardiorespiratory diseases. The actual age-related declines in resuscitation success were notably omitted. Clearly, this was a small, limited, study of a select sample of television drama. In addition, the impact on viewer perceptions was not directly measured. Noting these limitations, the influence of television is not trivial, and the data provides important clues to the attitudes of patients and families toward resuscitation. This data can assist EPs in discussions with patients and family involved in situations of resuscitation, end-of-life and death.

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