376 Fast, Safe and Cheap: A Structured Deep Venous Thrombosis Emergency Department Observation Unit Pilot Protocol

Clark CL, Shaqiri B, Bastani A/William Beaumont Hospital, Royal Oak, MI; William Beaumont Hospital, Troy, MI

Study Objectives: Treatment of deep venous thrombosis accounts for 600,000 hospitalizations per year. Despite literature advocating an outpatient treatment protocol for these patients, many hospitals continue to admit these patients in order to observe, arrange follow-up and educate patients prior to discharge. The diversity of cases that are being handled in an emergency department (ED) observation unit continues to grow as hospitals look to provide quality patient care, yet minimize cost. To date, no studies have described the treatment of deep venous thrombosis in an ED observation unit. Our primary objective was to evaluate the feasibility of a structured ED observation unity deep venous thrombosis treatment protocol.

Methods: We performed a prospective observational trial of patients placed in the ED observation unity deep venous thrombosis treatment protocol from April 1st 2010 to March 1st, 2011. The study was performed at William Beaumont Hospital, a tertiary care facility with an annual ED census of 118,000 patients. During this pilot, patients with an uncomplicated acute deep venous thrombosis were placed in the ED observation unity at the discretion of the treating emergency physician. To pilot the treatment of deep venous thrombosis in an ED observation unity, we developed a structured treatment algorithm focusing on 4 key facets of deep venous thrombosis management. First, we initiated treatment with low-molecular weight heparin and warfarin. This included a monitored self-administration of the second dose of low-molecular weight heparin in the ED observation unity. Second, we created an in-depth educational component including a video presentation and pamphlet describing deep venous thrombosis, low-molecular weight heparin and warfarin as well as potential risks and complications. Third, we observed the patient for a minimum of 12 hours for any signs of bleeding complications or pulmonary embolus. Fourth, we arranged follow-up with our anticoagulation monitoring service. Our primary outcome measures were admission, death, bleeding complications or pulmonary embolus on the index visit and at 30 days. Our secondary outcome measure was the cost difference between ED observation unit and admitted patients during the same period. Data was analyzed using descriptive statistics; confidence intervals were reported using a modified Wald method.

Results: During the pilot study period 28 patients were treated with the ED observation unity deep venous thrombosis protocol. 7 (25%) of the patients were female with an average age of 56.6 +/− 15.3. Within the pilot group there were 0 (C.I. 0.00% to 10.5%) deaths, bleeding complications or PE at the index visit or at 30 days. One patient who was status post cardiac catheterization was admitted on the index visit after identification of a coexisting arterial thrombus. All other patients were discharged home; there were no 30-day re-admissions. At our institution the average charge for a deep venous thrombosis admission is $23,118 dollars compared to an average charge of $8403 dollars for the ED observation unit patients. This difference alone represents $412,020 in decreased charges for the ED observation unit pilot cohort.

Conclusion: A structured ED observation unit deep venous thrombosis protocol is feasible and costs significantly less than an admission-based protocol.

377 Right Ventricular Strain on Bedside Echocardiography: Does It Help in the Diagnosis of a Pulmonary Embolism?

Dresden S, Mitchell PM, Leo M, Wilcox AR, Rubin-Smith J, White LF, Sullivan A, Rahimi LM, Carmody KA/Boston University, Boston Medical Center, Boston, MA; Boston University, Boston Medical center, Boston, MA

Study Objective: The purpose of this study was to determine the sensitivity and specificity of right ventricular strain on bedside emergency physician performed echocardiography (echo) for the diagnosis of pulmonary embolism.

Methods: This was a prospective observational study of emergency department (ED) patients at an urban academic medical center from March 2009 to April 2011. We included patients age >21 years who met 1 of 2 criteria: 1) a documented pulmonary embolism by radiological imaging performed as an outpatient prior to arrival in the ED or 2) a moderate to high pre-test probability of pulmonary embolism (based on Wells' criteria >3) and a plan to obtain radiological imaging for pulmonary embolism in the ED. Non-English speaking patients were excluded. Patients were enrolled during periods when 1 of 4 emergency physician co-investigators with training in bedside echo was available. The ultrasounds were performed using a Philips HD11 XE machine and a phased array cardiac probe. The echo views obtained included the parasternal long and short axis views and the apical-4-chamber view. The co-investigator digitally recorded the images onto an external hard drive and documented relevant measurements onto a data collection sheet. Confirmatory review was conducted by an expert sonographer blinded to clinical information and outcome data. Right ventricular strain was defined as measured right ventricular:left ventricular ratio of 1:1 or greater. Sensitivity, specificity, positive predictive value, negative predictive value, positive likelihood ratio and negative likelihood ratio were calculated.

Results: Of 153 eligible subjects, 134 subjects with complete data and adequate ultrasound images for interpretation were analyzed. Pulmonary embolism was diagnosed in 27/134 (20%). In the subjects with a pulmonary embolism, right ventricular strain was present on bedside echo in 12/27 (44%). Two subjects (1%) were found to have right ventricular strain on bedside echo with no diagnosis of pulmonary embolism on imaging, and were classified as false positives. The sensitivity of right ventricular strain for pulmonary embolism was 44% (95% CI 28%-63%), and the specificity was 98% (95% CI 93%-100%). PPV was 85.7% (95% CI 57%-98%) and NPV was 87.5% (95% CI 80%-93%). Positive likelihood ratio was 23.8 (95% CI 5.7-100) and negative likelihood ratio was 0.57 (95% CI 0.4-0.8).

Conclusions: These findings show that the presence of right ventricular strain on bedside emergency echo is highly specific for the diagnosis of pulmonary embolism. Evidence has shown that right ventricular strain diagnosed on echo in patients with a pulmonary embolism leads to a higher incidence of permanent right ventricular dysfunction, right ventricular failure, recurrent pulmonary embolism and death. Discovery of right ventricular strain in a patient who presents with unexplained chest pain or shortness of breath may help to expedite the diagnosis and treatment of a pulmonary embolism. However, because of poor sensitivity, lack of right ventricular strain on bedside echo should not rule out the diagnosis of pulmonary embolism.

378 Revitalizing a Vital Sign: Measurement of Respiratory Rate With a Thoracic Belt Improves Detection of Tachypnea at Primary Triage

Bianchi W, Hsieh Y, Hill P, Saheed M, Terzis A, Rothman R/Johns Hopkins School of Medicine, Baltimore, MD; Johns Hopkins University, Baltimore, MD

Study Objectives: Prior studies demonstrate that busy emergency department (ED) nursing (RN) assessment of respiratory rate (RR) at triage is inaccurate. Although electronic methods have been evaluated, none have provided an improved measurement of RR. A newly developed biomechanical device, (coined BioHarness® [BH], Zephyr Technology, Inc.), employs a thoracic pressure sensor to detect respirations and has potential utility in ED triage. We conducted a pilot study to assess the sensitivity of BH versus RN, relative to gold standard (GS) measurement through direct observation of respirations, for identifying tachypnea (defined as RR > 20 breaths per minute [BPM]).

Methods: Design: Cross-sectional study with consecutive enrollment at ED triage. Nursing staff were blinded to study. Each task of collecting GS data, processing of BH data, and chart abstraction of RN data was conducted by different research staff. Study was approved by the institutional IRB. Setting: Adult urban ED with an annual census of approximately 60,000 patients. Patients verbally consented at triage between 7am and 12pm, 7 days/week. Type of Participants: Participants approached were triage acuity level 2 through 5, age range ≥18 years. Patients presenting with an altered mental status and/or a chief complaint incompatible with application of the BH (eg, trauma, vomiting) were excluded.

Methods: BH was applied around the patients' lower chest over the first layer of clothing and data collection was initiated after calibration (<30 seconds). GS and BH measurement obtained concurrently during a 60-second period immediately following triage assessment; patient position not altered between measurements. BH measurements downloaded from device's internal memory. GS, BH, and RN data were de-identified and analyzed in a retrospective manner.

Results: 214 patients were approached in this ongoing study: 4 patients declined; 19 patients did not yield successful GS and/or BH recordings; 191 remaining patients analyzed as paired recordings. The mean difference between BH and GS measurement of RR was 1.5 ± 1.5 BPM, while the mean difference between RN and GS measurement of RR was 3.3 ± 2.7 BPM. Forty-four (23%) patients were positive for tachypnea by GS. RN measurement yielded 32 false

negatives for GS tachypnea; BH correctly identified 29 of these RN measurements as true positive. Sensitivity of BH for detecting tachypnea, relative to GS comparator, was 91% (95% CI: 80-97). Sensitivity of RN was 23% (95% CI: 12-37). BH and RN specificities for detecting tachypnea were 97% (95% CI: 93-99) and 99% (95% CI: 97-100), respectively.

Conclusion: RN measurement at primary triage continues to be poorly sensitive (23%) for detecting tachypnea in ED patients; improvements in routine RR measurement are warranted. This pilot study describes the first highly sensitive and specific electronic method for detecting tachypnea in a triage environment. The BH RR measurement was much more consistent with GS than RN measurement, and also detected 91% of tachypnic patients that were missed by RN measurement. Studies investigating patient acceptability, feasibility, and clinical utility of the BH in the ED are ongoing.

379 Availability of and Compliance With Patient Code Status Prior to Endotracheal Intubation in the Emergency Department

Crispo MM, Lerwick P, Higgins III GL, Strout TD/Maine Medical Center, Portland, ME

Study Objectives: Establishing a clear understanding of patient preferences for end-of-life decisions during critical clinical situations is an essential yet frequently challenging task in the emergency department (ED) setting. Failure to obtain this information risks noncompliance with patient and family wishes. This study sought to determine the prevalence of point-of-care code status documentation for patients requiring endotracheal intubation in the ED. In addition, patient characteristics and outcomes in the various code status groups were compared.

Methods: This retrospective review was conducted over a 4-year time period (2006 to 2009) at an academic medical center. Study subjects included patients older than age 45 years who required endotracheal intubation in the ED. Contemporaneous medical records were examined for the presence of documentation that end-of-life preferences were discussed prior to endotracheal intubation, categorized as: no code status documented, full code, do not resuscitate/do not intubate or advance directive/living will/conflicting information. Acceptable documentation sources included the initial history and physical, progress notes, specific mention of patient/family conversation, physician order, and copies of advance directive/living wills.

Results: 540 patients were enrolled. Documentation of code status was present in 201 (38%) and absent in 334 (62%). Patient characteristics and outcomes for each category are displayed in the Table. Significant differences in age ($p<0.001$) and disposition ($p= 0.01$) were noted across the code status groups. Only 12 patients (2%) had an advance directive/living will accessible to the ED staff.

Conclusions: At this single institution, honoring patient preferences for end-of-life care prior to the implementation of endotracheal intubation was substantially compromised. Even when point-of-care code status was known, there was inconsistent adherence to patient end-of-life preferences. Causes for this likely included inability or reluctance to retrieve end-of-life information from a reliable source in a timely manner, failure of providers to effectively address this issue with the patient/family prior to implementing aggressive resuscitative measures, and patient/family code status revision at the time of crisis.

Total Patients Enrolled: 540	NCSD 334 (62%)	FC 130 (24%)	DNR/DNI 54 (10%)	AD/LW/CI 17 (4%)
Male	196 (59%)	83 (64%)	31 (57%)	8 (47%)
Mean Age (95%CI)	64 (63-66)	68 (67-70)	74 (71-77)	79 (75-83)
CPR Performed	92 (29%)	34 (26%)	11 (20%)	2 (12%)
ED Expire	83 (25%)	25 (19%)	13 (24%)	2 (12%)
ICU Expire	81 (24%)	29 (22%)	19 (35%)	9 (51%)
Total Expire	164 (49%)	54 (41%)	32 (59%)	11 (63%)

380 Emergency Airway Management in Japan: Interim Analysis of a Multi-Center Prospective Observational Study

Hasegawa K, Hagiwara Y, Chiba T, Watase H, Brown III CA, Walls RM, Brown DF, Japanese Emergency Medicine Research Alliance Investigators
Brigham & Women's Hospital, Massachusetts General Hospital, Boston, MA; Kawaguchi Municipal Medical Center, Kawaguchi, Japan; Obama Municipal Hospital, Obama, Japan; Oregon Health & Science University, School of Public Health, Portland, OR; Brigham and Women's Hospital, Boston, MA; Massachusetts General Hospital, Boston, MA

Study Objectives: Emergency medicine is increasingly recognized as a medical specialty in Japan; however, comprehensive studies evaluating current practices of emergency department (ED) airway management are lacking. We sought to characterize ED airway management in Japan including methods of intubation, success rates, and adverse event rates using a large multi-center registry.

Methods: We formed the Japanese Emergency Airway Network (JEAN), a consortium of 10 academic medical centers in Japan and prospectively collected data for ED intubations from July 2010 to February 2011. The participating sites are level I (n=9) or level II (n=1) trauma centers with an average annual ED census of 31,000 patient visits (range 10,000 to 42,000). Nine centers have emergency medicine residency training programs. All patients undergoing emergency intubation were eligible for inclusion. Data were entered in real time by the intubator using a standardized data form. Variables included patient age, sex, and weight; indication for intubation; methods of intubation; drugs and dosages; level of training and specialty of the intubator; number of attempts; success and adverse events. We present descriptive data as proportions with 95% confidence intervals (95% CI). Odds ratio (OR) are reported with 95% CI and p-value via chi-squared testing; p-values < 0.05 are considered significant.

Results: We recorded 1,486 intubations (compliance rate 96%) including 1,208 (81%) medical and 278 (19%) trauma patients; 612 patients (41%) were in cardiac arrest. Rapid sequence intubation, oral intubation with sedation only, intubation with neuromuscular blockade only and intubation without medications were the first method in 20%, 18%, 3% and 58%, respectively. Use of rapid sequence intubation varied among sites ranging from 0% to 79%. The first method chosen was successful in 97% of encounters (95% CI 96-98%) within 3 attempts. (Table) Success rate on first attempt for rapid sequence intubation was higher than oral intubation with sedation only in all encounters (78% vs. 61%, 95% CI for difference [9-24%]; $p < 0.01$). Intubation was ultimately successful in 1,482 (99.7%) of encounters. Emergency physicians and residents performed 83% and other specialties 17%. Adverse event rate overall was 11%, without significant difference by method used. Surgical airways were performed in 0.5% of all cases and 1.4% of trauma cases.

Conclusion: In this Japanese multi-center study, most ED intubations were performed by emergency physicians and residents. Use of neuromuscular blockade is highly variable. 3% of patients were intubated with neuromuscular blockades but without sedation. Overall success rates vary by method, and first attempt success rate is higher with rapid sequence intubation than with sedation alone. This study has the limitations of reporting bias, lack of data validation, and confounding by indication.

Success for Initial Method

	All Encounters		Non-Cardiac Arrest	
Initial Method	Successful on 1st Attempt n (%)	Successful in ≤3 Attempts n (%)	Successful on 1st Attempt n (%)	Successful in ≤3 Attempts n (%)
Rapid sequence intubation	235 (78%)	298 (98%)	235 (78%)	298 (98%)
Sedation without paralysis	162 (61%)	255 (96%)	162 (61%)	255 (96%)
Paralysis without sedation	27 (63%)	41 (95%)	26 (63%)	39 (95%)
Without medications	617 (72%)	833 (97%)	158 (63%)	238 (95%)
Surgical airways	7 (100%)	7 (100%)	3 (100%)	3 (100%)
Other	4 (44%)	9 (100%)	4 (44%)	9 (100%)
Total	1052 (71%)	1443 (97%)	588 (67%)	842 (96%)