treatment guidelines for this patient population. *Design:* Retrospective, consecutive chart review of patients who met inclusion criteria. Data including BP, total amount of intravenous fluids administered, lactate levels, infection source, and antibiotic class for the first 12 hours were recorded. Analysis: Incidence of the development of hypotension in the first 12 hours and survival to discharge were determined.

Results: A total of 883 participants were eligible for inclusion; 586 subjects met all inclusion criteria and were entered into final data analysis. Seventy-five (12.8%) of enrolled patients became hypotensive within the first twelve hours following admission. Among these patients, overall mortality was determined to be 13.3% compared with the mortality in the 511 subjects who did not become hypotensive (6.3%). Of the patients who became hypotensive following admission to the hospital that did not survive to discharge 60% had only one episode of hypotension while the remaining 40% had only two documented episodes of hypotension within the twelve-hour study period. Onset of hypotension following admission appeared equally distributed with 50% (5 patients) of the cases occurring within the first 6 hours of admission while the remaining 50% (5 patients) occurred between 6-12 hours following admission to the hospital. We performed an internal analysis of the data using excluded patients with an initial lactate level of > 4 mmol/L (20 subjects) determined to have an overall mortality of 25% which is in line with previous literature evaluating mortality in patients with severe sepsis.

Conclusion: Normotensive septic patients admitted from the ED who experience even one episode of hypotension have twice the in-hospital mortality compared with their normotensive counterparts. This finding suggests that close clinical evaluation is warranted in hemodynamically stable patients who develop hypotension following admission as they portend a worse prognosis.

411 Thromboembolism After Emergency Warfarin Reversal With Fresh Frozen Plasma

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Background: Fresh frozen plasma (FFP) is often administered in conjunction with vitamin K to reverse warfarin anticoagulation. Warfarin reversal may be associated with thromboembolic adverse events, but it is not clear whether FFP dose influences this risk.

Study Objectives: The primary objective is to determine the incidence of thrombotic complications after warfarin reversal. Secondary objectives were to determine whether FFP dose or rate of infusion are associated with thromboembolism.

Methods: Trained research coordinators performed a structured retrospective review of consecutive patients who received FFP for warfarin reversal in an academic medical center over a 3-year period. Prothrombin complex concentrates (PCCs) were not available in the emergency department (ED) during this time. The number of units/hour was calculated based on the start time between the first and last unit.

Results: During the study period, 335 cases of FFP administration for warfarin reversal were identified. Of these, 287 (86%) received FFP in the ED while the remainder received FFP exclusively in the in-patient setting. One hundred eighty-one (54%) received vitamin K in the ED (140 IV, 40 PO, 1 SQ). The median number of units of FFP administered in the ED was 2. A single ED-administered FFP unit was given in 61 cases (21%), and three, four, and six ED FFP units were administered in 26 (9%), 49 (17%), and 11 (4%) of cases. In two cases (0.7%) there were 8 units administered, and one patient (0.4%) received 10 units of FFP in the ED. The median duration of total FFP administration in the ED was 0.75 hrs (IQR 0.3-1.8). The median infusion rate (in units/hr) was 3.1 (IQR 1.7-4.0). The median (IQR) length of stay was 5 (3-10) days. Twelve patients (3.6%; 95% CI 1.9-6.2%) developed thrombosis-related complications during the index hospitalization. These included 2 cases of myocardial ischemia, 3 cases of deep venous thrombosis, and 7 cases of other-vessel thrombosis, which primarily involve thrombosis in superficial vessels. No patient had a pulmonary embolism or stroke (one-sided 97.5% CI for point estimate of 0%: 0.0-1.1%). Due to small numbers of adverse thrombosis-related events, the pooled outcome of "any thrombotic complication during the index hospitalization" was analyzed; there were insufficient outcomes to enable multivariate analysis. There was no association between this outcome of interest, and either the amount of FFP administered (odds ratio 1.22, 95% CI .84-1.77, $P = .29$) or the infusion rate of FFP (OR 1.1, 95% CI 0.89-1.39, $P = .40$).

Conclusions: In a large cohort of patients receiving emergency warfarin reversal, 3.6% of patients developed a thromboembolic event during hospitalization. We found no evidence that FFP dose or rate of infusion increase this risk; however, the low frequency of this event may have limited our ability to detect a true but small effect.

412 Intraosseous Pressure Monitoring in Critical Care Patients

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Study Objective: Rapid access to the vascular system for fluid resuscitation and medication administration via an intraosseous (IO) line has become a common practice in emergency medicine. However, if vascular dynamics can be determined from the intramedullary space, more invasive types of monitoring may be able to be avoided. The objective of this proof of concept pilot study is to describe IO pressure measures and their relationship to blood pressure obtained via external blood pressure cuff in intensive care unit patients.

Methods: This is a prospective, convenience sample, proof of concept pilot study conducted in the medical and intensive care units at an urban, Level I trauma center. Patients were identified in the emergency department and enrolled under a waiver of informed consent granted by the HealthPartners Institute for Education and Research Institutional Review Board. Inclusion criteria included age $\geq$ 18 year old, presence of an IO placed by EMS or in the emergency department as standard of care, and planned admission to the medical or surgical intensive care unit. Patients were excluded if they had anticipated surgery within 12 hours of IO placement, current infection at the placement site, or prisoner of the state. A pressure transducer was attached to the IO catheter as soon as the line was no longer required for clinical care. External cuff pressure readings were recorded every 15 minutes, and IO pressure data were recorded continuously for up to 12 hours. IO systolic, diastolic, and mean pressure (IO SBP, IO DBP, IO Mean) readings were summarized for the minute before and minute following an external cuff pressure reading. The ratio of IO pressure to external cuff pressure (IO Systolic Blood Pressure / Cuff SBP; IO DBP / Cuff DBP; IO Mean / Cuff Mean) were calculated.

Results: Ten patients were enrolled between January 2014 and April 2015. Average patient age was 60 (range = 45-81), and 80% were male. Primary diagnoses were as follows: acute respiratory failure (4), meningitis (1), ingestion (1), hemorrhagic shock (1), congestive heart failure (1), cardiac arrest (1), and altered mental status (1). The average IO SBP, IO DBP, and IO mean were 39.47$\pm$12.73 mm Hg, 31.51$\pm$7.59 mm Hg, and 34.96$\pm$8.83 mm Hg respectively. The ratio of IO SBP to cuff SBP, IO DBP to cuff DBP, and IO mean to cuff mean are 34.5$\pm$13.4%, 40.5$\pm$22.3%, and 40.1$\pm$17.1% respectively. There were no adverse events reported during the monitoring period.

Conclusions: In this convenience sample of severely ill and injured patients, IO pressure was reliably obtained and appears to be 35-40% of blood pressure readings obtained via external blood pressure cuff. This method of pressure monitoring may be an appropriate alternative invasive monitoring option in the future.

413 Is Routine Chest Radiography Necessary After Ultrasound–Guided Right Internal Jugular Vein Catheterization?

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Study Objectives: Central venous catheter (CVC) placement is a common procedure performed on critically ill patients. Routine chest radiographs immediately after CVC placement is considered standard practice and the use of CVCs are commonly delayed until the chest radiograph is performed and read. Ultrasound-guided right internal jugular vein (IJV) CVCs are the most common type of CVC placed. We hypothesize that the rate of clinically relevant complications of ultrasound-guided right IJV catheterization is extremely low.

Methods: This study is a retrospective chart review of all (n=1,322) ultrasound-guided right IJV CVCs attempts at an academic tertiary care hospital system over a one-year period (January 2014 to January 2015). Demographic and clinical information including age, sex, race, body mass index (BMI), history of chronic obstructive pulmonary disease (COPD) and end-stage renal disease (ESRD) was obtained. Standardized procedure notes for all ultrasound-guided right IJV CVC attempts were reviewed for number of attempts, success of placement and documented complications. Chart review was performed on each patient to verify hospital location and mechanical ventilation at the time of CVC placement, and complications including pneumothorax or significant misplacement. The clinical relevance of these complications (intervention for pneumothorax or misplaced CVC) was also assessed. Analysis included descriptive statistics and logistic or Poisson regression to model variables associated with successful placement and complications.