CAT- Jamie Bonner- Block 10, March 22nd, 2017

Use of Nitroglycerine by Bolus Prevents Intensive Care Unit Admission in Patients with Acute Hypertensive Heart Failure

Wilson SS, Kwiatkowski GM, Millis SR, Purakal JD, Mahajan AP, Levy PD. American Journal of Emergency Medicine. 2017 Jan; 35 (1): 126-131

Question: Is there a difference in healthcare resource utilization among patients who were given IV nitroglycerine by intermittent bolus, continuous infusion or a combination of both for the initial management of acute heart failure in the emergency department.

Background: Vasodilators are considered initial therapy for acute heart failure. The use of vasodilators to provide preload and afterload reduction in hypertensive patients with AHF improves hemodynamics and symptoms but provides no apparent benefit on mortality or readmissions. Nitroglycerine has been the vasodilator of choice and is typically administered as continuous infusion at a dosage ranging from 5-400 μg/min. Continuous infusions have been associated with increased health care dollars and increased length of stay, questioning their use. Previously established, Nitro given by higher intermittent bolus causes increased arterial dilation substantially reducing afterload and leading to lower rates of intubation, MI, and ICU admissions, but the "real-world" impact has not been evaluated. This study aims to point out that high dose intermittent bolus administration of Nitro with be associated with a lower rate of ICU admission and shorter hospital LOS when compared to continuous infusion.

Methods: A single hospital (Detroit Receiving Hospital, 100, 000 visits/yr with 1,400 yearly AHF admissions) retrospective cohort study identified 395 patients that received nitroglycerine for AHF therapy in the emergency department over the last 5 years. The patient treatments were compared: intermittent bolus therapy (n= 124), continuous infusion therapy (n= 182) and combined bolus with continuous therapy (n= 89). The primary outcomes that were focused on were length of hospital stay and frequency of ICU admissions. Patients were identified by electronic pharmacy orders, then further verified to make sure infusion was initiated and the reason for Nitro infusion was treatment of AHF. Per protocol Nitro is given in AHF with SBP >160 mm Hg at this facility in the following fashion: 10 mg Nitro in 10 mL syringe, 2 mg given IVP every 3-5 minutes. Per protocol every patient on a titratable vasoactive drug at the time of dispo must be admitted to the ICU. Secondary outcomes include: hypotension defined as SBP <90 mm Hg at any time interval less than 180 minutes after the administration of Nitro, acute MI defined at increase in troponin of at least 0.25 ng/mL within the first 24 hours of presentation, development or worsening renal dysfunction determined by an increase in serum creatinine by 0.5 or more during the first 24 and 48 hour of presentation. Other outcomes include rates of mechanical ventilation and BiPAP use in the ED.

Results: 1,227 patients were identified from pharmacy electronic medication orders and 395 patients met eligibility criteria. The most common reason to have been not eligible for the study was no documentation of Nitro given on the eMAR when ordered. There were small population differences in the 3 study groups: combination treatment had high SBP, patients that received Nitro alone had significantly lower respiratory rates, bolus patients were more likely to have a history of chronic CHF.

In the IV bolus group the median total dose was 2 mg and most patients (79%) received just one dose. The starting does for the infusion was 20 μg/min with a max rate of 35 μg/min.

Primary outcomes: Patients who received nitro bolus alone were less likely to require ICU admission (bolus 48.4%, infusion 68.7%, combination 83%). Median total hospital hours LOS was significantly shorter (bolus 3.7 days, infusion 4.7 days, combination 5 days). There was a trend toward increased rates of mechanical ventilation in the combination group but associated with lower rates of AHF specific readmission within 30 days. The patients that received combination therapy were less likely to have a history of chronic HF and, as such, might be at lower risk.

Bottomline: Bolus dosing decreased ICU admission by 20-30% and decreased LOS by 2-3 days. Some ICU admissions can be avoided with bolus dosing based on avoiding protocol transfers to ICU for patients on titratable vasoactive drugs.

Discussion: Did the combination group's clinical presentation trigger a more aggressive initial therapy because they were a more acute population requiring combination therapy and naturally having increased rates of mechanical ventilation and increased LOS? Do patients on drips just go to the ICU because its protocol? Can this study be applied to our patient population passed on patient demographics, mostly African American population, underserved population with poor medical compliance? Retrospective, non-blinded approach.