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Title: Analysis of DOAC Effects on Heparin Infusion Anti-Xa Levels

Purpose:
An anti-factor Xa assay is one way to monitor the anticoagulant effects of heparin infusions. However, recent literature and clinical findings suggest that patients who are admitted to the hospital previously on a direct oral anticoagulants (DOACs) who then require further anticoagulant therapy with parenteral heparin are more prone to variations in their anti-Xa levels. At this time, a better understanding of the effects of DOACs on differing anti-Xa levels is needed to evaluate the impact on patient safety.

Methods:
This retrospective chart review obtained local institutional review boards for approval. The charts of patients over the age of 18 years old who were on either apixaban, betrixaban, dabigatran, edoxaban, or rivaroxaban prior to receiving an intravenous heparin infusion from September 1, 2019 to April 30, 2020 were reviewed. Specifically, weight, age, heparin dose and indication, anti-factor Xa levels, and current DOAC agent, dose, and indication were collected from patients' charts for evaluation. The primary outcome measure was the initial anti-Xa on heparin infusion and whether it was within, below or above the goal anti-Xa range. The goal ranges were defined for medical treatment (atrial fibrillation (Afib), deep vein thrombosis (DVT), pulmonary embolism (PE), and peripheral artery disease(PAD)) as below goal (<0.3 IU/mL), within goal (0.3 to 0.7 IU/mL), or above goal (>0.7 IU/mL) and for acute coronary syndrome (ACS) treatment as below goal (<0.3 IU/mL), within goal (0.3 to 0.5 IU/mL), or above goal (>0.5 IU/m). Secondary outcomes included mean time to therapeutic goal, defined as at least two consecutive anti-Xa levels within the goal range while on a heparin infusion and mean baseline anti-Xa levels before the start of heparin infusions.

Results:
A total of 27 patients met inclusion criteria, 22 for medical heparin infusion and 5 for ACS heparin infusion, and had an average age of 73 years old and weight of 96.5 kg. Prior to heparin infusion, 74% of patients were on apixaban, 22% on rivaroxaban, and 4% on dabigatran. Additionally, 59% of patients received a heparin bolus before starting on the heparin infusion. The initial anti-Xa level while on the heparin infusion was above the goal range for 74% of all patients, within range for 18.5%, and below goal for 7.4%. More specifically, for the medical treatment group 17 (77%) were above the goal range, 4 (18%) within range, and 1 (5%) below range. While for the ACS treatment group 3 (60%) were above range, 1 (20%) within range, and 1 (20%) below range. The mean time to therapeutic goal was 38.02±31.34 hours for both groups with 41.78±36.43 hours for the 22 medical treatment patients and 22.62±7.66 for the ACS treatment patients. The average baseline anti-Xa level before heparin infusion for the 22 patients in which it was collected was 0.72±0.66 for both groups.

Conclusion:
This retrospective chart review indicates that patients on a DOAC who later require a heparin infusion in the hospital may have elevated initial anti-factor Xa levels and that more research needs conducted to determine the safety impact on patients.