Outcomes of No Bolus versus Bolus Unfractionated Heparin Nomograms in a Real-World Cohort

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Introduction

- Unfractionated heparin (UFH) is a cornerstone of acute pulmonary embolism (PE) management. A weight-based UFH nomogram, with an initial bolus followed by continuous infusion **("bolus nomogram")** titrated to target activated partial thromboplastin time (aPTT), has been established as standard dosing.
- Studies have shown difficulty of achieving and maintaining therapeutic aPTT values. Increased time in subtherapeutic range is associated with increased rates of recurrent venous thromboembolism (VTE) and mortality.
- Patient factors may lead clinicians to withhold the initial UFH bolus **("no bolus nomogram").** There are few data describing the effects of withholding the initial UFH bolus on aPTT values.

Methods

- Patients with Pulmonary Embolism Response Team consult at Barnes-Jewish Hospital between 1/1/2021-7/1/2025
- Intermediate-risk or massive PE treated with UFH as initial AT
- Primary outcome was the percent time with a subtherapeutic aPTT value in the first 24 hours of UFH treatment

Acknowledgements

This study was supported by the Mentors in Medicine Program (Department of Medicine, Washington University in St. Louis)

Results

- 261 patients were identified
  - UFH Bolus **withheld** from 63 patients (24%)
  - UFH Bolus **given** to 198 patients (76%)
- Predictors of bolus omission:
  - **Surgery within 12 weeks prior to PE diagnosis** (Odds Ratio [OR] 0.37; 95% confidence interval [CI] 0.20-0.71; p = 0.002)
  - **History of major bleed** (OR 0.14; 95% CI 0.04-0.47; p = 0.002)
  - **Each 1-unit decrease in hemoglobin** (OR 0.85; 95% CI 0.75-0.96; p = 0.014)

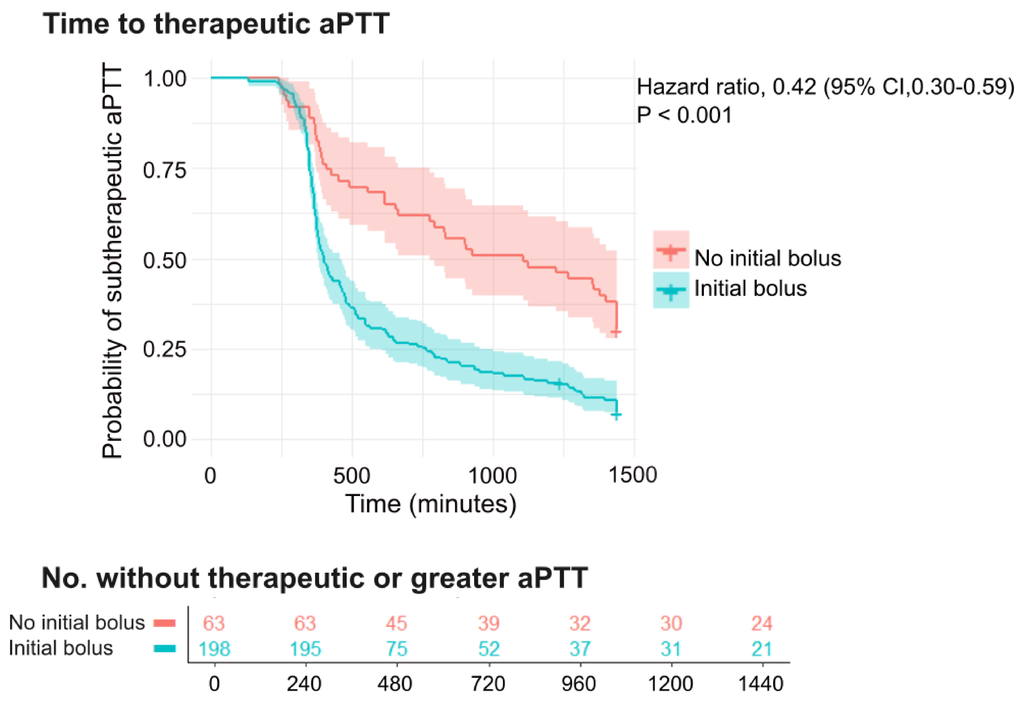

Figure 1. Omission of an initial bolus was associated with a 58% decrease in likelihood of achieving a therapeutic or greater aPTT within 24 hours of UFH initiation

- At 24 hours after UFH initiation, 24 patients (38%) in the no bolus compared to 21 patients (11%) in the bolus group still had not achieved a therapeutic or greater aPTT

Table 1. Association between heparin nomograms and aPTT

Outcome	No bolus (n=63)	Bolus(n=198)	Mean Difference (95% CI)	P Value
Percent time in subtherapeutic range-%. (IQR)	**63.9 (74.6)**	**33.8 (60.4)**	**62.5% (24.2%, 100%)**	**0.001**
Percent time in therapeutic range -%. (IQR)	12.8 (42.3)	30.7 (53.5)	-24.6% (-58.1%, 8.9%)	0.15
Percent time in supratherapeutic -%. (IQR)	0.0 (30)	26.6 (50)	-66.1% (-99.9%, -32.3%)	0.001
Median hours in subtherapeutic range (IQR)	15.3 (17.9)	8.1 (8.6)		0.01
Median hours to to achieve an aPTT ≥ therapeutic range (IQR)	18.5 (17)	6.7 (6.9)		0.001

Conclusions

- Withholding the initial UFH bolus in the treatment of acute PE is associated with an increased percentage of time in subtherapeutic aPTT range within the first 24 hours of therapy.
- Prior studies have demonstrated an association between delay to therapeutic anticoagulation and risk of adverse outcomes.
- Evaluation of the risk of PE-related mortality and recurrent VTE after bolus omission is needed.

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