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“It's so expensive and isn't any better! Or is it?” A Comparative Analysis of Price per ECMO Hour, Intracranial Hemorrhage, and Survival Rates in Neonates on Bivalirudin vs. Heparin

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A Cost-Analysis of Bivalirudin vs Heparin in Neonatal ECMO

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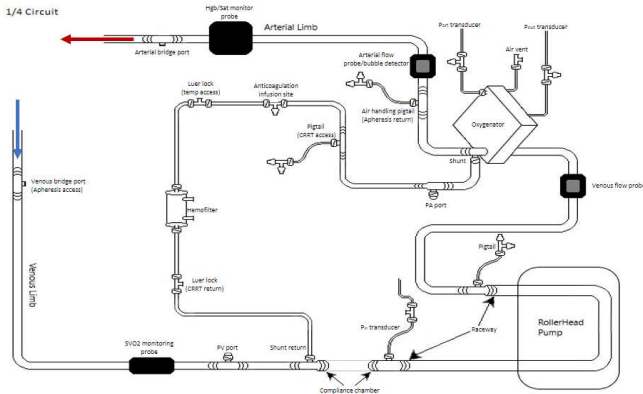
Introduction

- Heparin is currently the primary anticoagulant for ECMO
 - Ease of reversibility, low cost, purported ease of titration
- Limitations of heparin
 - Requires anti-thrombin for efficacy, only inhibits free thrombin, may cause heparin-induced thrombocytopenia
 - Newborns have ↓ anti-thrombin, ↓ ability to generate thrombin, and ↑ clearance of heparin than other ages
- Bivalirudin does not require anti-thrombin for efficacy, inhibits free and bound thrombin, and does not result in heparin induced thrombocytopenia
- Hesitation to utilize bivalirudin largely stems from the ↑ increased cost of bivalirudin, lack of ease of reversal, lack of prospective studies evaluating use

Methods

- Single center, retrospective study
- Inclusion Criteria
 - Admitted to the NICU from 1/2019 to 5/2023
 - Received heparin or bivalirudin continuous infusion while on ECMO
- Patients were divided into two groups
 - Group 1: Heparin; Group 2: Bivalirudin
- Primary Objective:
 - Evaluate cost per ECMO hour between Group 1 and 2
- Secondary Objectives:
 - Evaluate the incidence of intracranial hemorrhage and survival between the two groups.

Circuit Setup

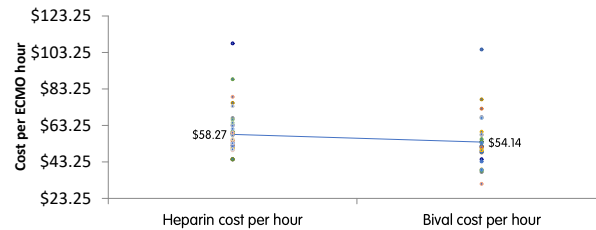


Demographics

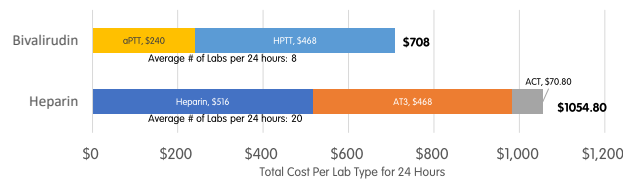
	Group 1: Heparin (n=39)	Group 2: Bivalirudin (n=29)
	Median (Range)	
Gestational Age (Weeks)	38.3 (33-41.2)	39 (33.6-44)
Weight (kg)	3.1 (2.1-6.7)	3.4 (2.1-5.6)
Age on ECMO (Days)	1 (0-201)	1 (0-191)
ECMO Days	6 (1.3-40.5)	11 (2.5-45.3)
Primary Diagnosis, n		
PPHN	10	8
CDH	5	10
Sepsis	9	0
Respiratory Failure	2	4
Meconium Aspiration	3	3
Congenital Heart Defect	4	1
Miscellaneous	7	4

Results

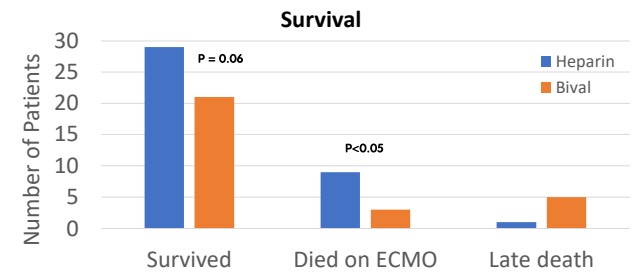
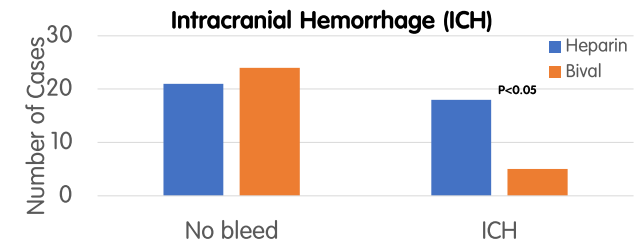
Heparin vs Bivalirudin Cost Per Hour



Mean Lab Cost for Heparin or Bivalirudin



Results



Strengths/Limitations

- Strengths
 - Limited to NICU admissions to minimize variability
 - Largest known cohort of infant ECMO that assessed comprehensive costs (tubing, components, labs, costs)
 - Wide range of ECMO duration and diagnoses
- Limitations
 - Did not assess time to therapeutic anticoagulation or % within therapeutic range for anticoagulation

Conclusions

- Cost difference per hour of ECMO is similar between heparin and bivalirudin anticoagulation when utilizing average wholesale price costs
- A reduction in ICH was seen with bivalirudin
- Survival trended towards improvement with use of bivalirudin

