PERT Activation with AI Improves Time to Intervention and Survival in High-Risk Pulmonary Embolism

Joshua Meredith, MD[1]; Patrick Muck, MD[1,2]; Adam Reichard, MD[1,2]; Angela N Fellner, PhD CCRP[3]
Affiliations: TriHealth, Cincinnati, OH, [1]Department of Vascular Surgery; [3]Hatton Research Institute

BACKGROUND

- High-risk pulmonary embolism is associated with exceedingly high mortality rates. Pulmonary embolism response teams (PERT) allow rapid evaluation and triage of these patients
- With integration of artificial intelligence (AI), PERT activations should improve speed and quality of communication between teams allowing for more rapid treatment and improved survival
- We predicted that time to intervention and mortality would improve after integration of AI PERT activation due to improvement in communication and multidisciplinary involvement

METHODS

- Single center retrospective review of operative high-risk PE patients from 2018 through 2025. Artificial Intelligence providing identification and notification of PE was integrated in 12/2022 with an overhaul of our PERT
- **Primary outcomes: In-hospital mortality, time to Intervention**
- **Secondary outcomes: Limb Ischemia, major hemorrhage, renal replacement therapy, cerebrovascular accident (CVA)**
- Continuous variables were analyzed using t-test. Categorical variables reported using percentages; compared using Fishers Exact Test. Preoperative patient factors were evaluated using Spearman's Rank Correlation

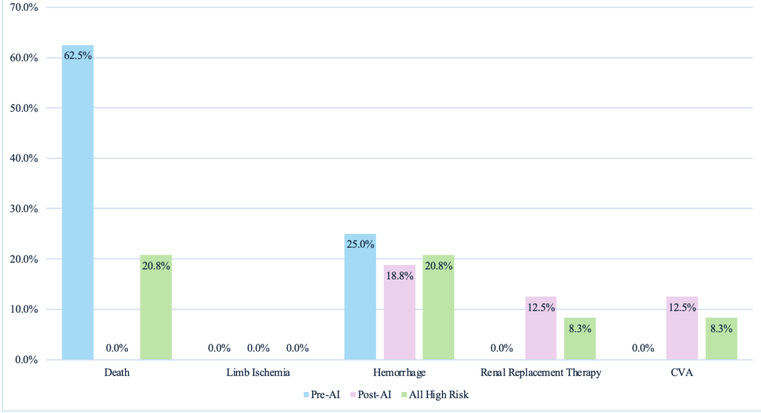
2. Author has a financial relationship with Penumbra Inc.

Table 1: Patient Demographics and Outcomes

	All Patients	Pre-AI	Post-AI	Odds Ratio	P-Value
Patients (n)	24	8	16	N/A	N/A
Age (Avg Years)	58.2	63	55.75	N/A	N/A
Intrahepatic Reflux of Contrast	59.1%	62.5%	57.1%	0.8	0.69
Severe RV Dysfunction	75%	62.5%	83.3%	3	0.34
RV:LV	1.86	1.875	1.85	N/A	0.94
Thrombolysis	20.8%	50%	6.25%	0.067	0.027
VA-ECMO Utilization	54.2%	25%	68.8%	6.6	0.048
Mortality	21.7%	62.5% (5 of 8)	0% (0 of 16)	N/A	0.001
Limb Ischemia	0%	0% (0 of 8)	0% (0 of 16)	N/A	1.0
Hemorrhagic Complications	20.8%	25% (2 of 8)	18.75% (3 of 16)	0.54	0.54
Acute Renal Failure	8.3%	0% (0 of 8)	12.5% (2 of 16)	0.53	0.53
Cerebrovascular Accident	8.3%	0% (0 of 8)	12.5% (2 of 16)	0.53	0.53

Correlation with Mortality		
	Pearson's Rho	P-Value
Female Sex	0.4055	0.049
RV:LV	0.1836	0.478
Severe RV Dysfunction	-0.3162	0.175
Severe RV Dilation	-0.2941	0.209
Contrast Reflux in IVC	-0.3608	0.118

Figure 1: Outcomes High Risk PE - Pre-AI and Post-AI



RESULTS

- Table 1 and Figure 1 summarize study data and outcomes
- 24 patients underwent embolectomy, 8 Pre-AI, 16 Post-AI
- VA-ECMO was utilized more frequently Post-AI (OR 6.6, p=0.048)
- Thrombolytics was utilized less frequently Post-AI (OR 0.067, p=0.027)
- Time to Intervention decreased significantly Post-AI (1.75 days vs. 0.56 days, p=0.018)
- Mortality decreased Post-AI (62.5% vs. 0%, p=0.001)
- Limb ischemia, major hemorrhage, renal replacement therapy, and CVA occurred at similar rates between the groups
- Female sex correlated moderately with mortality (Pearson's rho=0.4055, p=0.049)
- Preoperative RV dysfunction, RV Strain, and contrast reflux into the IVC did not correlate with mortality

CONCLUSIONS

- Integration of AI into PERT is associated with improved survival in high-risk PE
- Time to intervention also decreased substantially following integration
- Despite increasing utilization of VA-ECMO, complication rates have remained low
- Improved communication and multidisciplinary involvement stimulated by artificial intelligence PERT activation can have a meaningful impact on patient outcomes