

Management of RV shock in acute PE

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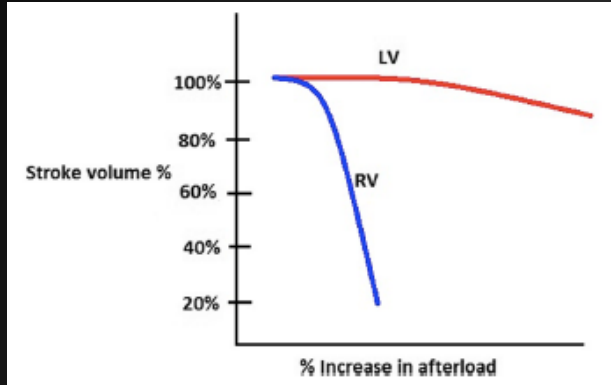
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Disclosures

- Consultant : Neptune Medical
- Institutional Educational Support: Inari medical

The unique features of shock caused by PE

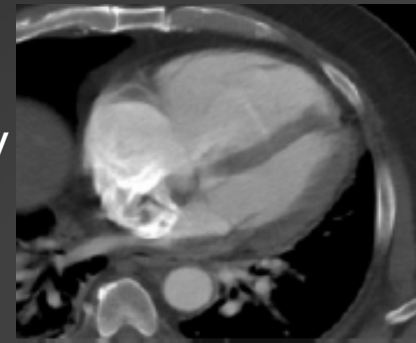
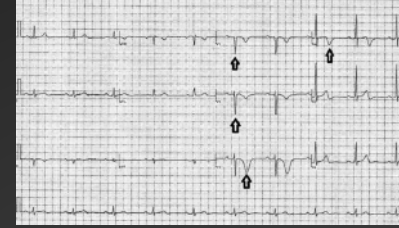


Initial Insult:

RV failure due to excess afterload

Amplifiers

- Ischemia
- Inflammation
- Decreased LV output due to LV compression



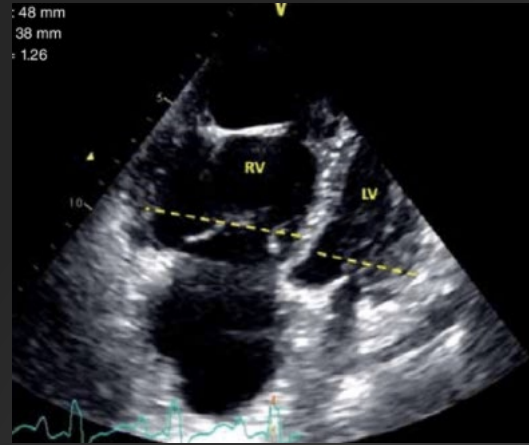
First target : RV support Pharmacology

Preload

- RA 8-12 mm Hg
- caution if JVD/plethoric IVC on echo

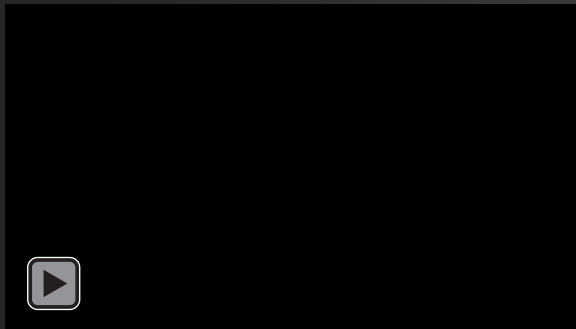
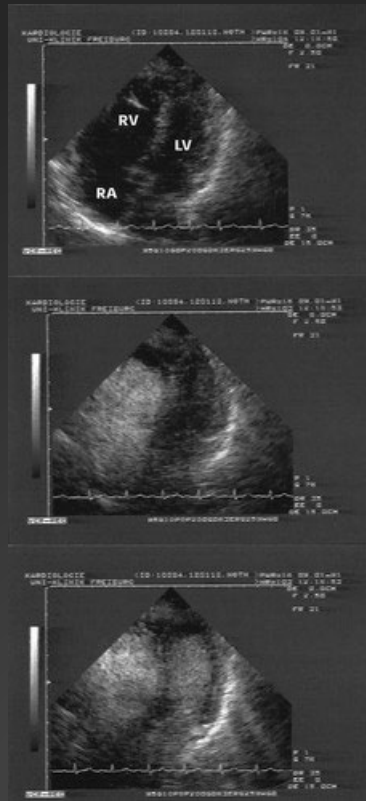
Vasopressor Support

- Preferred : **epinephrine**, norepinephrine
- Avoid : phenylephrine, vasopressin (pulmonary vasoconstriction)
dobutamine, milrinone (hypotension)

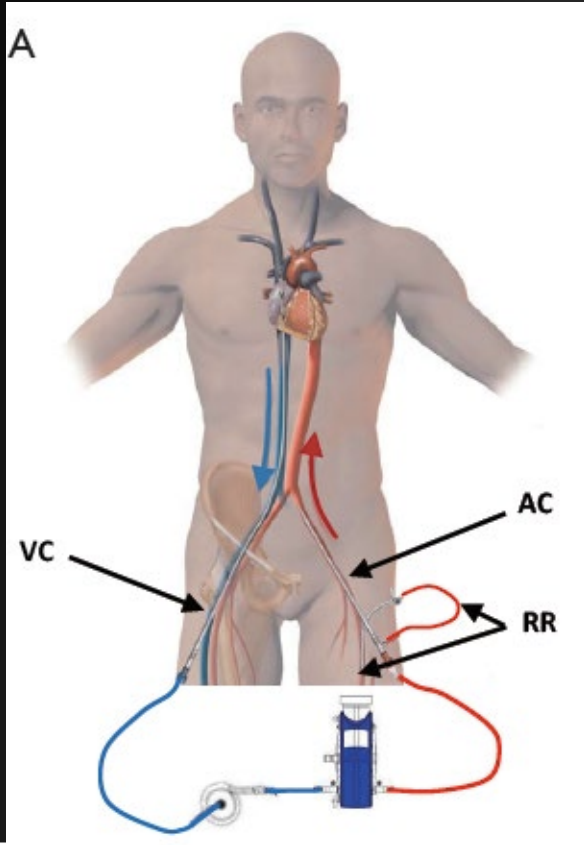


Beware of the PFO!

- PFOs are common (30%) and associated with 11.4 OR mortality in PE
 - Profound drop in SpO₂ can occur due to elevated RA pressures shunting through PFO
- Paradoxical embolization



MCS in PE=VA ECMO



ECMO use is uncommon in PE BUT expertise is critical for the PERT!

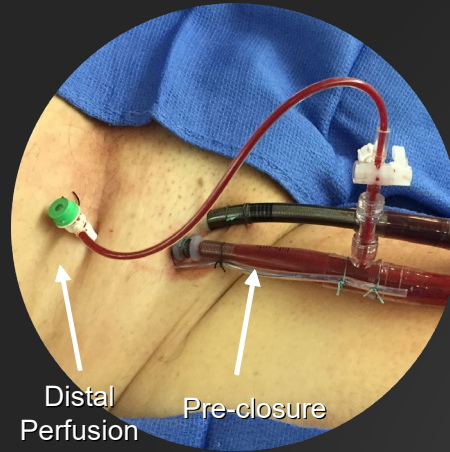
- Circulatory collapse (< 30 min CPR with ROSC)
- Hemodynamic support during thrombectomy
- Need for intubation

Contemporary ECMO in PE Shock

Rapid deployment process



Access access access...

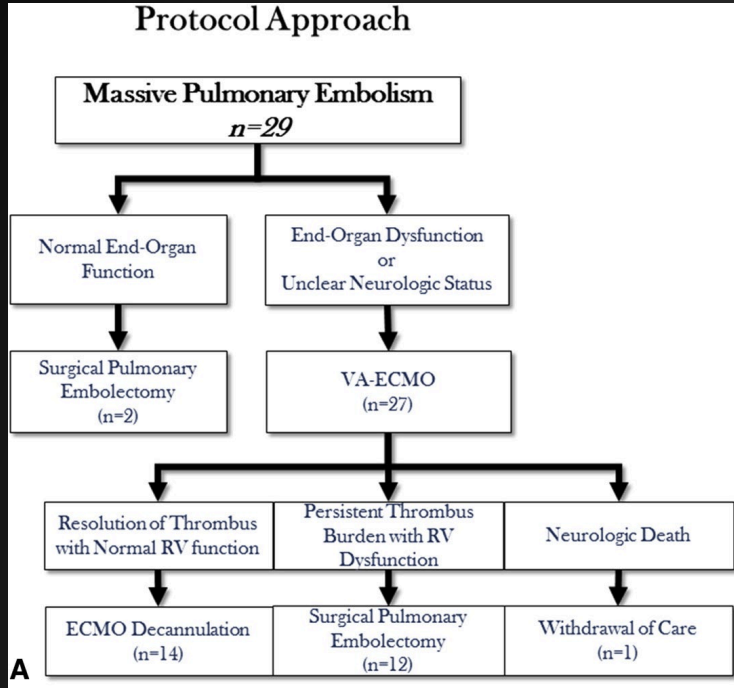


- US/fluoro guide access
- Arterial placeholder at the beginning of the case
- Distal perfusion cannula

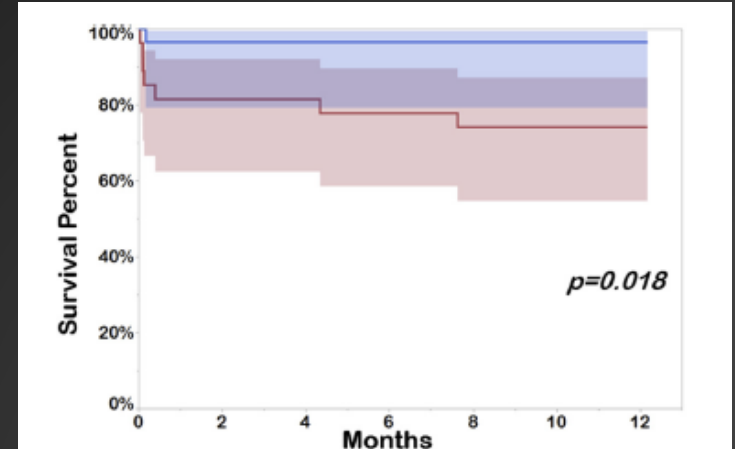
Courtesy of John C. Gurley MD University of Kentucky

ECMO in PE Shock

U Maryland Protocol: upfront ECMO + thrombectomy for high risk (massive) PE



97% survival!



Pasrija et al, J Thor CV Surg 2018

Second target : The clot

Challenging the thrombolytic-first approach for massive PE

Systemic thrombolytic therapy is recommended for high-risk PE.²⁸²

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B

Percutaneous catheter-directed treatment should be considered for patients with high-risk PE, in whom thrombolysis is contraindicated or has failed.^d

IIa

C

ESC PE Guidelines
Konstantinides et al, 2019

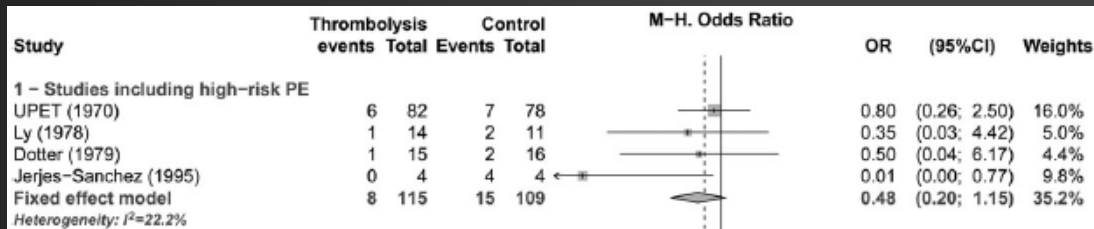
Challenging the thrombolytic-first approach for massive PE

Systemic thrombolytic therapy is recommended for high-risk PE. ²⁸²

I

B

- 9.9% risk of major bleeding ¹
- < 30% of high risk (massive) PE pts get lytics ^{2,3}
- 30% of patients have contraindication to lytics
- Mortality remains high 25% ^{4,5}
- Limited evidence



Large Bore Aspiration Thrombectomy as an Alternative

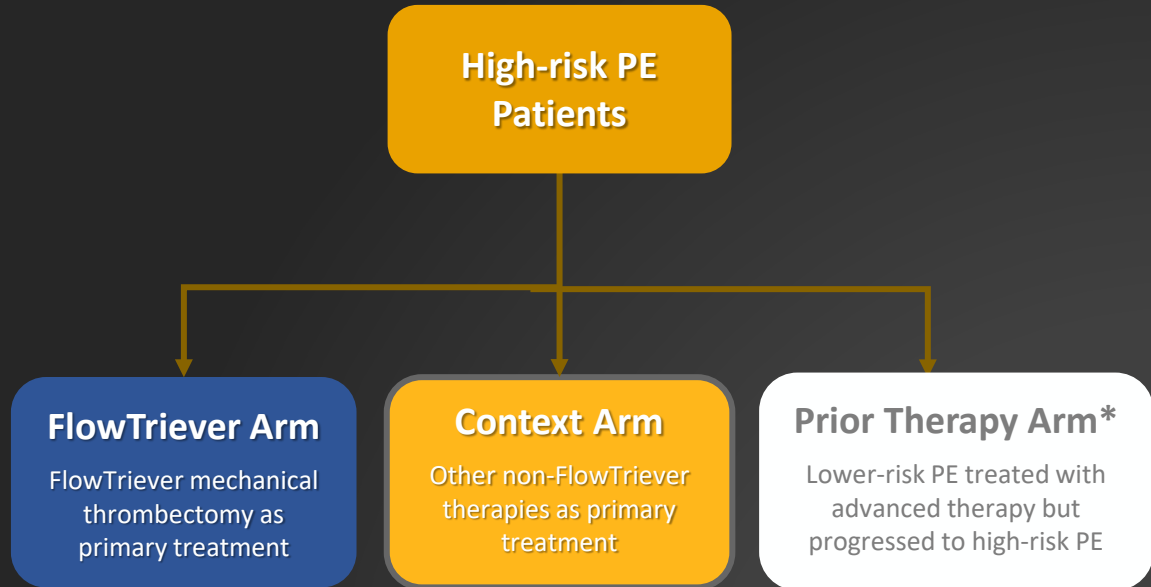


FLAME: Study Design

Prospective, multicenter, non-randomized, parallel group, observational study of high-risk PE

Trial Details

- Specific treatment not dictated (physician discretion)
- Concurrent, non-randomized enrollment
- Patients followed through discharge or 45 days
- Designed to capture all high-risk PE patients:
 - Waiver of consent for unbiased enrollment
 - Chart review to ensure no high-risk patients were missed



*Not shown due to low enrollment (n=1)

FLAME registry: Clinical Presentation

115 patients from 11 US
Interventional Cardiology sites
with established PE programs

	FlowTrievers Arm (n = 53)	Context Arm (n = 61)
Reason for high-risk PE:		
• Systolic BP <90 mmHg or decrease of >40 mmHg for 15 minutes	34 (64.2%)	31 (50.8%)
• Need for vasopressor support	32 (60.4%)	46 (75.4%)
• Resuscitation after cardiac arrest with <30 minutes of CPR and Glasgow Coma Scale >8	11 (20.8%)	20 (32.8%)
Contraindication to thrombolytics	22/53 (41.5%)	7/60 (11.7%)
Absolute	6/53 (11.3%)	3/60 (5.0%)
Relative	16/53 (30.2%)	4/60 (6.7%)

FLAME Registry: Primary Endpoint

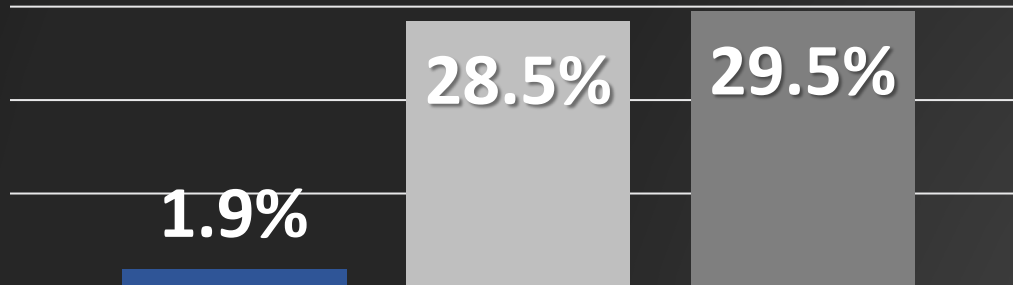
FlowTrievers Arm

Composite Primary Endpoint: **17.0%***

- all-cause mortality
- bailout to an alternate thrombus removal strategy
- clinical deterioration
- major bleeding

*Significantly lower than the literature-based performance goal of **32.0%** ($P < 0.01$)

In-hospital Mortality



FlowTrievers Arm

n = 53

Performance Goal

Literature-based

Context Arm

n = 61

FLAME registry

- The FLAME study is the largest interventional trial in high-risk PE
- *Patients with PE shock* who are deemed candidates for large-bore aspiration thrombectomy and can be transported to a catheterization lab for the procedure *demonstrate excellent outcomes and low rates of complication*

Initial therapeutic option for high risk PE

Should I give tPA to this patient?

Initial therapeutic option for high risk PE

Can I take this patient to the cath lab for aspiration thrombectomy?

- Available rapid deployment team
- Assessment of hemodynamics
- Mechanical Circulatory Support
- Prompt relief of obstruction without bleeding risk

Stages of Cardiogenic Shock in PE

Low Risk

- Normotensive
- No RV dysfunction
- Normal biomarkers

Submassive (Intermediate Risk)

- Normotensive
- RV dilation (RV/LV>1)
- + biomarkers

Massive (High Risk)

- Hypotension (SBP < 90 for > 15 min)
- Shock (on pressors)
- PEA

At Risk for shock

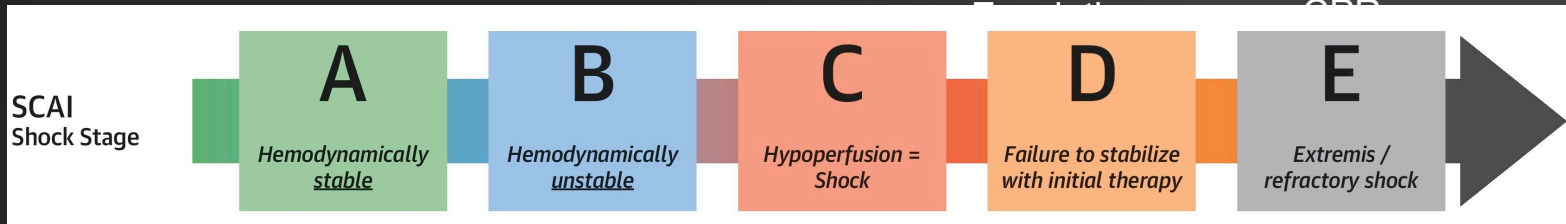
Normotensive shock

Hypotension

Obstructive Shock

Cardiac Arrest

Dilated RV+



Cold/clammy
/oliguric

