



Fairfield
Medical Center

Management of Venous Thromboembolism

Jason André, MD
Cardiovascular Symposium
November 13th, 2024

OBJECTIVES

- Why VTE Important
- When To Be Concerned About VTE
- Medical Management Of VTE
- When Do You Need Vascular Surgery
- What We Provide At Fairfield Medical Center



WHY IS VTE IMPORTANT

- 900,000 case of VTE yearly (0.1% of population)
- Patients we see are higher risk
 - Less active (obese?)
 - Cancer
 - Surgery
 - COVID-19
- 60,000-100,000 patients die each year from VTE

BUT WHAT HAPPENS TO THE PATIENTS WHO SURVIVE

Center for Disease Control May 15, 2024



Fairfield Medical Center

POST THROMBOTIC SYNDROME

- 20-50% of patients develop PTS
 - Studies with longer follow up found even higher rates over time
- 5-10% develop severe PTS
 - Venous ulcers
- Annual healthcare cost for PTS patients \$7000



POST THROMBOTIC SYNDROME

Symptoms	Clinical Signs
Pain	Edema
Sensation of swelling	Telangiectasia
Cramps	Venous dilatation/ectasia
Heaviness	Varicose veins
Fatigue	Redness
Itching	Cyanosis
Pruritis	Hyperpigmentation
Bursting pain	Eczema
Venous claudication	Pain during calf compression
	Lipodermatosclerosis
	Atrophie blanche
	Open or healed ulcers

POST PULMONARY EMBOLISM SYNDROME

- Not as well studied
- Broken down into two categories
 - Chronic Thromboembolic Pulmonary Disease (CTEPD)
 - Chronic Thromboembolic Pulmonary Hypertension (CTEPH)
- Persistent dyspnea, cardiac dysfunction, pulmonary hypertension
- Up to 3% of patients who survive from PE will develop CTEPH



Long-term Consequences of PE: “Post-PE Syndrome”

Meta-analysis including **nearly 3,700** PE patients
(18-month median follow-up):



18%

ongoing RV
dysfunction¹



11%

moderate or severe
functional impairment
(NYHA III-IV)¹



5th percentile

6-minute walk test scores
(vs. population norms)¹



24%

30-day all-cause
readmission²

“Mechanistically, rapid unloading of the right ventricle and increased thrombus clearance may prevent maladaptive cardiopulmonary remodeling.”¹

1. Sista AK, et al. Persistent right ventricular dysfunction, functional capacity limitation, exercise intolerance, and quality of life impairment following pulmonary embolism: Systematic review with meta-analysis. Vasc Med. 2017 Feb;22(1):37-43
2. PERT Consortium Registry Data. Interim results on 3,400 Patients presented at PERT Symposium October 2020

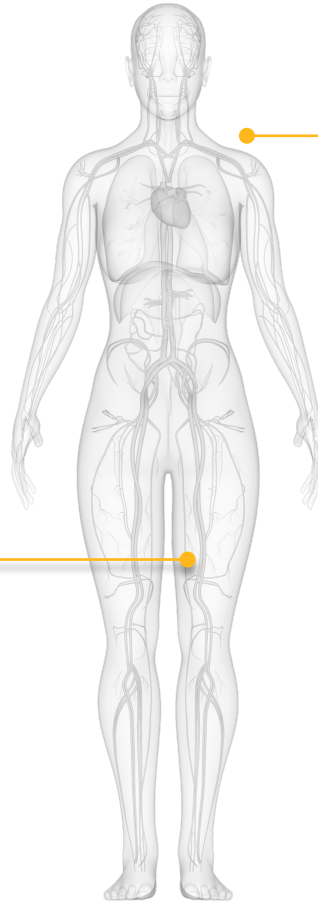
VTE Long Term

DVT

Up to **50%** develop post-thrombotic syndrome (PTS) within 2 years of a proximal DVT¹

~90% of PTS patients are unable to work 10 years after diagnosis²

>10% of PTS patients develop venous leg ulcers.³ Patients w/ severe PTS have QoL comparable to congestive heart failure or cancer⁴



PE

#3 leading cause of cardiovascular death⁵ (and a leading cause of preventable deaths in hospital)

Up to **15%** 30-day all-cause mortality^{6,7} (28% for high-risk PE⁶)

Up to **50%** have residual vascular obstruction⁸⁻¹⁰ and long-term complications are common¹¹

1. Kahn, Susan R. Hematology Am Soc Hematol Educ Program. 2016 Dec 2; 2016(1): 413–418
2. Kahn, et al. Arch Intern Med. 2004;164:17-26
3. Galanaud, et al. Thromb Haemost 2018; 118(02): 320-328
4. Office of the Surgeon General (US); National Heart, Lung, and Blood Institute (US). Office of the Surgeon General (US); 2008.
5. "Pulmonary Embolism in 2017: Increasing Options for Increasing Incidence", National Center for Biotechnology Information, May 2017.
6. PERT Consortium* Registry Data. Interim results on 5,048 Patients presented at PERT Symposium October 2021
7. Schultz J, et al. Pulm Circ. 2019 Jan 11;9(3):2045894018824563;
8. Chopard et al. 2017. Am J of Cardiol. Volume 119, Issue 11, 1883–1889
9. Miniati et al. 2006 Medicine. 85. 253-62. 10.1097/01.md.0000236952.87590.c8
10. Mrozek et al. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2018 162(2):121-126. doi: 10.5507/bp.2018.001
11. Sista AK, et al. Vasc Med. 2017 Feb;22(1):37-43

WHEN TO THINK DVT

- Acute leg swelling
 - Chronic swelling PTS?
- Calf pain with standing or walking
 - If a more chronic symptom and only with walking consider PAD as well
- Calf pain with foot dorsiflexion
- Previous history of VTE
- Cancer, recent surgery, recent travel, family history



WHEN TO THINK PE

- Chest pain
- Shortness of breath
- Coughing
 - Hemoptysis
- Flank/rib pain
- Dizziness lightheadedness
- Tachycardia
- Hypoxia and associated symptoms



Concomitant DVT in Setting of PE

Diagnosing DVT during PE treatment may reduce PE-related mortality, and prompt timely prevention of post-thrombotic syndrome (PTS) symptoms.



50-65%

Of patients with PE also have **proximal DVT**¹⁻³.



>4X

Risk of **90-day PE-related mortality** in PE patients with proximal DVT⁴



>4X

Risk of **90-day recurrent VTE** in PE patients with proximal DVT⁴

1. Becattini, et al. Risk Stratification of Patients With Acute Symptomatic Pulmonary Embolism Based on Presence or Absence of Lower Extremity DVT: Systematic Review and Meta-analysis. Chest. 2016 Jan.
2. Hirmerova, et al. The Prevalence of Concomitant Deep Vein Thrombosis, Symptomatic or Asymptomatic, Proximal or Distal, in Patients With Symptomatic Pulmonary Embolism. Clin Appl Thromb Hemost. 2018 Nov.
3. Nishiwaki, et al. Impact of Concomitant Deep Vein Thrombosis on Clinical Outcomes in Patients With Acute Pulmonary Embolism. American Heart Association. 2019 Nov.
4. Jiménez, et al. Prognostic significance of deep vein thrombosis in patients presenting with acute symptomatic pulmonary embolism. Am J Respir Crit Care Med. 2010 May

MEDICAL MANAGEMENT OF VTE

- CHEST GUIDELINES!
- Panel of physicians using evidence-based medicine to give guidelines for management of VTE
- Give a multitude of clinical scenarios and give their recommendation
- None of the panelist are vascular surgeons
- Link on UpToDate



Evidence-Based Medicine

Antithrombotic Therapy for VTE Disease: CHEST Guideline and Expert Panel Report

8. In patients with an unprovoked DVT of the leg (isolated distal or proximal) or PE, we recommend treatment with anticoagulation for at least 3 months over treatment of a shorter duration (Grade 1B), and we recommend treatment with anticoagulation for 3 months over treatment of a longer time-limited period (eg, 6, 12, or 24 months) (Grade 1B).

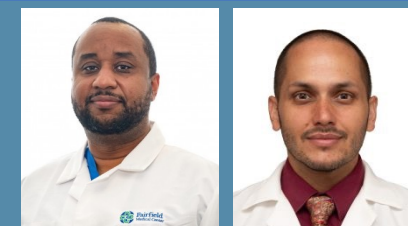
Remarks: After 3 months of treatment, patients with unprovoked DVT of the leg or PE should be evaluated for the risk-benefit ratio of extended therapy. Duration of treatment of patients with isolated distal DVT refers to patients in whom a decision has been made to treat with anticoagulant therapy; however, it is anticipated that not all patients who are diagnosed with isolated distal DVT will be prescribed anticoagulants.

9. In patients with a first VTE that is an unprovoked proximal DVT of the leg or PE and who have a (i) low or moderate bleeding risk (see text), we suggest extended anticoagulant therapy (no scheduled stop date) over 3 months of therapy (Grade 2B), and (ii) high bleeding risk (see text), we recommend 3 months of anticoagulant therapy over extended therapy (no scheduled stop date) (Grade 1B).

INTERVENTIONS FOR DVT

- IVC filter
 - CHEST guidelines
- Proximal occlusive DVT
 - Iliac or COMMON femoral vein DVT
 - Subclavian vein
- Chronic DVT with PTS/venous hypertension symptoms



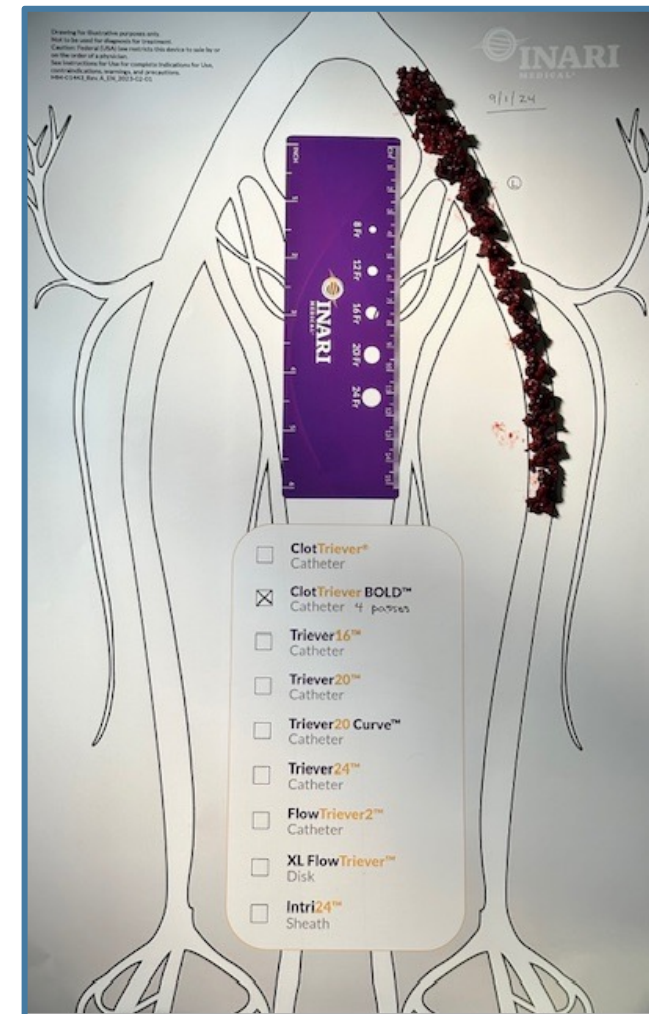
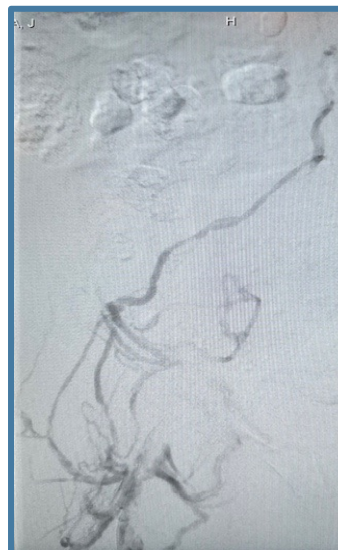


PRESENTATION | September 1st, 2024

- 54-year-old female presented to the ED with left lower extremity pain & swelling.
- Duplex US confirmed extensive left iliofemoral DVT
- Single Session Thrombectomy Intervention with NO thrombolytics or ICU stay

CASE RESULTS

- 20-min device time & 60-min stick-to-stitch
- Post thrombectomy venography confirmed 100% clot removal & restored vessel patency



Deep Vein Thrombosis

Inari Medical ClotTrievers BOLD® w/Protrieve

Procedure Date: 09/16/2024



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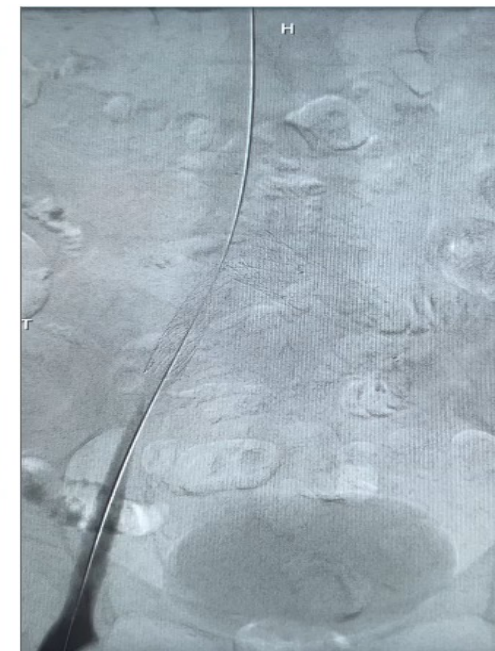
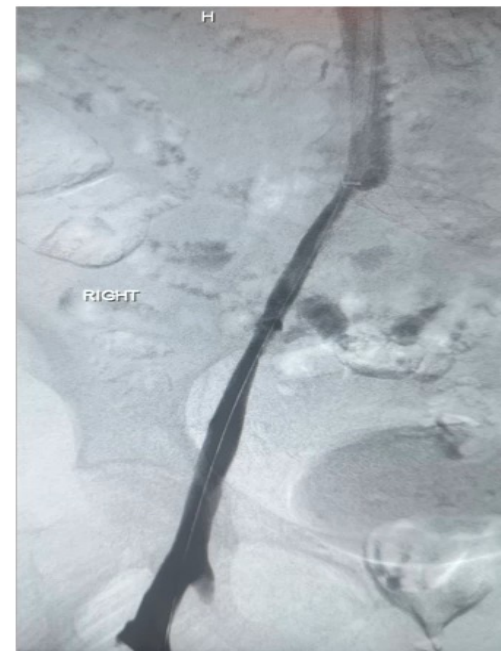
Vascular Surgery Team

Patient History

- **Patient:** 79-year-old female
- **History:** Presented to the ED with right lower extremity pain & swelling. Duplex confirmed right iliac DVT.

Procedure Notes

- Patient positioned supine for R.CFV & R.IJ access
- The occlusion was successfully crossed by working from above and below.
- Inari Protrieve sheath inserted into the R.IJ for embolic protection
- 16Fr ClotTrievers Sheath placed into the patients R.CFV
- Multiple passes with ClotTrievers BOLD from the groin removed large chunks of chronic thrombus
- Post thrombectomy venograms confirmed 100% clot removal and restored vessel patency
- An Abre stent was placed to treat the remaining compression
- **30-min device time, 120-min stick-to-stitch**
Single session, NO TPA, NO ICU

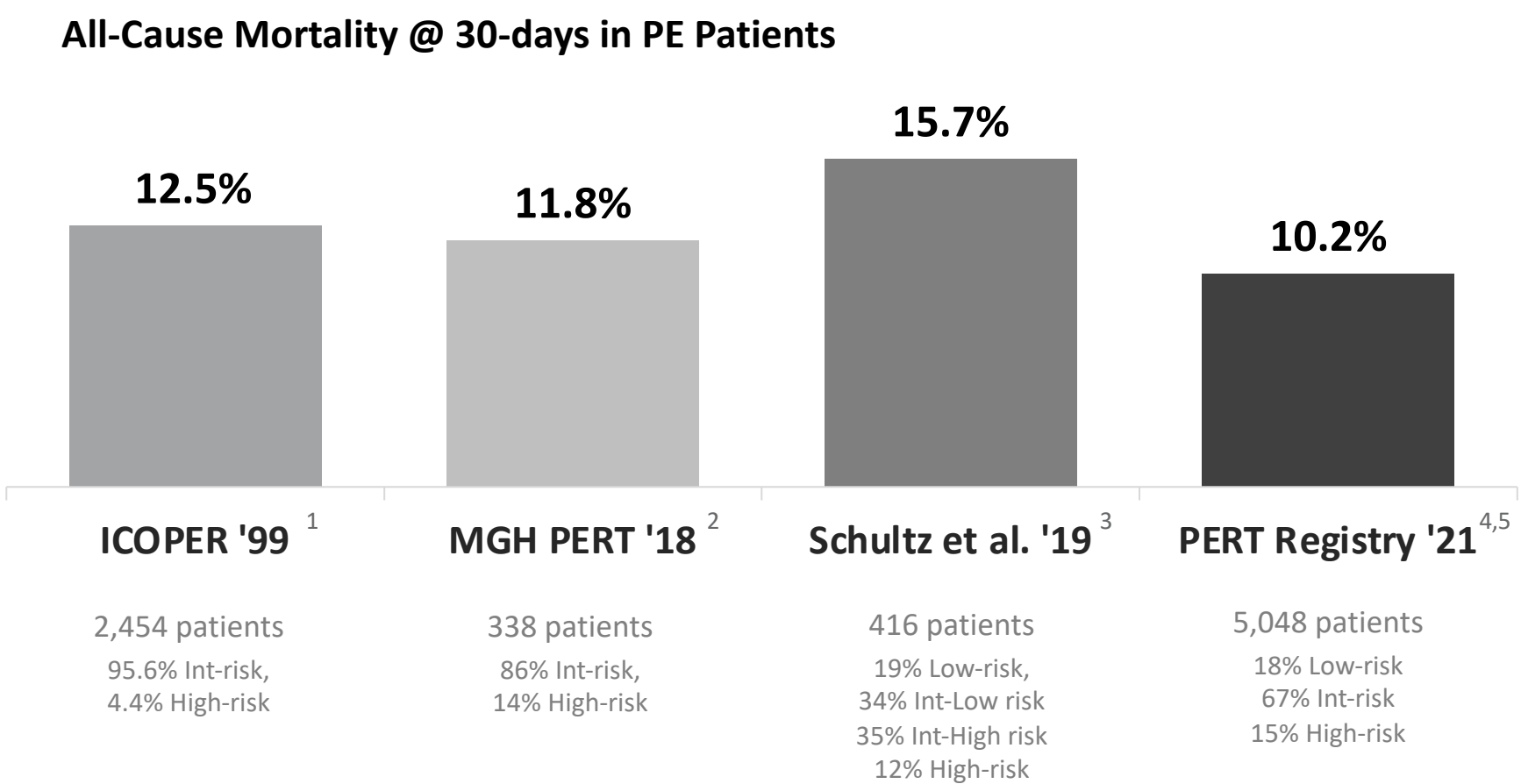


INTERVENTION FOR PE

- IVC filter
- Saddle pulmonary embolism
- Intermediate risk PE
- Cor pulmonale
- FMC PERT Protocol



Mortality in PE patients has not improved much over 20 years



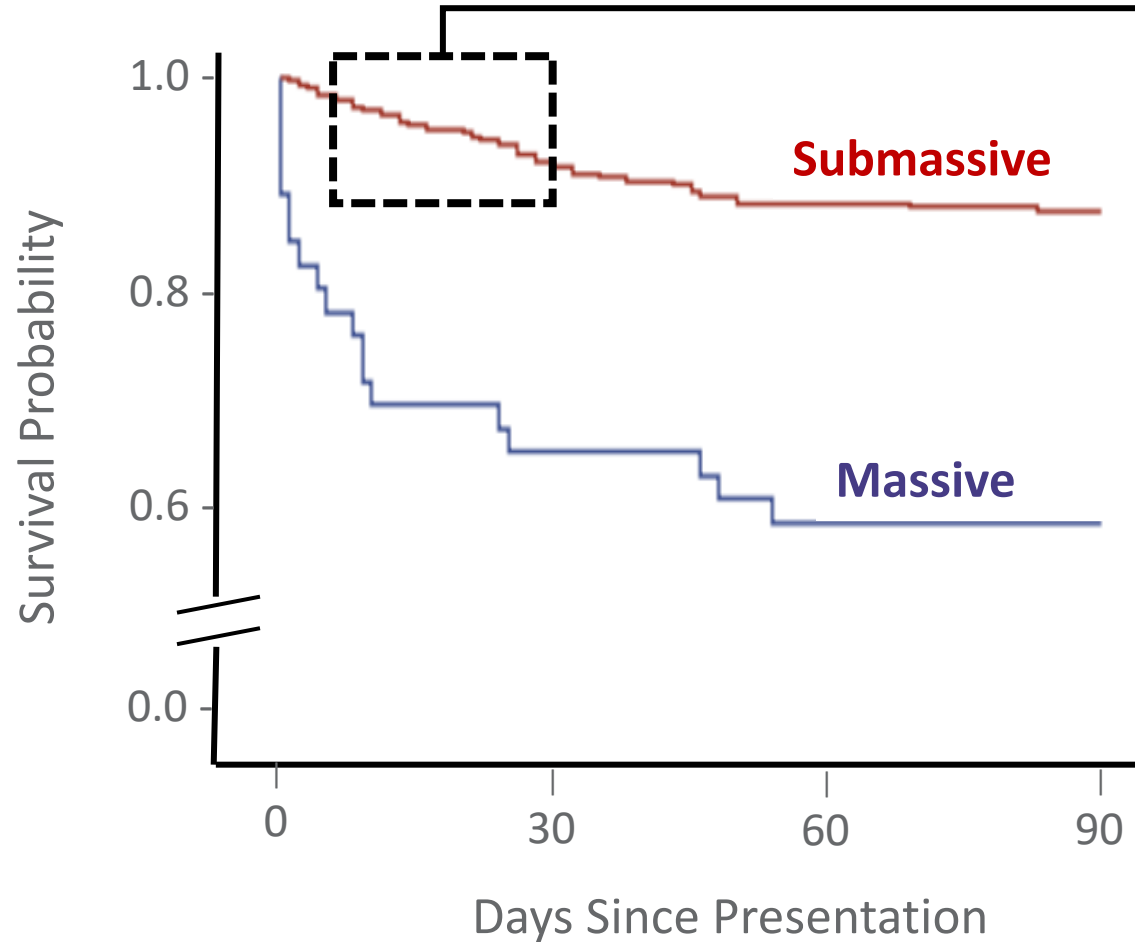
30-day all-cause
Mortality by risk level:

6-15%
for **submassive**
PE patients

25-50%
in **massive** PE
patients

1. Kucher N, et al. Massive pulmonary embolism. Circulation. 2006 Jan 31;113(4):577-82. doi: 10.1161/CIRCULATIONAHA.105.592592. Epub 2006 Jan 23. PMID: 16432055 2. Secemsky E, et al. Contemporary Management and Outcomes of Patients with Massive and Submassive Pulmonary Embolism. Am J Med. 2018 Dec;131(12):1506-1514.e0 3. Schultz J, et al. A Multidisciplinary Pulmonary Embolism Response Team (PERT) - Experience from a national multicenter consortium. Pulm Circ. 2019 Jan 11;9(3):2045894018824563 4. PERT Consortium Quality Database. October 2021 (Presented by Secemsky E) 5. Darki A & Jaber WA. Endovascular Today. July 2022 Supplement (PERT Updates)

MGH PERT Data: acute submassive mortality happening after discharge



Nearly half

of submassive 30-day mortality occurred after the patient left the hospital

& nearly **2/3** of 90-day mortality

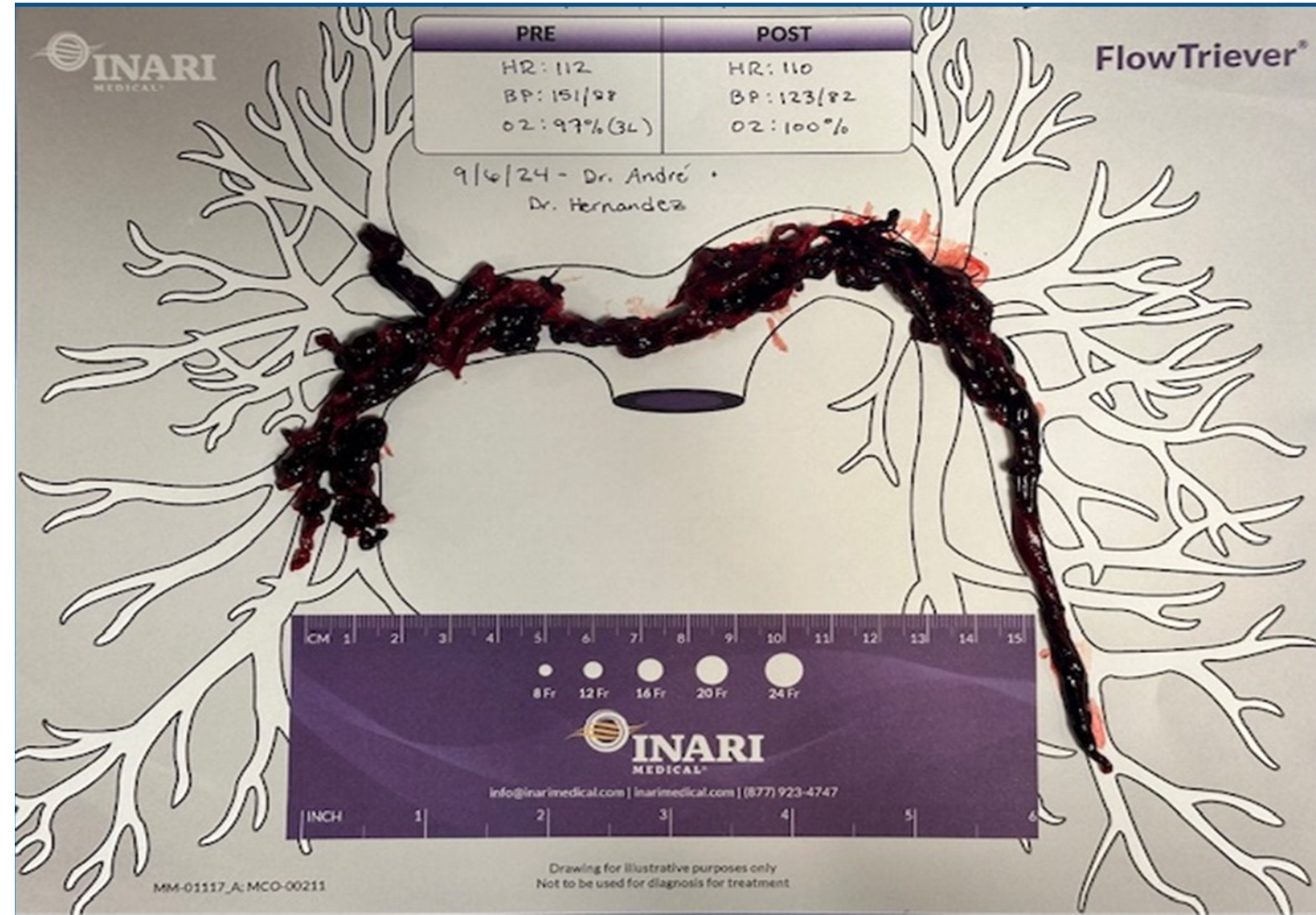


PRESENTATION | September 6th, 2024

- 82-year-old female presented to the ED shortness of breath, and was tachycardic into the one-teens
- CT showed large bilateral & saddle embolus with RV strain
- Single Session Thrombectomy Intervention with NO Thrombolytics

CASE RESULTS

- 30-min device time & 60-min stick-to-stitch
- Post angiography confirmed 100% clot removal
- 50cc total EBL: 95% blood returned with FlowSaver



Vascular Surgery Team | Fairfield Medical Center

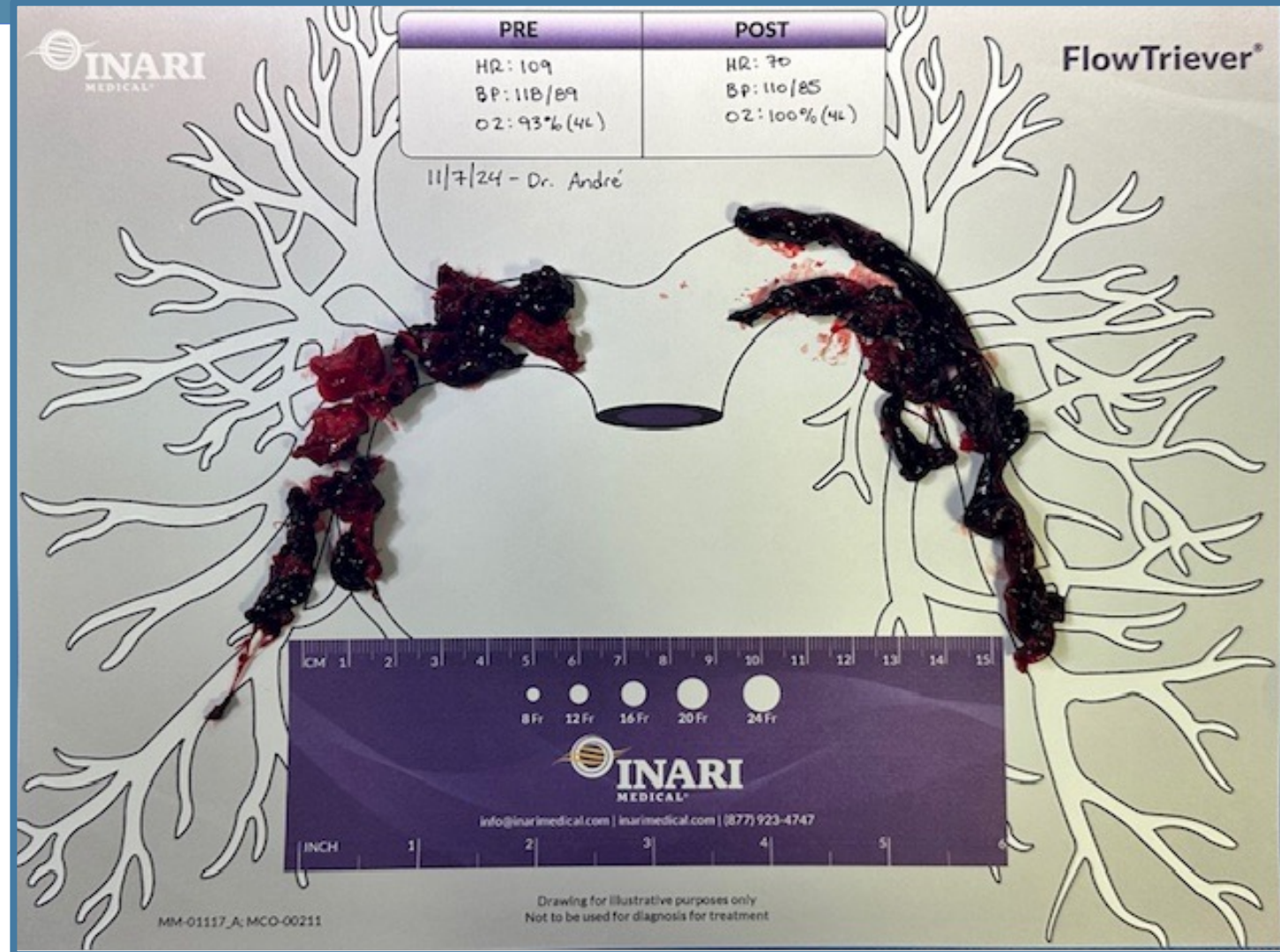
Pulmonary Embolism Thrombectomy via Inari FlowTrievers

PRESENTATION | November 8th, 2024

- 73-year-old female presented to the River Valley ED with chest pain & shortness of breath.
- CT showed large bilateral & saddle embolus and right heart strain
- Single Session Thrombectomy Intervention with **NO Thrombolytics**

CASE RESULTS

- 30 min device time & 60 min stick-to-stitch
- Post CT angiography confirmed 100% clot removal
- **100cc total EBL** | 95% blood returned with FlowSaver



PE Care Pathway

Pulmonary Embolism

Triage and Treatment

What is pulmonary embolism (PE)?

PE occurs when a blood clot travels through the venous system, right side of the heart and into the pulmonary arteries where it becomes lodged. The PE blocks blood flow to the lungs causing increased stress on the right heart and decreased oxygen levels in the body. As the right side of the heart works harder to pump blood past the clot, it can become enlarged with greater risk of failure.

What are the symptoms of PE?

- ♦ Chest pain
- ♦ Shortness of breath
- ♦ Cough/Hemoptysis
- ♦ Irregular heartbeat
- ♦ Light-headedness

Long term complications

Residual clot left in the pulmonary arteries has been shown to increase:

- ♦ Risk of death
- ♦ Heart failure or dyspnea
- ♦ Pulmonary hypertension
- ♦ Recurrent venous clotting
- ♦ Decreased quality of life

Pre-Intervention



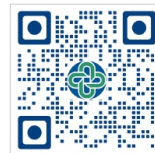
Post-Intervention



Who's a candidate for intervention?



Scan to see PE algorithm

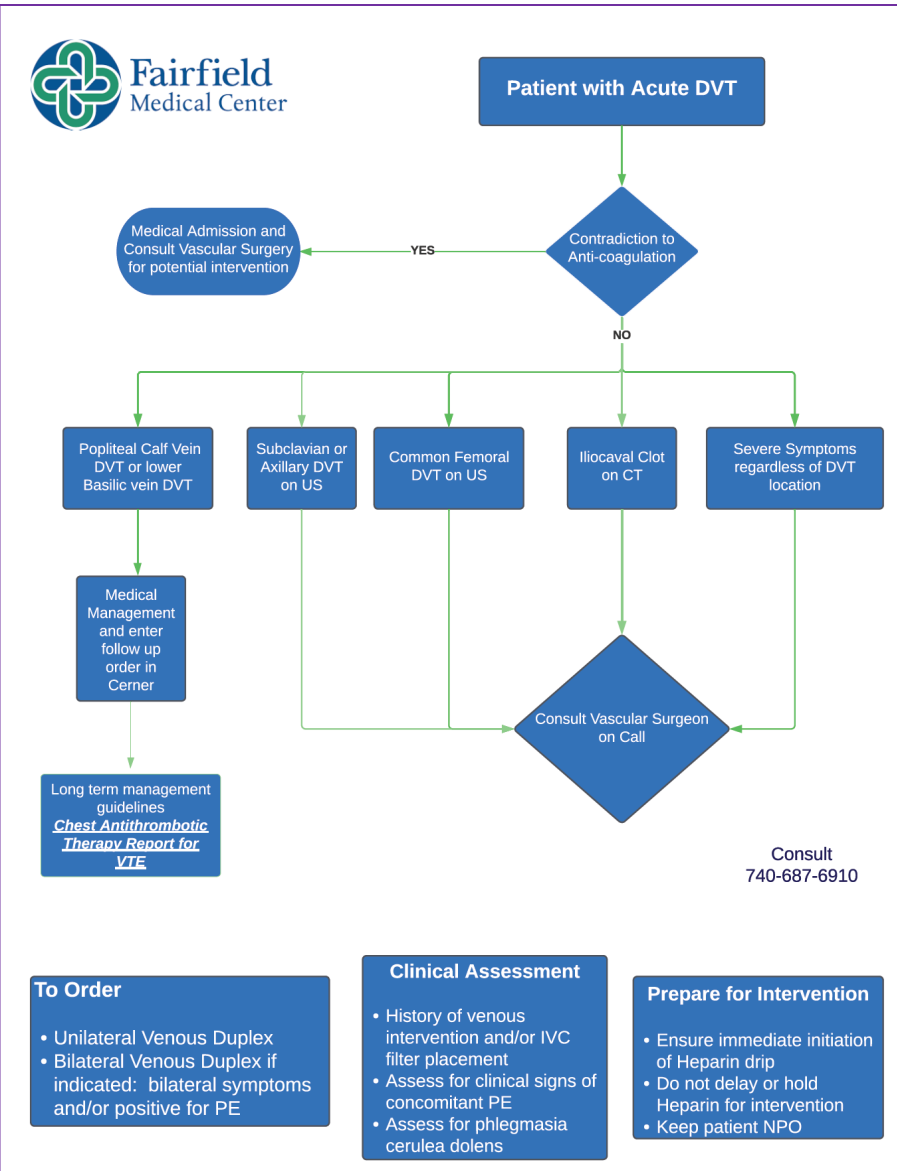
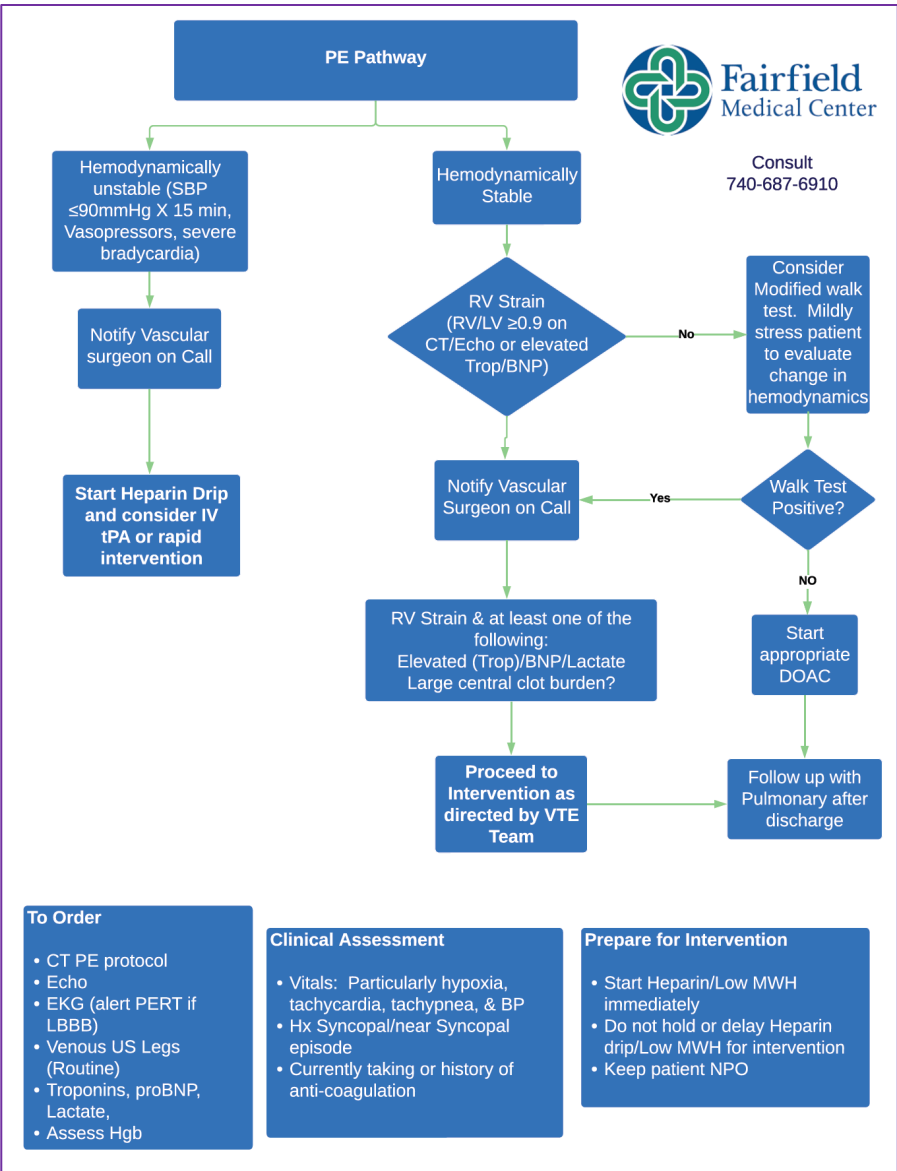


Scan to see PE contact

Sources:
1. Tunstall M, Scales AC, Friedman CA, Tugwell N, Horowitz JH. Epidemiology, Pathophysiology, and Natural History of Pulmonary Embolism. Semin Intervent Radiol. 2018;35(2):92-98. doi:10.1055/s-0039-1642038

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VTE Program Algorithms





Thank You