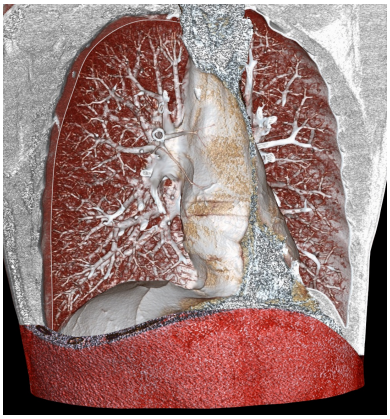
Understanding Pulmonary Embolism

A Blood Clot in the Lungs - What It Is and How We Treat It

Move Your Legs. Take Your Blood Thinner. Watch the Warning Signs.



Online: https://go.riasalimd.com/pe-guide

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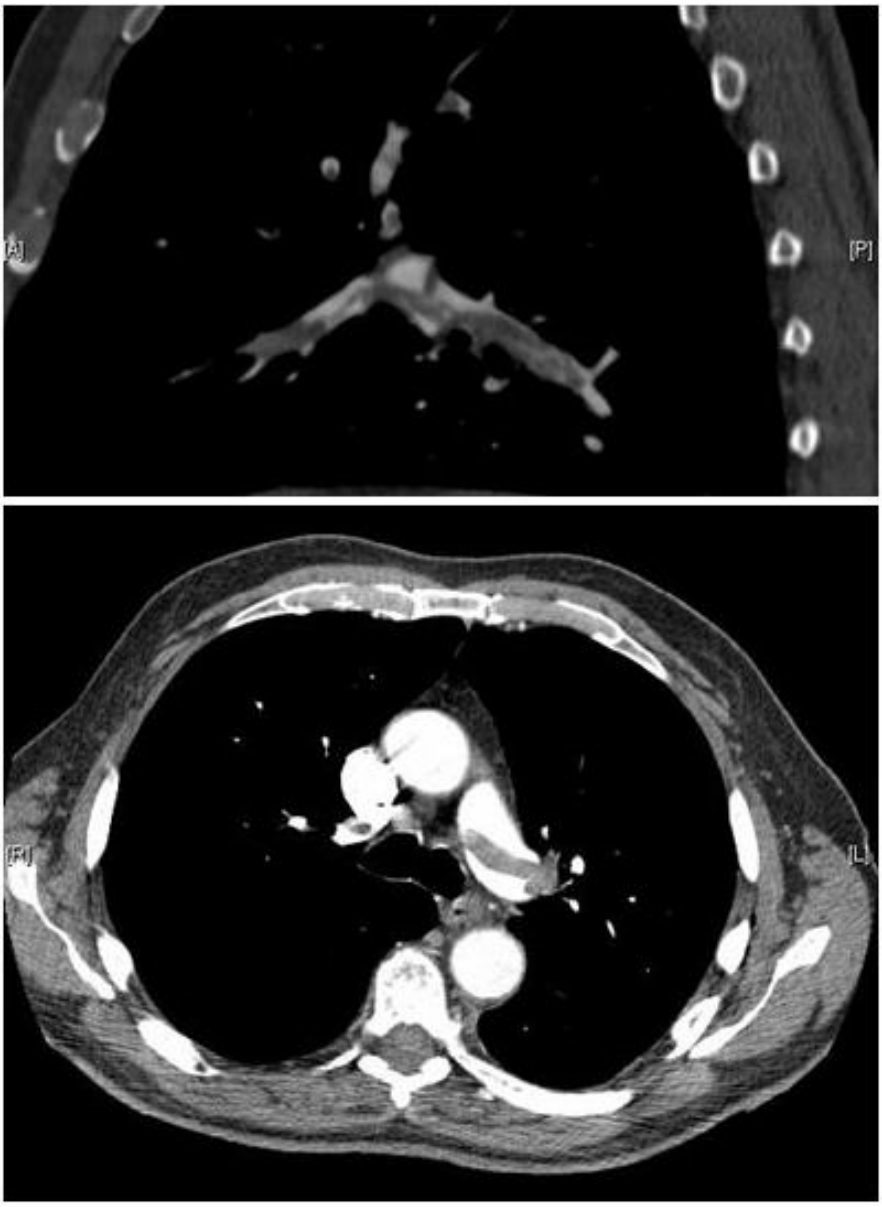
Names & Terms You Will Hear

Term	Meaning
PE	Pulmonary Embolism (the medical name we use in the chart)
Pulmonary Embolus	longer form, same meaning
Lung clot	plain term for PE
VTE	Venous Thromboembolism - umbrella term for DVT and PE together
DVT	Deep Vein Thrombosis - a clot in a leg vein that can break off and reach the lungs
Saddle PE	one large clot sitting at the main lung-artery fork
Massive PE	a PE that drops blood pressure - life-threatening; needs urgent care
Submassive PE	a PE that strains the right heart but blood pressure stays normal
Low-risk PE	a PE with stable vitals and no right-heart strain

What Is Pulmonary Embolism?

- A pulmonary embolism (PE) is a blood clot that travels to the arteries of your lungs and blocks blood flow.
- Most clots start in a leg vein (DVT), break off, and travel to the lungs through the heart.
- When a clot blocks a lung artery, that part of the lung does not get enough oxygen. This causes shortness of breath, chest pain, and — when severe — a drop in blood pressure.
- PE affects about 350,000 to 650,000 Americans per year and causes about 100,000 deaths.
- Common triggers: surgery, hospital stays, long bed rest, cancer, estrogen (birth control, pregnancy), and inherited clotting problems.
- PE has three risk levels: **massive** (low blood pressure — life-threatening), **submassive** (right-heart strain on imaging or labs), and **low-risk** (stable vitals, no strain).
- The good news: with early blood thinners, low-risk and submassive PE have very good results. Catheter-based tools have changed care for massive and high-risk PE.



A real CT pulmonary angiogram (CTPA) showing a clot (the dark filling defect) blocking a lung artery — this is the scan we use to diagnose PE. Image: Aung Myat and Arif Ahsan, Wikimedia Commons (CC BY 2.0).

Why It Matters

- Untreated PE can be fatal in 30% or more of cases. With early blood thinners, the death rate drops below 5% for low-risk patients.
- PE is the third leading heart or blood vessel cause of death, after heart attack and stroke.
- Right-heart strain from PE can become a long-term problem called CTEPH (chronic thromboembolic pulmonary hypertension). This is rare but serious.
- About 1 in 4 PE patients has another clot event within 5 years without full treatment.
- The good news: catheter-based therapy (CDT, EKOS, FlowTriever) can treat high-risk PE without the full risk of systemic clot-dissolving drugs.

Treatment Options

- **Blood thinners (anticoagulants)** are the core of all PE treatment. They start right away when PE is found.
- **DOACs** (apixaban, rivaroxaban, edoxaban, dabigatran) are the first choice for most patients. They are pills, do not need regular blood tests, and work as well as warfarin.
- **Warfarin** is still used in pregnancy, with mechanical heart valves, or with severe kidney disease.
- **Catheter-directed therapy (CDT)** delivers a low-dose clot-dissolving drug straight to the clot through a thin tube. This is used for high-risk PE.
- **Ultrasound-assisted CDT (EKOS)** adds gentle sound waves to break up the clot faster. The ULTIMA trial showed this works well.
- **Mechanical clot removal (FlowTriever, Inari)** pulls the clot out through a catheter without any clot-dissolving drug. The FLARE study supports this method.
- **Full-dose clot-dissolving drug (systemic tPA)** is used for massive PE with shock and very low blood pressure. It carries a higher bleeding risk than catheter-based options.
- **IVC filter** is rarely used. It is placed in the main vein in the belly when blood thinners are not safe or not working.
- **How long to take blood thinners**: at least 3 months for a clot with a clear cause; long-term or lifelong for unprovoked PE or repeat clots.

Risks, Benefits, and Alternatives

Every choice has trade-offs. Use this table to start the shared decision conversation.

Option	Risks	Benefits	Alternatives
DOAC blood thinners (apixaban, rivaroxaban)	Bleeding risk (stomach bleeding most common; brain bleeding rare). Some drugs interact. Kidney-based dose changes may be needed.	Cuts repeat clot risk by 80% or more. Once- or twice-daily pill. No routine blood tests needed (EINSTEIN-PE, AMPLIFY trials).	Warfarin (lower cost, needs INR blood tests). Low-molecular-weight heparin shots (for cancer-related clots).
Catheter-based therapy (CDT, EKOS, FlowTriever)	Bleeding at the entry site (about 3%), stroke risk (about 1%), rare lung artery injury.	Relieves right-heart strain faster than blood thinners alone. Much lower bleeding risk than full-dose clot-dissolving drugs.	Blood thinners alone (for low-risk PE). Full-dose clot-dissolving drug (for massive PE with shock).
Full-dose clot-dissolving drug (systemic tPA)	Major bleeding in 10 to 15% of cases. Brain bleeding in 2 to 3%.	Dissolves the clot fast in massive PE with shock. Can be life-saving when needed.	Catheter-based therapy (lower bleeding risk). Surgical clot removal (rarely used).
IVC filter	Filter can move or tear the vein. Repeat leg clots are more common over time. The filter can be hard to remove later.	Lowers the chance of another PE reaching the lungs when blood thinners are not safe.	Blood thinners are almost always the better choice when they are safe to use.

Common Misconceptions

Myth	Reality
Once the clot dissolves, I'm done.	Blood thinners must continue for at least 3 months. Many patients need long-term or lifelong treatment based on the cause of their clot.
DOACs are dangerous because there is no antidote.	Reversal drugs do exist. Andexanet alfa reverses apixaban and rivaroxaban. Idarucizumab reverses dabigatran.
Aspirin is enough to prevent another PE.	Aspirin does not prevent PE. Blood thinners are the only proven treatment.
If I feel fine, I can stop my blood thinner early.	The risk of a repeat clot is highest in the first 3 to 6 months. Stopping early can triple that risk.
PE always causes chest pain.	Many people with PE have only shortness of breath or mild fatigue. Some have no symptoms at all.
Long flights are the main cause of PE.	Flights add a small extra risk for people already at risk. Most PE cases follow surgery, a hospital stay, cancer, or long bed rest.
If my D-dimer is normal, I cannot have PE.	A normal D-dimer test rules out PE only when the pretest chance of PE is low. When the chance is high, we still get a scan.
All clots dissolve fully with treatment.	Most do, but some leave a small residual clot. A small number of patients (about 3%) develop CTEPH. This needs specialist care.

Possible Complications

Knowing what can go wrong helps you spot problems early. Most complications are uncommon, especially with treatment.

Where / What	What Can Happen
Right-heart strain or failure	Large clots block blood flow through the lungs. The right side of the heart has to pump much harder and can fail. An echo or troponin test helps grade the severity.
Massive PE with shock	Blood pressure drops suddenly and the body goes into shock. Treatment includes clot-dissolving drugs or a catheter-based procedure, plus ICU care.
Bleeding from blood thinners	Stomach, brain, or surgical-site bleeding can occur. Most bleeding events are minor. Serious bleeds are uncommon with modern DOAC doses.
Repeat PE or leg clot (DVT)	The risk is highest in the first 6 to 12 months after the first clot. Taking blood thinners as directed cuts repeat clot risk by 80 to 90%.
Post-PE syndrome	Some patients have lasting shortness of breath, less exercise ability, or anxiety. Pulmonary rehab (a supervised breathing and exercise program) often helps.
CTEPH (chronic clots causing high lung pressure)	In about 3% of patients, residual clots cause long-term high pressure in the lung arteries. See a specialist if symptoms last past 3 months.

Points to Know

If you remember nothing else, remember these key points.

- Take your blood thinner exactly as directed. Missing doses raises your clot risk.
- Tell every doctor, dentist, and ER team that you take a blood thinner before any procedure.
- On long trips, move your legs every hour. Wear compression stockings if you have had a leg clot before.
- Call right away if you have unusual bleeding: from the gums, in the stool or urine, or a bad headache.
- Get a follow-up heart echo at 3 to 6 months to check for long-term right-heart strain (CTEPH).
- Hormonal birth control raises clot risk. Talk with us before using it if you have had a PE.
- Close family members may benefit from clotting-factor tests if your PE had no clear cause.
- Do not stop your DOAC on your own. Always check with us or the procedure team first.

When to Call Us - and When to Call 911

If you are not sure, call. We would rather hear from you twice than miss a real problem.

- Sudden severe shortness of breath - call 911.
- Chest pain with shortness of breath - call 911.
- Coughing up blood - call 911.
- Lightheadedness or passing out - call 911.
- Severe leg pain or swelling, especially the calf - call us the same day to rule out a new leg clot.
- Bleeding that does not stop in 10 minutes, blood in stool or urine, or a severe headache while on blood thinners - call 911.
- You missed blood thinner doses - call us before deciding what to do.
- You have a planned procedure or dental work - call us ahead of time to plan your blood thinner use.

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Trusted Resources

The links below are the trusted resources Dr. Ali used to write this guide and that he recommends you visit for more information. Each is a clickable link in the digital version and a Short.io tracked URL on the printed version.

- AHA - Pulmonary Embolism / VTE - Plain-language overview of VTE/PE.
- Mayo Clinic - Pulmonary Embolism - Comprehensive overview with FAQs.
- CDC - DVT and PE - US prevalence and prevention information.
- National Blood Clot Alliance - Patient-led education and support community.

Sources Used to Build This Guide

Every recommendation in this guide is grounded in one or more of the studies, guidelines, or trusted resources below. Short links are tracked so Dr. Ali can see which references patients are reading; nothing personally identifying is captured.

- 2019 ESC Guidelines for the Diagnosis and Management of Acute Pulmonary Embolism (Konstantinides et al., Eur Heart J 2020) *[Guideline]*
  Primary risk-stratification framework (massive/submassive/low-risk) and treatment pathways.
- AHA Scientific Statement: Management of Massive and Submassive PE (Jaff et al., Circulation 2011; PMID 21422387) *[Guideline]*
  US AHA framework for treatment escalation in higher-risk PE.
- PEITHO Trial - Tenecteplase + Heparin vs Heparin in Submassive PE (Meyer et al., NEJM 2014; PMID 24716681) *[Clinical Trial]*
  Defines the role and risks of systemic thrombolysis in submassive PE.
- ULTIMA Trial - Ultrasound-Assisted Catheter-Directed Thrombolysis (Kucher et al., Circulation 2014; PMID 24226805) *[Clinical Trial]*
  Catheter-directed therapy data supporting EkoSonic/EKOS in intermediate-risk PE.
- FLARE Study - FlowTriever Mechanical Thrombectomy (Tu et al., JACC: CV Interventions 2019) *[Clinical Trial]*
  Mechanical thrombectomy device data supporting catheter-based thrombus removal in intermediate-high-risk PE.
- EINSTEIN-PE Trial - Rivaroxaban vs Warfarin in PE (EINSTEIN-PE Investigators, NEJM 2012; PMID 22449293) *[Clinical Trial]*
  Foundational DOAC-vs-warfarin data for PE anticoagulation.
- AMPLIFY Trial - Apixaban vs Warfarin in VTE (Agnelli et al., NEJM 2013; PMID 23808982) *[Clinical Trial]*
  DOAC apixaban data for VTE/PE management.
- American Heart Association - Pulmonary Embolism *[Patient Education]*
  Plain-language overview for patients.
- Mayo Clinic - Pulmonary Embolism *[Patient Education]*
  Comprehensive overview with FAQs.

About This Guide

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Reviewer note: Reviewed against AHA Venous Thromboembolism page, Mayo Clinic PE page, and CDC DVT/PE pages. Ours adds: explicit risk levels (massive/submassive/low-risk), modern catheter-based therapy options (CDT, EKOS, FlowTriever), and DOAC vs warfarin guidance.

Disclaimer

This guide is for educational purposes only and does not replace medical advice from your physician. Recommendations may not apply to every patient. Always follow the specific instructions of Dr. Ali and your care team. In an emergency call 911 or go to the nearest emergency department.

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