

PULMONARY EMBOLISM AND PERT

Jonathon Kirkland, DO
OSU Department Chair, Radiology
Head of Interventional Radiology

▶ No financial disclosures

OBJECTIVES

- ▶ 1. What are the clinical signs/symptoms of submassive PE?
- ▶ 2. What are the clinical signs/symptoms of massive PE?
- ▶ 3. Current treatment of submassive and massive PE?
- ▶ 4. Learn how to review a CT for evidence of right heart strain.

- ▶ Pulmonary embolism- exact incidence is unknown. Up to 900K in the US annually.
- ▶ 60-100K Americans die of DVT/PE annually
 - ▶ 25% sudden death is first symptom
 - ▶ 1/3 will have recurrence in 10 years
- ▶ 5-8% of US population have inherited thrombophilias

- ▶ Source: CDC VTE Website
(<https://www.cdc.gov/ncbddd/dvt/data.html>)

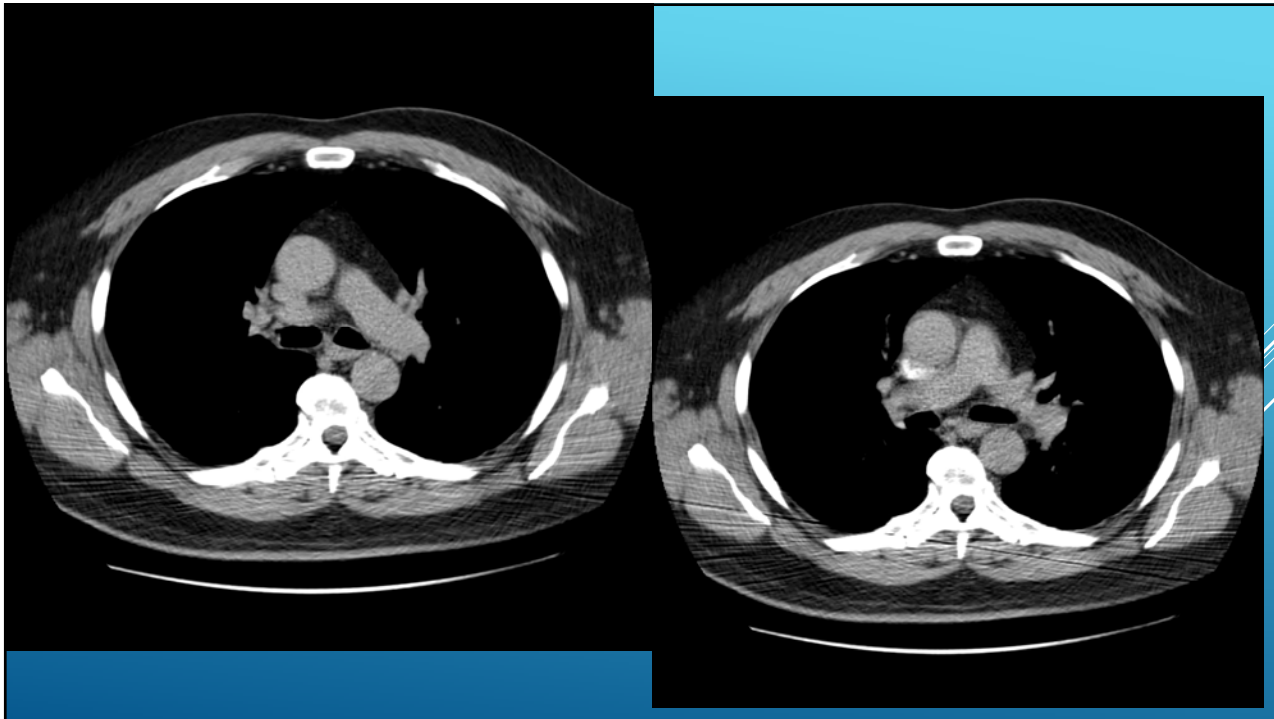
- ▶ Medicare data from 2000-2009.
 - ▶ 2.5M ER visits. 2.5 % underwent CTA for PE
 - ▶ <1% in 2000, More than 4% in 2009.
- ▶ AK Venkatesh et al. AJR Am J Roentgenol 210 (3), 572-577. 2018 Jan 24.

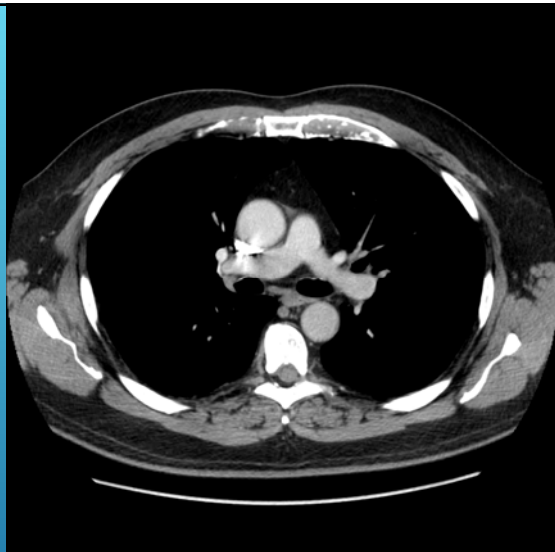
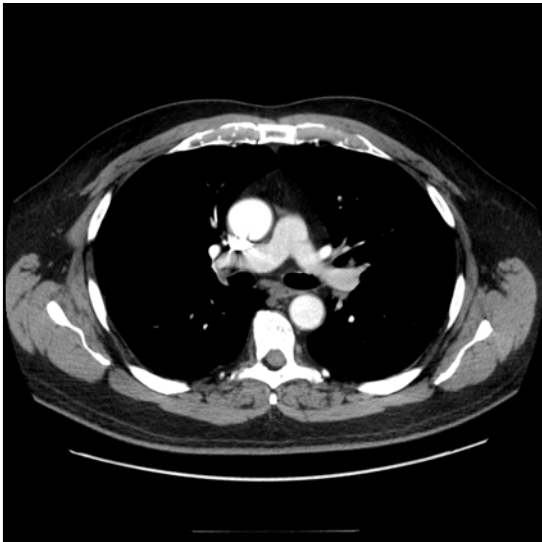
WELLS CRITERIA

- ▶ Clinical signs/symptoms of PE or PE is #1 diagnosis- 3 points each
- ▶ Tachycardia, Immobilization for 3 days or recent surgery in last 4 weeks, Previous diagnosed PE/DVT. 1.5 points each
- ▶ Hemoptysis or malignancy with recent (<6 months) treatment or palliative care. 1 point each.
- ▶ Management-
 - ▶ Low risk (<2 points). Consider D-dimer.
 - ▶ Moderate (2-6 points) consider D dimer or CTA
 - ▶ High risk- Consider CTA
- ▶ <https://www.mdcalc.com/wells-criteria-pulmonary-embolism>

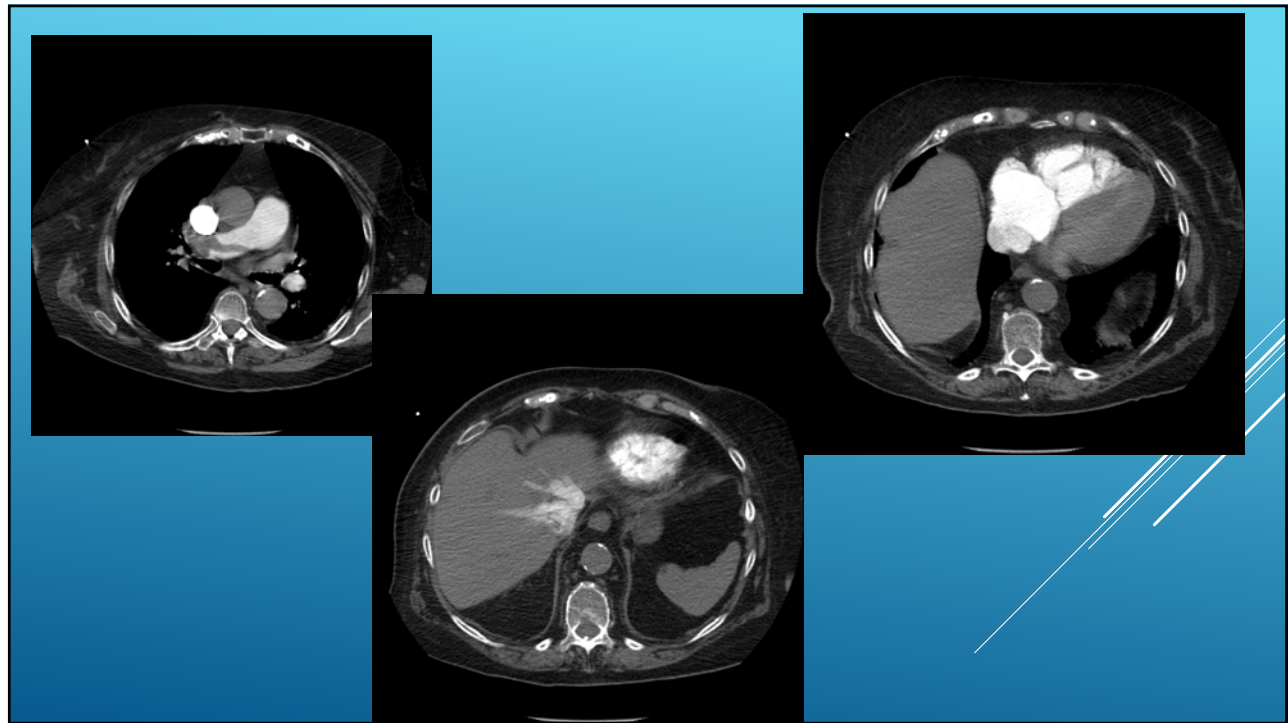
CTA PE PROTOCOL

- ▶ Minimum of 20G IV
- ▶ Antecubital fossa needed
- ▶ 4 mL/second Power injection
- ▶ Contrast- Variable by institution. Generally 100 mL +/-
- ▶ ROI placed in SVC or intermittent visualization of the SVC



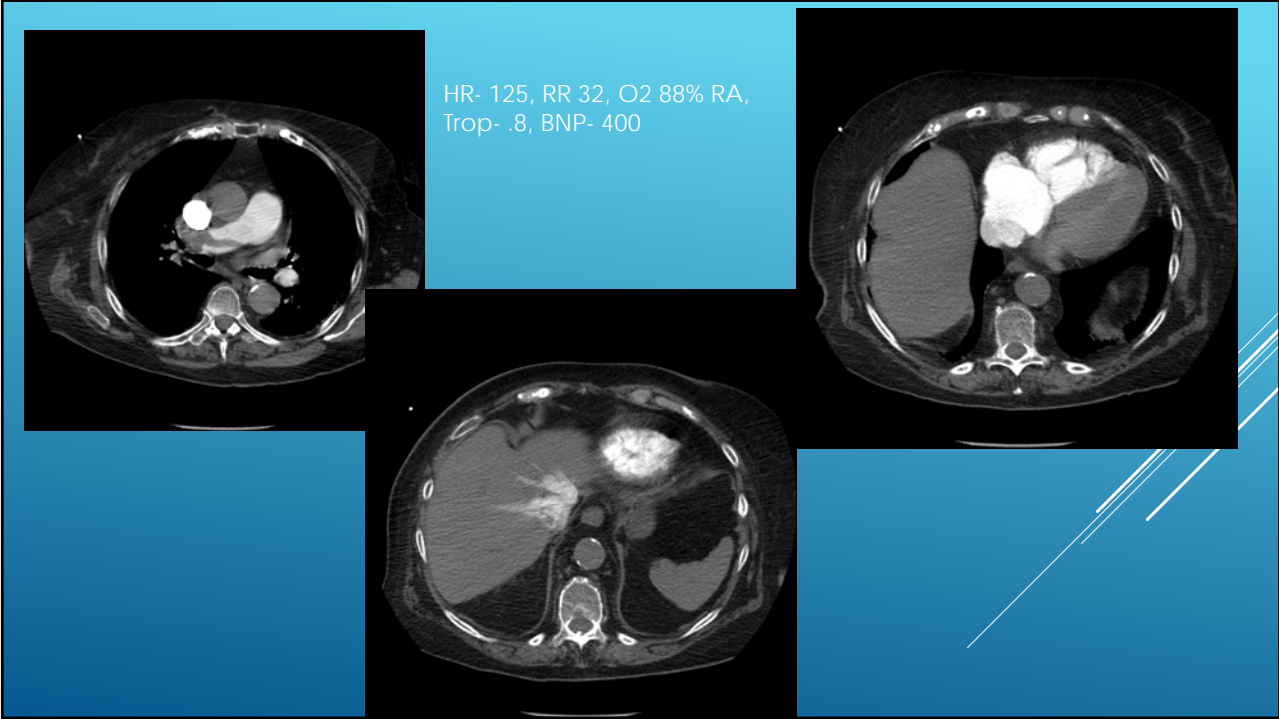
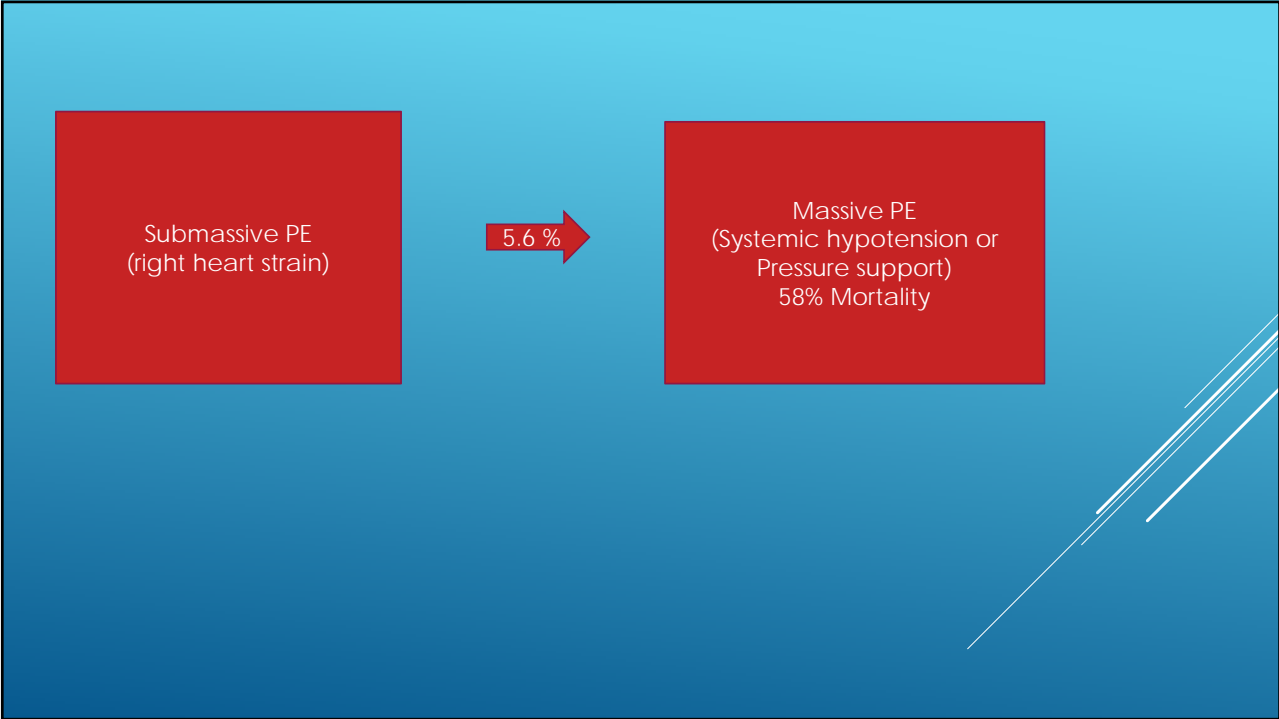


SAME PATIENT, 7 MINUTES APART



CLASSIFICATION OF PULMONARY EMBOLI

- ▶ Low risk PE- No heart strain or systemic arterial hypotension.
- ▶ Submassive PE(Intermediate risk)- Presence of right heart strain in the setting of normal blood pressure. ICOPER 90 day mortality 15.1%. (International cooperative PE Registry).
- ▶ Massive PE (High risk PE) – Sustained systemic arterial hypotension <90 mm for 15 minutes or requiring pressure support. ICOPER 90 day mortality 58%.



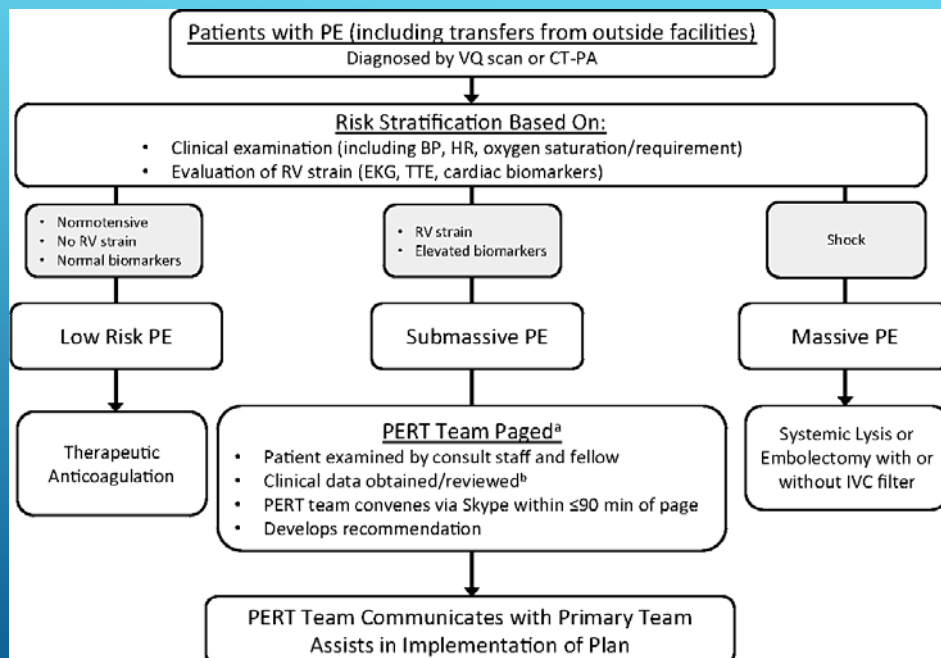
TREATMENT

PERT



PULMONARY EMBOLISM RESONSE TEAM

- ▶ Multidisciplinary conversation between Emergency Room (if patient in ED), Intensivist/IM, Cardiology, Vascular surgeon, Interventional Radiology.
- ▶ Clinical presentation- Extremely important. ?Syncope? BP, HR, RR, O2 sats. CAN THE PATIENT LIE FLAT? Any recent surgeries? Contraindications to TPA?
- ▶ Labs- CBC, INR, BMP, Troponin, BNP
- ▶ ECHO- If needed. CT is just as sensitive for right heart strain. ECHO can be used as a assistant in unclear patients.
- ▶ CTA
- ▶ EKG- Look for signs of heart strain and look for LBBB

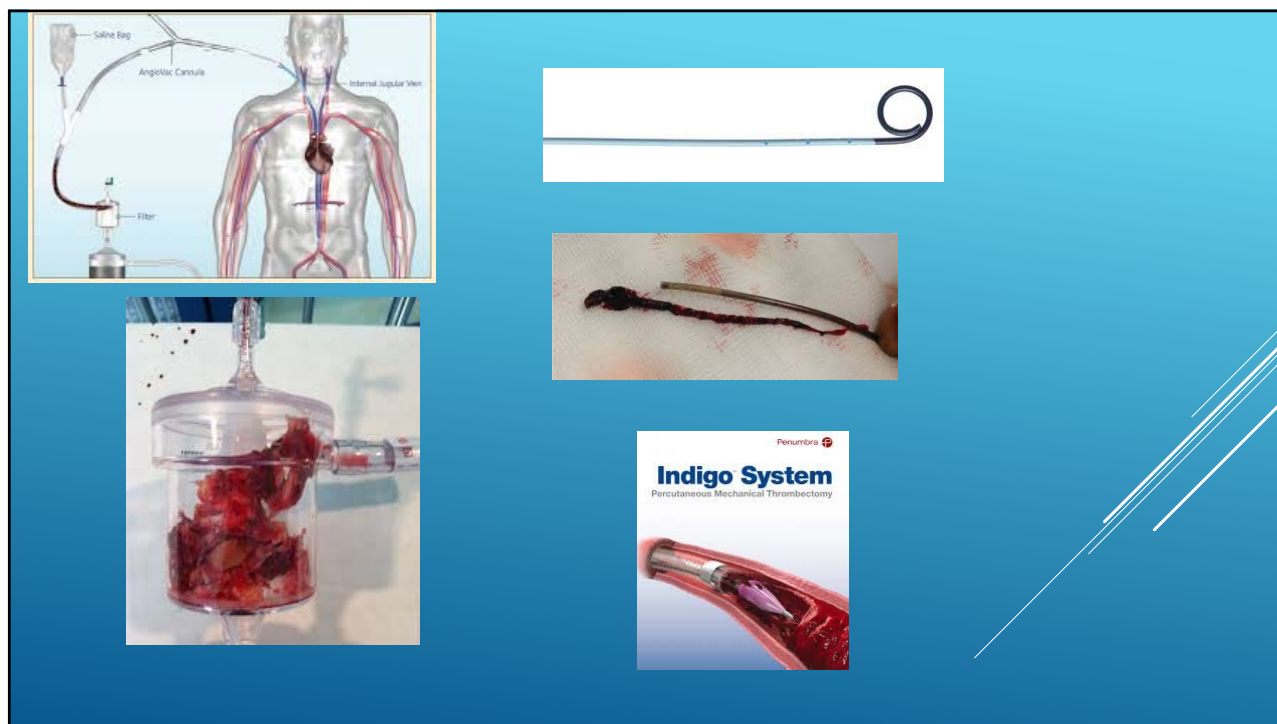


[HTTPS://WWW.MDCALC.COM/PULMONARY-EMBOLISM-SEVERITY-INDEX-PESI](https://www.mdcalc.com/pulmonary-embolism-severity-index-pesi)

- ▶ PESI Score-
- ▶ Age, Sex, History of CA, History of HF, Chronic lung dz, Heart rate >110, SBP <100, RR > 30, Temp <36C, AMS (disorientated, lethargic), O2 <90%.
- ▶ 1 point for year old. Otherwise, variable point system (AMS is 60 points alone). Risk stratify 30 day mortality.
 - ▶ 65YO Male who is tachy over 110, but all other negative. 3.2-7.1% 30 day mortality
 - ▶ Same, but add hypoxia at <90%- 4.0-11.4% mortality.

ACCP GUIDELINES- 2016

- ▶ Please take with a grain of salt.
- ▶ Massive PE- systemic TPA
 - ▶ Submassive who are deteriorating, but not yet massive. TPA
- ▶ Suggest systemic over CDT (Catheter directed thrombolysis)
 - ▶ If hypotension and high risk of bleeding, failed systemic, shock "that is likely to cause death before systemic thrombolysis can take effect" Suggest catheter assisted thrombus removal over nothing. Mechanical w/wo CDT.



ULTIMA TRIAL

- ▶ 59 patients (363 screened). RV/LV >1. EKOS/TPA and heparin vs heparin alone. 10mg per catheter over 15 hours.
- ▶ Statistically significant reduction in RV/LV with EKOS/TPA. Insignificant reduction with heparin alone.
- ▶ No major bleeding. Three site bleeds with lysis and one with heparin.

SEATTLE II

- ▶ All are EKOS trials (US assisted CDT)
- ▶ SEATTLE II- 24 MG TPA over 12 hours if bilateral catheters or 24 hours if unilateral. Statically significant Reduction in RV/LV ratio, Mean PA pressure. One major bleed (Groin hematoma with transient hypotension) and 15 Moderate (10%).
- ▶ No ICH

OPTALYSE PE- 2017

- ▶ 101 patients, four cohorts.
 - ▶ 4mg/catheter over 2 hours
 - ▶ 4 mg/catheter over 4 hours
 - ▶ 6mg/catheter over 6 hours
 - ▶ 12 mg/catheter over 6 hours
- ▶ All had significant reduction in RV/LV 23-26%.
- ▶ Three bleeds- one ICH in Cohort 4.

WHAT HAVE WE LEARNED IN OUR EXPERIENCE?

CONCLUSION

- ▶ Don't fear the TPA. TPA saves lives.
- ▶ Prepare for the worst- Decompensation happens.
- ▶ Send them on over- Transfer for IR/CV services for more definitive treatment.

SOURCES

- ▶ CDC VTE Website (<https://www.cdc.gov/ncbddd/dvt/data.html>)
- ▶ AK Venkatesh et al. AJR Am J Roentgenol 210 (3), 572-577. 2018 Jan 24.
- ▶ <https://www.mdcalc.com/wells-criteria-pulmonary-embolism>
- ▶ <https://www.mdcalc.com/pulmonary-embolism-severity-index-pesi>
- ▶ [http://journal.chestnet.org/article/S0012-3692\(15\)00335-9/fulltext](http://journal.chestnet.org/article/S0012-3692(15)00335-9/fulltext)
- ▶ Martin C, Sobolewski K, Bridgeman P, Boutsikaris D. Systemic Thrombolysis for Pulmonary Embolism: A Review. *Pharmacy and Therapeutics*. 2016;41(12):770-775.