Shared decision-making for workup of PE in Pregnancy

Shared decision-making criteria [8]**:**

1) Is there clinical uncertainty or equipoise regarding PE workup in pregnancy? *Yes.*
2) Does the patient have decision-making ability? *Physician decision.*
3) Does the physician have the time for a shared decision-making conversation which could take 15 minutes or longer? *Physician decision. If physician does not have time due to other emergencies, physician may elect to proceed with a physician-directed approach.*

Shared decision-making conversation:

1) Acknowledge that a clinical decision needs to be made:

"Anytime a pregnant patient comes to the ER with complaints like chest pain, shortness of breath, bloody cough, rapid heart rate or loss of consciousness we consider the possibility of pulmonary embolism (commonly called a PE). Your oxygen level is normal, your legs show no obvious sign of blood clot, and based on prior research, your risk of PE is low (<5%) [5] [6]. However, blood clots can rarely be fatal, so we recommend further testing to lower your risk below 2%. Going forward, we have a decision to make about how to test for PE, so let's talk about the options and consider the decision together."

2) Share information about pulmonary embolism:

"PEs are blood clots that travel from a vein in your arm or leg to an artery in your lungs. PEs can be fatal and are one of the leading causes of death in pregnant women. Fatal PEs during pregnancy are rare, occurring roughly in 1-1.5/100,000 deliveries [9]. Most blood clots are not deadly and will resolve naturally but the concern is if you have one blood clot, you may form more in the future that could be more dangerous or even deadly. The treatment for PEs is to thin the blood with a medicine called an anticoagulant."

3) Share information in regard to 3 management options (see 3 figures below):

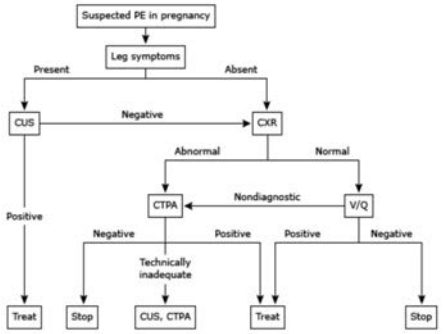
1) Traditional approach- CT Scan Protocol [15]

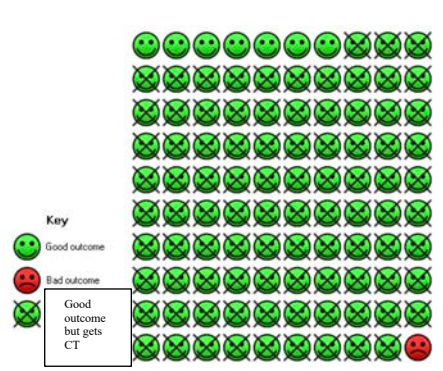
Benefits:

- Highly accurate at finding blood clots.
- CT only misses roughly 1.4% of PE [1].
- May find other cause for patient's symptoms.
- Recommended by several guidelines (UpToDate, ACOG and ATS).

Drawbacks:

- 1) Radiation to mom- lifetime risk of fatal cancer of 1 in 500 per chest CT, may be > in younger women due to rads to breast [7].
- 2) Radiation to fetus- 1/10 the rads required to raise teratogenic risk. Risk of childhood cancer <1/million [9].
- 3) Contrast nephropathy (<2% risk) [4].
- 4) Contrast allergic rxns 1%, rarely fatal [7].
- 5) CT misdiagnose PE (6-10%) [7]. Start ACs, cause major bleed in 2.8% of pts [2].
- 6) Non-diagnostic CT- 2x more common (27%) in pregnancy [4] need 2nd study (VQ).
- 7) Cost- CTA + duplex $$$> d-dimer.
- 8) Time- CTA+ duplex hrs > than d-dimer.
- 9) No prospective trial.
- 10) 93% get CT scans (estimate) [10].





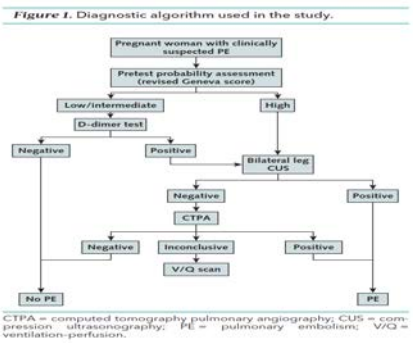
2) Risk Assess + Standard D-Dimer Protocol [10]

Benefit:

- Based on a prospective trial [10].
- Reduced CT exposure (only 78% of patients received CT).
- No missed VTE (95% CI 0-1%).
- Class 2A recommendation by 2 European society guidelines [11].
- UpToDate proposes it as an "alternative approach" [14].

Drawbacks:

- No validation study (traditional approach has no prospective study). Validation study recommended by UpToDate before it becomes routine protocol.
- 78% of women still required CT
- Not recommended as first line by UPTODATE, ACOG, ATS.



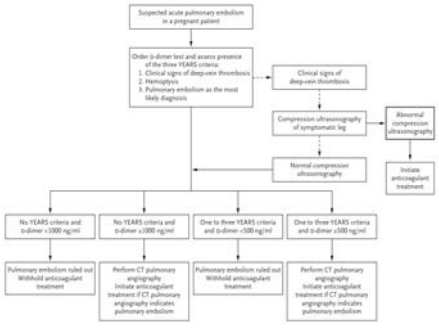
3) Years Protocol (adjusted D-Dimer) [5]

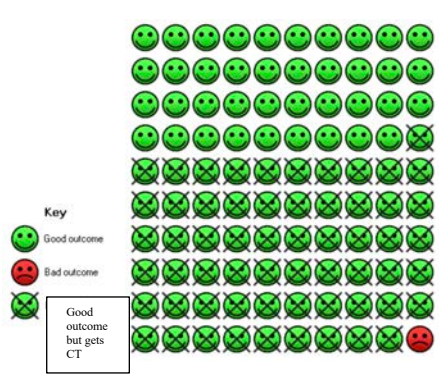
Benefit:

- Based on a prospective trial [5].
- 1 missed DVT, no missed PE (0.21%, 95% CI .04-1.2%).
- Lowest rate of CT exposure (only 61% of patients received CT).
- Post-hoc validation study showed no missed VTE [12].
- Class 2A recommendation by 2 European society guidelines [11].
- Recommended by EMRAP [13].
- UpToDate proposes it as an "alternative approach" [14].

Drawbacks:

- No prospective validation study (there was a post-hoc validation study performed, see above). Validation study recommended by UpToDate before it becomes routine protocol.
- Not recommended as first line by UPTODATE, ACOG, ATS.





Bibliography

[1] F. M. Fesmire, "Critical Issues in the Evaluation and Management of Adult Patients Presenting to the Emergency Department With Suspected Pulmonary Embolism," *Annals of Emergency Medicine,* pp. 628-651, 2011.

[2] D. Newman, "Rethinking Testing for Pulmonary Embolism: Less is More," *Annals of Emergency Medicine,* pp. 622-627, 2011.

[3] B. Geyer, "Patient preferences for testing for pulmonary embolism in the ED using a shared decision-making model," *American Journal of Emergency Medicine,* pp. 233-236, 2014.

[4] A. Mitchell, "Incidence of contrast-induced nephropathy after contrast-enhanced computed tomography in the outpatient setting.," *Clin J AM Soc Nephrol,* pp. 4-9, 2009.

[5] L. van der Pol, "Pregnancy-Adapted YEARS Algorithm for Diagnosis of Suspected Pulmonary Embolism," *NEJM,* vol. 380, no. 12, pp. 1139-1149, 2019.

[6] J. Kline, "Systematic Review and Meta-analysis of Pregnant Patients Investigated for Suspected Pulmonary Embolism in the Emergency Department," *Acad Emerg Med,* vol. 21, no. 9, pp. 949-959, 2014.

[7] J. Kline, "Emergency Evaluation For Pulmonary Embolism, Part 2: Diagnostic Approach," *The Journal of Emergency Medicine,* vol. 49, no. 1, pp. 104-117, 2015.

[8] M. Probst, "Shared Decisionmaking in the Emergency Department: A Guiding Framework for Clinicians," *Annals of Emergency Medicine,* vol. 70, no. 5, pp. 688-695, 2017.

[9] P. Marik, "Venous Thromboembolic Disease and Pregnancy," *NEJM,* vol. 359, no. 19, pp. 2025-2033, 2008.

[10] M. Righini, "Diagnosis of Pulmonary Embolism During Pregnancy," *Annals of Internal Medicine,* vol. 169, no. 11, pp. 766-773, 2018.

[11] S. Konstantinides, "2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS)," *European Heart Journal,* vol. 41, pp. 543-603, 2020.

[12] E. Langlois, "Could the Years Alogrithm be used to exclude pulmonary embolism during pregnancy? Data from the CT-PE-pregnancy study," *J Thromb Haemost,* vol. 17, pp. 1329-1334, 2019.

[13] Bavolek, "Chest Pain in Pregnancy: Part 3 Pulmonary Embolism," *EMRAP,* vol. 21, no. 2, pp. 4-5, 2021.

[14] Malhotra, "Pulmonary Embolism in Pregnancy: Epidemiology, pathogenesis, and diagnosis," 2021.

[15] A. Leung, "An Official American Thoracic Society/Society of Thoracic Radiology Clinical Practice Guideline: Evaluation of Suspected Pulmonary Embolism in Pregnancy," *American Journal of Respiratory and Critical Care Medicine,* vol. 184, pp. 1200-1208, 2011.

[16] Health Risks From Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2. Washington, DC:, National Academies Press, 2006.