

## **Suspected Pulmonary Thromboembolism in Pregnant Patients**

The estimated incidence of pulmonary thromboembolism in pregnant women is 10.6 per 100,000. CT angiogram of the pulmonary arteries is the accepted standard of care for diagnosis in non-pregnant patients. There is currently low-quality, limited direct evidence regarding diagnostic test accuracy and patient-centered outcomes in pregnant women. Considerations are as follows:

### **Radiation Exposure**

#### Fetus

There is no consensus as to whether V/Q scan or CTPA delivers the lower fetal radiation dose. However, measured values for each study is low, roughly equivalent, and similar to the background radiation dose absorbed by the fetus during the 9-month gestation (1 – 2.5 mGy). This is well below the accepted limit of 50 mGy for induction of deterministic effects in the fetus. The estimated risk of stochastic effects / radiation induced carcinogenesis is controversial. The currently accepted linear no-threshold model hypothesizes that ionizing radiation can cause cancer at any dose; the risk is dependent on age of exposure and cumulative organ dose. Given the low dose compared to background radiation, diagnostic imaging is safe for evaluation of pulmonary embolism.

#### Mother

In contrast to the minimal fetal risk, the estimated risk of induction of maternal breast and lung cancer is higher. Compared with V/Q scan, CTPA delivers a higher radiation dose to the mother's breasts (~1 mGy vs. 10-60 mGy) and lungs (5.7-13.5 mGy vs. 39.5 mGy). Precise quantification of increased risk of radiation-induced cancers is not currently possible.

### **Iodine**

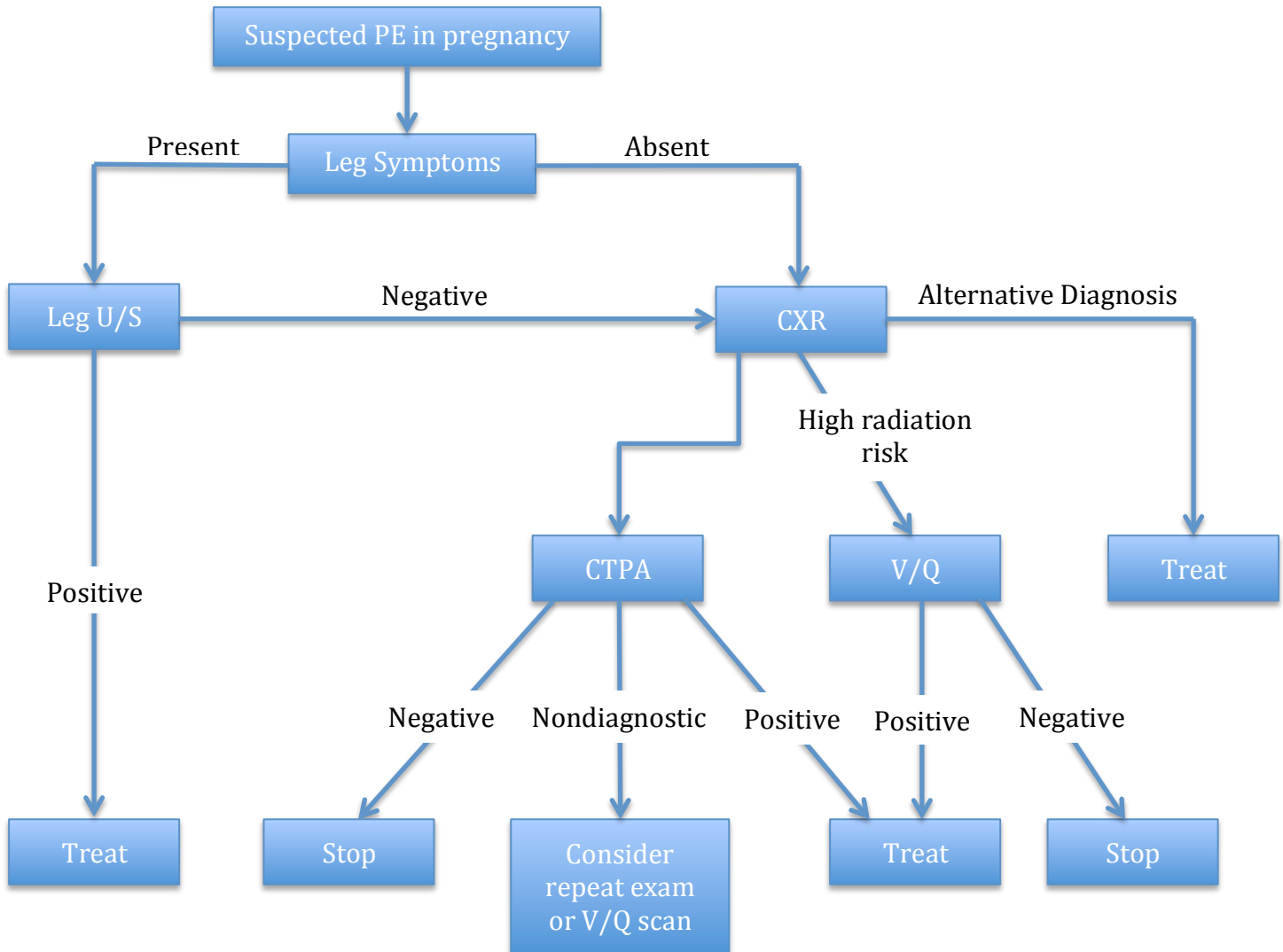
Iodinated contrast crosses the placenta and enters the fetal circulation and amniotic fluid. The main risk is related to the presence of free iodine with possible induction of neonatal hypothyroidism, which can lead to mental retardation if thyroid therapy is not initiated within two weeks of birth. However, data suggests that neonatal hypothyroidism resulting from a single administration of maternal iodinated contrast is exceedingly rare and unlikely to be clinically important.

## RECOMMENDATION

The algorithm proposed by the American Thoracic Society advocates for performing a V/Q scan in the setting of a normal CXR, and a CTPA in the setting of an abnormal CXR. This places a higher value on minimizing radiation dose to the mother and a lower value on rapidity of diagnostic testing and the possibility of alternative diagnoses afforded by CTPA. In our current practice, V/Q scan is limited by off-hours availability, slower acquisition time, potentially equivocal results, and the inability to provide an alternative diagnosis. In addition, dose models in the literature do not account for current state-of-the-art low dose CT protocols utilizing tube current modulation of mA and kV, which significantly lower the dose of CTPA while preserving diagnostic accuracy. Current data for absolute quantification of dose reduction is limited, although studies propose 30-75% reductions in effective dose with these techniques.

While low dose CTPA still delivers a higher maternal dose than V/Q scan, the diagnostic accuracy, availability and rapidity of acquiring the test, and the ability to offer an alternative diagnosis render CTPA the recommended examination at our institutions (see algorithm below). If maternal radiation exposure is a significant concern in a specific clinical situation (i.e. high-lifetime risk of breast and/or lung cancer, history of substantial chest radiation exposure, etc.), then V/Q scan can be considered as the examination of choice in the setting of a normal chest radiograph. In these instances, prophylactic anticoagulant therapy may be necessary while awaiting the exam given the limited off-hour availability of V/Q scans.

**ALBANY ACUTE**  
**RECOMMENDED DIAGNOSTIC ALGORITHM**



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