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Thrombosis - Section 2

# *Novel aspects in the diagnostic management of deep vein thrombosis and pulmonary embolism*

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## Take-home messages

- Validated diagnostic algorithms should be used in every patient with suspected deep-vein thrombosis or pulmonary embolism.
- The YEARS diagnostic algorithm is an easy algorithm for suspected PE, with parallel assessment of D-dimer and clinical decision items, leading to improved logistics and less need for CTPA.
- The ADJUST rule of using adjusted D-dimer above the age of 50 years is safe and leads to less need for CTPA.
- In patients with suspected recurrent ipsilateral DVT, MRDTI may prevent over diagnosis and treatment.

## Introduction

Because the diagnosis of clinically suspected deep vein thrombosis (DVT) and pulmonary embolism (PE) is nonspecific, standard diagnostic algorithms for patients with suspected venous thromboembolism (VTE) have been developed over the years, which include sequential use of both non-invasive bedside tools (clinical decision rules and D-dimer blood tests) for patients with low pre-test probability and imaging techniques - which comprises of compression ultrasound for DVT and computed tomography pulmonary angiography for PE - for patients with a high pre-test probability based on the bedside tools (Huisman MV. J Thromb Haemost 2013;11:412-22; Huisman MV. Blood 2013;121:4443-8.) Recently, the YEARS algorithm has been developed and validated in a prospective management outcome study (van der Hulle T. Lancet 2017, in press). The YEARS algorithm involves the simultaneous assessment of three most contributing items of the original Wells rule – symptoms of DVT, hemoptysis and diagnosis of PE most likely – and a D-dimer level. Dependent on the result of this assessment a CT pulmonary angiography (CTPA) is indicated. In the validation study, this novel algorithm proved efficient – leading to an absolute 14% reduction in CTPA - and safe-incidence of recurrent VTE was 0.61% and fatal PE was

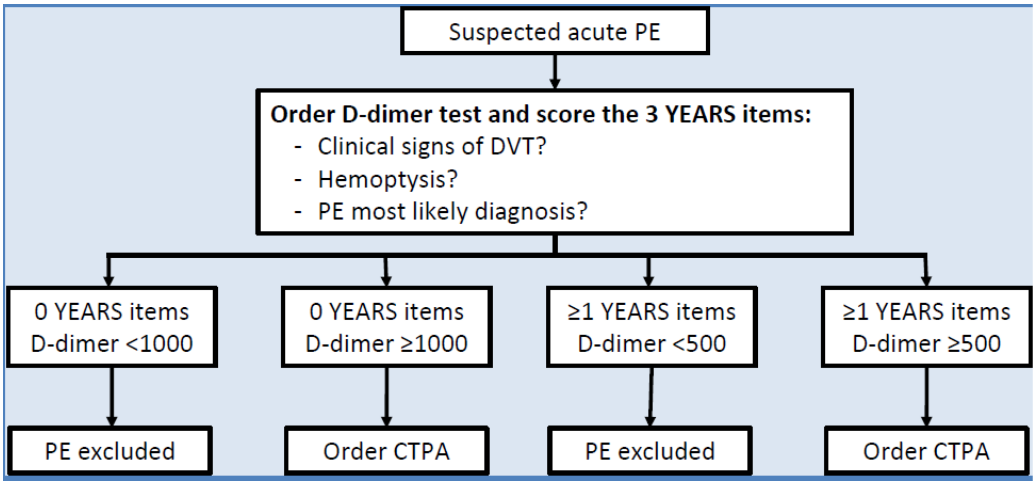


Figure 1. YEARS algorithm.

## Thrombosis - Section 2

0.20%. This combination has led to standardized diagnostic approaches with proven safety and efficiency for excluding VTE. At the same time, it has become apparent that there are several areas of diagnosis where there is controversy as to the best approach. This includes patients with clinically suspected arm vein thrombosis, patients with clinically suspected recurrent VTE, elderly and pregnant patients with suspected VTE. These patient groups all present with special diagnostic challenges, since either the current standard diagnostic algorithms are not sufficient or they involve unwanted radiation. In a recent management study a comprehensive algorithm for suspected arm vein thrombosis proved to be efficient and safe (Kleinjan A. Ann Int Med 2014;160:451-7). In 87 of 406 patients (21%), an unlikely score combined with normal d-dimer levels excluded upper extremity DVT. Superficial vein thrombosis and arm vein thrombosis were diagnosed in 54 (13%) and 103 (25%) patients, respectively. Only one of 249 patients with a normal diagnostic work-up developed a thrombosis at follow-up, for a failure rate of 0.4% (95% CI, 0.0% to 2.2%). Of note, the efficiency of the algorithm - defined as not needing a CUS - was lower in patients with cancer (11%) or older age (>75 years -13%). In patients with suspected recurrent DVT of the leg, CUS is often not decisive, because old thrombi render the CUS to stay abnormal. A novel technique called MR direct thrombus imaging was proved to be highly sensitive and specific for first and recurrent DVT. In a proof of principle study, the MRDTI showed sensitivity of 95% and specificity of 100% with a kappa of 99% (Tan M. Blood 2014;124:623-7). A clinical outcome study using MRDTI as the sole imaging test to rule out ipsilateral DVT is currently including patients. In elderly patients, there is a need for improved efficiency of the algorithm since the clinical utility of the D-dimer test is limited in them. A new cut-off of D-dimer measurement - 10 times the age above 50 years has been successfully evaluated as part of an algorithm in more than 3000 patients (Righini M. JAMA 2014;311:1117-24). Using this rule, an absolute extra 10% of patients could be managed without imaging tests and recurrent VTE occurred in 0.3% of patients. Finally, in pregnancy there are few validated algorithms. Currently the ARTEMIS study - based on the YEARS algorithm - is currently including pregnant patients.

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