

Venous Thromboembolism Including Pulmonary Embolism

Jeffrey A. Kline

REFERENCES

- https://www.hcup-us.ahrq.gov/nisoverview.jsp. (Healthcare Cost and Utilization Project [HCUP]: HCUP Nationwide Inpatient Sample [NIS]. Agency for Healthcare Research and Quality, Rockville, MD.) Accessed March 11, 2019.
- Rajpurkar M, Biss T, Amankwah EK, et al: Pulmonary embolism and in situ pulmonary artery thrombosis in paediatrics. A systematic review. *Thromb Haemost* 117: 1199, 2017. [PMID: 28331932]
- Carpenter SL, Richardson T, Hall M: Increasing rate of pulmonary embolism diagnosed in hospitalized children in the United States from 2001 to 2014. *Blood Adv* 2: 1403, 2018. [PMID: 29907635]
- Wang CY, Ignjatovic V, Francis P, et al: Risk factors and clinical features of acute pulmonary embolism in children from the community. *Thromb Res* 138: 86, 2016. [PMID: 26702484]
- Brahmandam A, Abougergi MS, Ochoa Chaar CI: National trends in hospitalizations for venous thromboembolism. *J Vasc Surg Venous Lymphat Disord* 5: 621, 2017. [PMID: 28818212]
- Logan JK, Pantle H, Huiras P, Bessman E, Bright L: Evidence-based diagnosis and thrombolytic treatment of cardiac arrest or periarrest due to suspected pulmonary embolism. *Am J Emerg Med* 32: 789, 2014. [PMID: 24856738]
- Pollack CV, Schreiber D, Goldhaber SZ, et al: Clinical characteristics, management, and outcomes of patients diagnosed with acute pulmonary embolism in the emergency department: initial report of EMPEROR (Multicenter Emergency Medicine Pulmonary Embolism in the Real World Registry). *J Am Coll Cardiol* 57: 700, 2011. [PMID: 21292129]
- Klok FA, van der Hulle T, den Exter PL, Lankeit M, Huisman MV, Konstantinides S: The post-PE syndrome: a new concept for chronic complications of pulmonary embolism. *Blood Rev* 28: 221, 2014. [PMID: 25168205]
- Gopalan D, Delcroix M, Held M: Diagnosis of chronic thromboembolic pulmonary hypertension. *Eur Respir Rev* 26: 143, 2017. [PMID: 28298387]
- Kahn SR: The post thrombotic syndrome. *Thromb Res* 127(Suppl 3): S89, 2011. [PMID: 21262451]
- Schissler AJ, Rozenshtain A, Kulon ME, et al: CT pulmonary angiography: increasingly diagnosing less severe pulmonary emboli. *PLoS One* 8: e65669, 2013. [PMID: 23776522]
- Kearon C, Akl EA, Comerota AJ, et al: Antithrombotic therapy for VTE disease: anti-thrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest* 141(2 Suppl): e419S, 2012. [PMID: 22315268]
- Courtney DM, Kline JA, Kabrhel C, et al: Clinical features from the history and physical examination that predict the presence or absence of pulmonary embolism in symptomatic emergency department patients: Results of a prospective, multicenter study. *Ann Emerg Med* 55: 305, 2010.
- Pedrajas JM, Garmendia C, Portillo J, et al: Idiopathic versus secondary venous thromboembolism. Findings of the RIETE registry. *Rev Clin Esp* 214: 357, 2014. [PMID: 24958320]
- Tzoran I, Saharov G, Brenner B, et al: Silent pulmonary embolism in patients with proximal deep vein thrombosis in the lower limbs. *J Thromb Haemost* 10: 564, 2012. [PMID: 22288520]
- Righini M, Le Gal G, Aujesky D, et al: Diagnosis of pulmonary embolism by multidetector CT alone or combined with venous ultrasonography of the leg: a randomised non-inferiority trial. *Lancet* 371: 1343, 2008. [PMID: 18424324]
- van Es J, Douma RA, Kamphuisen PW, et al: Clot resolution after 3 weeks of anticoagulant treatment for pulmonary embolism: comparison of computed tomography and perfusion scintigraphy. *J Thromb Haemost* 11: 679, 2013. [PMID: 23347140]
- Jimenez D, Kopecna D, Tapson V, et al: Derivation and validation of multimarker prognostication for normotensive patients with acute symptomatic pulmonary embolism. *Am J Respir Crit Care Med* 189: 718, 2014. [PMID: 24471575]
- Shopp JD, Stewart LK, Emmett TW, Kline JA: Findings from 12-lead electrocardiography that predict circulatory shock from pulmonary embolism: systematic review and meta-analysis. *Acad Emerg Med* 22: 1127, 2015. [PMID: 26394330]
- Ouriel K, Ouriel RL, Lim YJ, Piazza G, Goldhaber SZ: Computed tomography angiography with pulmonary artery thrombus burden and right-to-left ventricular diameter ratio after pulmonary embolism. *Vascular* 25: 54, 2017. [PMID: 27090586]
- De Stefano V, Rossi E: Testing for inherited thrombophilia and consequences for anti-thrombotic prophylaxis in patients with venous thromboembolism and their relatives. A review of the Guidelines from Scientific Societies and Working Groups. *Thromb Haemost* 110: 697, 2013. [PMID: 23846575]
- Beam DM, Courtney DM, Kabrhel C, Moore CL, Richman PB, Kline JA: Risk of thromboembolism varies, depending on category of immobility in outpatients. *Ann Emerg Med* 54: 147, 2009. [PMID: 19135280]
- White RH, Murin S, Wun T, Danielsen B: Recurrent venous thromboembolism after surgery-provoked versus unprovoked thromboembolism. *J Thromb Haemost* 8: 987, 2010. [PMID: 20149075]
- Khorana AA, McCrae KR: Risk stratification strategies for cancer-associated thrombosis: an update. *Thromb Res* 133(Suppl 2): S35, 2014. [PMID: 24862143]
- Golomb BA, Chan VT, Denenberg JO, Kopferski S, Criqui MH: Risk marker associations with venous thrombotic events: a cross-sectional analysis. *BMJ Open* 4: e003208, 2014. [PMID: 24657882]
- Kelly C, Agy C, Carlson M, et al: Family history of venous thromboembolism predicts the diagnosis of acute pulmonary embolism in the emergency department. *Am J Emerg Med* 36: 1550, 2018. [PMID: 29338966]
- Ageno W, Dentali F, Donadini MP, Squizzato A: Optimal treatment duration of venous thrombosis. *J Thromb Haemost* 11(Suppl 1): 151, 2013. [PMID: 23809119]
- Kline JA, Hernandez-Nino J, Jones AE, Rose GA, Norton HJ, Camargo CA Jr: Prospective study of the clinical features and outcomes of emergency department patients with delayed diagnosis of pulmonary embolism. *Acad Emerg Med* 14: 592, 2007. [PMID: 17554011]
- Smith SB, Geske JB, Maguire JM, Zane NA, Carter RE, Morgenthaler TI: Early anticoagulation is associated with reduced mortality for acute pulmonary embolism. *Chest* 137: 1382, 2010. [PMID: 20081101]
- Torres-Macho J, Mancebo-Plaza AB, Crespo-Gimenez A, et al: Clinical features of patients inappropriately undiagnosed of pulmonary embolism. *Am J Emerg Med* 31: 1646, 2013. [PMID: 24060320]
- den Exter PL, van den Hoven P, van der Hulle T, et al: Performance of the revised Geneva score in patients with a delayed suspicion of pulmonary embolism. *Eur Respir J* 43: 1801, 2014. [PMID: 24525436]
- Terry PB, Buescher PC: Pulmonary infarction: in the beginning: the natural history of pulmonary infarction. *Chest* 152: 1135, 2017. [PMID: 28716646]
- Werdecker S, Stortecky S, Meier B: Paradoxical embolism. *J Am Coll Cardiol* 64: 403, 2014. [PMID: 25060377]
- Kline JA, Corredor DM, Hogg MM, Hernandez J, Jones AE: Normalization of vital signs does not reduce the probability of acute pulmonary embolism in symptomatic emergency department patients. *Acad Emerg Med* 19: 11, 2012. [PMID: 22251189]
- Kline JA, Neumann D, Hall CL, Caputo J: Role of physician perception of patient smile on pretest probability assessment for acute pulmonary embolism. *Emerg Med J* 34: 82, 2017. [PMID: 27485261]
- Manara A, D'Hoore W, Thys F: Capnography as a diagnostic tool for pulmonary embolism: a meta-analysis. *Ann Emerg Med* 62: 584, 2013. [PMID: 23769645]
- Marchick MR, Courtney DM, Kabrhel C, et al: 12-Lead ECG Findings of pulmonary hypertension occur more frequently in emergency department patients with pulmonary embolism than in patients without pulmonary embolism. *Ann Emerg Med* 55: 331, 2009. [PMID: 19766353]
- Golpe R, Perez-de-Llano LA, Farinas MC: Central thromboembolism as a predictor of right ventricle dysfunction in hemodynamically stable pulmonary embolism. *Thromb Res* 127: 386, 2011. [PMID: 21146200]
- Shopp JD, Stewart LK, Emmett TW, Kline JA: Findings from 12-lead electrocardiography that predict circulatory shock from pulmonary embolism: systematic review and meta-analysis. *Acad Emerg Med* 22: 1127, 2015. [PMID: 26394330]
- Kline JA, Jones AE, Shapiro NI, et al: Multicenter, randomized trial of quantitative pretest probability to reduce unnecessary medical radiation exposure in emergency department patients with chest pain and dyspnea. *Circ Cardiovasc Imaging* 7: 66, 2014. [PMID: 24275953]
- Freund Y, Cachanado M, Aubry A, et al: Effect of the pulmonary embolism rule-out criteria on subsequent thromboembolic events among low-risk emergency department patients: the PROPER Randomized clinical trial. *JAMA* 319: 559, 2018. [PMID: 29450523]
- Singh B, Mommer SK, Erwin PJ, Mascarenhas SS, Parsaik AK: Pulmonary embolism rule-out criteria (PERC) in pulmonary embolism—revisited: a systematic review and meta-analysis. *Emerg Med J* 30: 701, 2013. [PMID: 23038695]
- Bokobza J, Aubry A, Nakle N, et al: Pulmonary embolism rule-out criteria vs D-dimer testing in low-risk patients for pulmonary embolism: a retrospective study. *Am J Emerg Med* 32: 609, 2014. [PMID: 24736129]
- Fesmire FM, Brown MD, Espinosa JA, et al: Critical issues in the evaluation and management of adult patients presenting to the emergency department with suspected pulmonary embolism. *Ann Emerg Med* 57: 628, 2011. [PMID: 21621092]
- Raja AS, Greenberg JO, Qaseem A, Denberg TD, Fitterman N, Schuur JD: Evaluation of patients with suspected acute pulmonary embolism: best practice advice from the Clinical Guidelines Committee of the American College of Physicians. *Ann Intern Med* 163: 701, 2015. [PMID: 26414967]
- Lim W, Le Gal G, Bates SM, et al: American Society of Hematology 2018 guidelines for management of venous thromboembolism: diagnosis of venous thromboembolism. *Blood Adv* 2: 3226, 2018. [PMID: 30482764]
- Gorlicki J, Penalzo A, Germeau B, et al: Safety of the combination of PERC and YEARS rules in patients with low clinical probability of pulmonary embolism: a retrospective analysis of two large European cohorts. *Acad Emerg Med* 26: 23, 2019. [PMID: 29947451]
- Gibson NS, Sohne M, Kruip MJ, et al: Further validation and simplification of the Wells clinical decision rule in pulmonary embolism. *Thromb Haemost* 99: 229, 2008. [PMID: 18217159]
- Righini M, van Es J, den Exter PL, et al: Age-adjusted D-dimer cutoff levels to rule out pulmonary embolism: the ADJUST-PE study. *JAMA* 311: 1117, 2014. [PMID: 24643601]

50. Klok FA, Mos IC, Nijkeuter M, et al: Simplification of the revised Geneva score for assessing clinical probability of pulmonary embolism. *Arch Intern Med* 168: 2131, 2008. [PMID: 18955643]
51. Lucassen W, Geersing GJ, Erkens PM, et al: Clinical decision rules for excluding pulmonary embolism: a meta-analysis. *Ann Intern Med* 155: 448, 2011. [PMID: 21969343]
52. Lim W, Le Gal G, Bates SM, et al: American Society of Hematology 2018 guidelines for management of venous thromboembolism: diagnosis of venous thromboembolism. *Blood Adv* 2: 3226, 2018. [PMID: 30482764]
53. van Es N, van der Hulle T, van Es J, et al: Wells rule and D-dimer testing to rule out pulmonary embolism: a systematic review and individual-patient data meta-analysis. *Ann Intern Med* 165: 253, 2016. [PMID: 27182696]
54. van der Hulle T, Cheung WY, Kooij S, et al: Simplified diagnostic management of suspected pulmonary embolism (the YEARS study): a prospective, multicentre, cohort study. *Lancet* 390: 289, 2017. [PMID: 28549662]
55. Moores L, Kline J, Portillo AK, et al: Multidetector computed tomographic pulmonary angiography in patients with a high clinical probability of pulmonary embolism. *J Thromb Haemost* 14: 114, 2016. [PMID: 26559176]
56. van Es J, Douma RA, Schreuder SM, et al: Clinical impact of findings supporting an alternative diagnosis on CT pulmonary angiography in patients with suspected pulmonary embolism. *Chest* 144: 1893, 2013. [PMID: 23989896]
57. Sinert R, Bandler E, Subramanian RA, Miller AC: Does the current definition of contrast-induced acute kidney injury reflect a true clinical entity? *Acad Emerg Med* 19: 1261, 2012. [PMID: 23167857]
58. Mitchell AM, Jones AE, Tumlin JA, Kline JA: One year outcomes following contrast induced nephropathy. *Am J Int Med* 1: 1, 2013.
59. Nijssen EC, Rennenberg RJ, Nelemans PJ, et al: Prophylactic hydration to protect renal function from intravascular iodinated contrast material in patients at high risk of contrast-induced nephropathy (AMACING): a prospective, randomised, phase 3, controlled, open-label, non-inferiority trial. *Lancet* 389: 1312, 2017. [PMID: 29328007]
60. Vanmassenhove J, Kielstein J, Jorres A, Biesen WV: Management of patients at risk of acute kidney injury. *Lancet* 389: 2139, 2017. [PMID: 28561005]
61. Au TH, Bruckner A, Mohiuddin SM, Hilleman DE: The prevention of contrast-induced nephropathy. *Ann Pharmacother* 48: 1332, 2014. [PMID: 24994723]
62. Mitchell AM, Jones AE, Tumlin JA, Kline JA: Immediate complications of intravenous contrast for computed tomography imaging in the outpatient setting are rare. *Acad Emerg Med* 18: 1005, 2011. [PMID: 21854485]
63. Roach PJ, Schembri GP, Bailey DL: V/Q scanning using SPECT and SPECT/CT. *J Nucl Med* 54: 1588, 2013. [PMID: 23907760]
64. Zhou M, Hu Y, Long X, et al: Diagnostic performance of magnetic resonance imaging for acute pulmonary embolism: a systematic review and meta-analysis. *J Thromb Haemost* 13: 1623, 2015. [PMID: 26179627]
65. Nazerian P, Volpicelli G, Gigli C, et al: Diagnostic performance of Wells score combined with point-of-care lung and venous ultrasound in suspected pulmonary embolism. *Acad Emerg Med* 24: 270, 2017. [PMID: 27859891]
66. Jiang L, Ma Y, Zhao C, et al: Role of transthoracic lung ultrasonography in the diagnosis of pulmonary embolism: a systematic review and meta-analysis. *PLoS One* 10: e0129909, 2015. [PMID: 26076021]
67. Pomero F, Dentali F, Borretta V, et al: Accuracy of emergency physician-performed ultrasonography in the diagnosis of deep-vein thrombosis: a systematic review and meta-analysis. *Thromb Haemost* 109: 137, 2013. [PMID: 23138420]
68. Hogg KE, Brown MD, Kline JA: Estimating the pretest probability to justify the empiric administration of heparin prior to pulmonary vascular imaging for pulmonary embolism. *Thromb Res* 118: 547, 2006. [PMID: 16356538]
69. Cohn DM, Vansenne F, de Borgie CA, Middeldorp S: Thrombophilia testing for prevention of recurrent venous thromboembolism. *Cochrane Database Syst Rev* 12: CD007069, 2012. [PMID: 23235639]
70. Vedantham S, Goldhaber SZ, Julian JA, et al: Pharmacomechanical catheter-directed thrombolysis for deep-vein thrombosis. *N Engl J Med* 377: 2240, 2017. [PMID: 29211671]
71. Kahn SR, Shapiro S, Wells PS, et al: Compression stockings to prevent post-thrombotic syndrome: a randomised placebo-controlled trial. *Lancet* 383: 880, 2014. [PMID: 24315521]
72. Righini M, Galanaud JP, Guenneguez H, et al: Anticoagulant therapy for symptomatic calf deep vein thrombosis (CACTUS): a randomised, double-blind, placebo-controlled trial. *Lancet Haematol* 3: e556, 2016. [PMID: 27836513]
73. Roy PM, Moumneh T, Penalosa A, Sanchez O: Outpatient management of pulmonary embolism. *Thromb Res* 155: 92, 2017. [PMID: 28525830]
74. Kabrhel C, Rosovsky R, Baugh C, et al: Multicenter implementation of a novel management protocol increases the outpatient treatment of pulmonary embolism and deep vein thrombosis. *Acad Emerg Med* 20: 10.1111/acem.13640, 2018. [Epub ahead of print]
75. Piran S, Le GG, Wells PS, et al: Outpatient treatment of symptomatic pulmonary embolism: a systematic review and meta-analysis. *Thromb Res* 132: 515, 2013. [PMID: 24035045]
76. Vinson DR, Zehtabchi S, Yealy DM: Can selected patients with newly diagnosed pulmonary embolism be safely treated without hospitalization? A systematic review. *Ann Emerg Med* 60: 651, 2012. [PMID: 22944455]
77. Quezada CA, Bikdeli B, Villen T, et al: Accuracy and interobserver reliability of the simplified pulmonary embolism severity index versus the hesta criteria for patients with pulmonary embolism. *Acad Emerg Med* August 29, 2018. [PMID: 30155937] [Epub ahead of print]
78. Kline JA, Kahler ZP, Beam DM: Outpatient treatment of low risk venous thromboembolism with monotherapy oral anticoagulation: patient quality of life outcomes and clinician acceptance. *Patient Prefer Adherence* 10: 561, 2016. [PMID: 27143861]
79. Kline JA, Jimenez D, Courtney DM, et al: Comparison of four bleeding risk scores to identify rivaroxaban-treated patients with venous thromboembolism at low risk for major bleeding. *Acad Emerg Med* 23: 144, 2016. [PMID: 26765080]
80. Sista AK, Miller LE, Kahn SR, Kline JA: Persistent right ventricular dysfunction, functional capacity limitation, exercise intolerance, and quality of life impairment following pulmonary embolism: systematic review with meta-analysis. *Vasc Med (London)* 22: 37, 2017. [PMID: 27707980]
81. Zhang Z, Zhai ZG, Liang LR, Liu FF, Yang YH, Wang C: Lower dosage of recombinant tissue-type plasminogen activator (rt-PA) in the treatment of acute pulmonary embolism: a systematic review and meta-analysis. *Thromb Res* 133: 357, 2014. [PMID: 24412030]
82. Kiser TH, Burnham EL, Clark B, et al: Half-dose versus full-dose alteplase for treatment of pulmonary embolism. *Crit Care Med* 46: 1617, 2018. [PMID: 29979222]
83. Tapson VF, Sterling K, Jones N, et al: A randomized trial of the optimum duration of acoustic pulse thrombolysis procedure in acute intermediate-risk pulmonary embolism: the OPTALYSE PE trial. *JACC Cardiovasc Interv* 11: 1401, 2018. [PMID: 30025734]
84. Bloomer TL, El-Hayek GE, McDaniel MC, et al: Safety of catheter-directed thrombolysis for massive and submassive pulmonary embolism: results of a multicenter registry and meta-analysis. *Catheter Cardiovasc Interv* 89: 754, 2017. [PMID: 28145042]
85. Kabrhel C, Ali A, Choi J, Hur C: Systemic thrombolysis, catheter-directed thrombolysis and anticoagulation for intermediate-risk pulmonary embolism: a simulation modeling analysis. *Acad Emerg Med* 24: 1235, 2017. [PMID: 28650086]
86. Kaymaz C, Akbal OY, Tanboga IH, et al: Ultrasound-assisted catheter-directed thrombolysis in high-risk and intermediate-high-risk pulmonary embolism: a meta-analysis. *Curr Vasc Pharmacol* 16: 179, 2018. [PMID: 28393706]
87. Chatterjee S, Chakraborty A, Weinberg I, et al: Thrombolysis for pulmonary embolism and risk of all-cause mortality, major bleeding, and intracranial hemorrhage: a meta-analysis. *JAMA* 311: 2414, 2014. [PMID: 24938564]
88. Holbrook A, Schulman S, Witt DM, et al: Evidence-based management of anticoagulant therapy: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 141(2 Suppl): e152S, 2012. [PMID: 22315259]
89. Meng K, Hu X, Peng X, Zhang Z: Incidence of venous thromboembolism during pregnancy and the puerperium: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med* 28: 245, 2014. [PMID: 24716782]
90. Kline JA, Richardson DM, Than MP, Penalosa A, Roy PM: Systematic review and meta-analysis of pregnant patients investigated for suspected pulmonary embolism in the emergency department. *Acad Emerg Med* 21: 949, 2014. [PMID: 25269575]
91. van Mens TE, Scheres LJ, de Jong PG, Leeftlang MG, Nijkeuter M, Middeldorp S: Imaging for the exclusion of pulmonary embolism in pregnancy. *Cochrane Database Syst Rev* 1: CD011053, 2017. [PMID: 28124411]
92. O'Connor C, Moriarty J, Walsh J, Murray J, Coulter-Smith S, Boyd W: The application of a clinical risk stratification score may reduce unnecessary investigations for pulmonary embolism in pregnancy. *J Matern Fetal Neonatal Med* 24: 1461, 2011. [PMID: 21854126]
93. Cutts BA, Tran HA, Merriman E, et al: The utility of the Wells clinical prediction model and ventilation-perfusion scanning for pulmonary embolism diagnosis in pregnancy. *Blood Coagul Fibrinolysis* 25: 375, 2014. [PMID: 24434350]
94. Righini M, Robert-Ebadi H, Elias A, et al: Diagnosis of pulmonary embolism during pregnancy: a multicenter prospective management outcome study. *Ann Intern Med* 169: 766, 2018. [PMID: 30357273]
95. Murphy N, Broadhurst DI, Khashan AS, Gilligan O, Kenny LC, O'Donoghue K: Gestation-specific D-dimer reference ranges: a cross-sectional study. *BJOG* 122: 395, 2015. [PMID: 24828148]
96. Kline JA, Hambleton GW, Hernandez J: D-dimer concentrations in normal pregnancy: new diagnostic thresholds are needed. *Clin Chem* 51: 825, 2005. [PMID: 15764641]
97. Hunt BJ, Parmar K, Horspool K, Shephard N, Nelson-Piercy C, Goodacre S: The DiPEP (Diagnosis of PE in Pregnancy) biomarker study: an observational cohort study augmented with additional cases to determine the diagnostic utility of biomarkers for suspected venous thromboembolism during pregnancy and puerperium. *Br J Haematol* 180: 694, 2018. [PMID: 29359796]
98. Parilla BV, Fournogerakis R, Archer A, et al: Diagnosing pulmonary embolism in pregnancy: are biomarkers and clinical predictive models useful? *AJP Rep* 6: e160, 2016. [PMID: 27119048]
99. Chan WS, Lee A, Spencer FA, et al: D-dimer testing in pregnant patients: towards determining the next "level" in the diagnosis of deep vein thrombosis. *J Thromb Haemost* 8: 1004, 2010. [PMID: 20128870]
100. Chan WS, Ginsberg JS: Management of venous thromboembolism in pregnancy. In: van Beek EJR, Buller HR, Oudkerk M (eds): *Deep Vein Thrombosis and Pulmonary Embolism*. Chichester, West Sussex: John Wiley & Sons; 2009:353-371.
101. Ratiu A, Navolan D, Spatariu I, Biris M, Miculita M, Motoc A: Diagnostic value of a negative single color duplex ultrasound in deep vein thrombosis suspicion during pregnancy. *Rev Med Chir Soc Med Nat Iasi* 114: 454, 2010. [PMID: 20700985]
102. Le GG, Kercet G, Ben YK, et al: Diagnostic value of single complete compression ultrasonography in pregnant and postpartum women with suspected deep vein thrombosis: prospective study. *BMJ* 344: e2635, 2012. [PMID: 22531869]
103. Leung AN, Bull TM, Jaeschke R, et al: An official American Thoracic Society/Society of Thoracic Radiology clinical practice guideline: evaluation of suspected pulmonary embolism in pregnancy. *Am J Respir Crit Care Med* 184: 1200, 2011. [PMID: 22086989]
104. Stein PD, Chenevert TL, Fowler SE, et al: Gadolinium-enhanced magnetic resonance angiography for pulmonary embolism: a multicenter prospective study (PIOPED III). *Ann Intern Med* 152: 434, 2010. [PMID: 20368649]
105. Martillotti G, Boehlen F, Robert-Ebadi H, Jastrow N, Righini M, Blondon M: Treatment options for severe pulmonary embolism during pregnancy and the postpartum period: a systematic review. *J Thromb Haemost* 15: 1942, 2017. [PMID: 28805341]

106. Bariteau A, Stewart LK, Emmett TW, Kline JA: Systematic review and meta-analysis of outcomes of patients with subsegmental pulmonary embolism with and without anti-coagulation treatment. *Acad Emerg Med* 25: 828, 2018. [PMID: 29498138]
107. Bochenek T, Nizankowski R: The treatment of venous thromboembolism with low-molecular-weight heparins. A meta-analysis. *Thromb Haemost* 107: 699, 2012. [PMID: 22318218]
108. Young AM, Marshall A, Thirlwall J, et al: Comparison of an oral factor Xa Inhibitor with low molecular weight heparin in patients with cancer with venous thromboembolism: results of a randomized trial (SELECT-D). *J Clin Oncol* 36: 2017, 2018. [PMID: 29746227]
109. Wells PS, Anderson DR, Rodger M, et al: Derivation of a simple clinical model to categorize patients' probability of pulmonary embolism: increasing the model utility with the SimpliRED D-dimer. *Thromb Haemost* 83: 416, 2000. [PMID: 10744147]