



# 2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism – web addenda

## The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC)

### Endorsed by the European Respiratory Society (ERS)

**Authors/Task Force Members: Stavros Konstantinides\* (Chairperson) (Germany/Greece), Adam Torbicki\* (Co-chairperson) (Poland), Giancarlo Agnelli (Italy), Nicolas Danchin (France), David Fitzmaurice (UK), Nazzareno Galiè (Italy), J. Simon R. Gibbs (UK), Menno Huisman (The Netherlands), Marc Humbert† (France), Nils Kucher (Switzerland), Irene Lang (Austria), Mareike Lankeit (Germany), John Lekakis (Greece), Christoph Maack (Germany), Eckhard Mayer (Germany), Nicolas Meneveau (France), Arnaud Perrier (Switzerland), Piotr Pruszczyk (Poland), Lars H. Rasmussen (Denmark), Thomas H. Schindler (USA), Pavel Svtil (Czech Republic), Anton Vonk Noordegraaf (The Netherlands), Jose Luis Zamorano (Spain), Maurizio Zompatori (Italy)**

**ESC Committee for Practice Guidelines (CPG): Jose Luis Zamorano (Chairperson) (Spain), Stephan Achenbach (Germany), Helmut Baumgartner (Germany), Jeroen J. Bax (Netherlands), Hector Bueno (Spain), Veronica Dean (France), Christi Deaton (UK), Çetin Erol (Turkey), Robert Fagard (Belgium), Roberto Ferrari (Italy), David Hasdai (Israel), Arno Hoes (Netherlands), Paulus Kirchhof (Germany/UK), Juhani Knuuti (Finland), Philippe Kolh (Belgium),**

\* Corresponding authors. Stavros Konstantinides, Centre for Thrombosis and Hemostasis, Johannes Gutenberg University of Mainz, University Medical Centre Mainz, Langenbeckstrasse 1, 55131 Mainz, Germany. Tel: +49 613 1176255, Fax: +49 613 1173456. Email: [stavros.konstantinides@unimedizin-mainz.de](mailto:stavros.konstantinides@unimedizin-mainz.de), and Department of Cardiology, Democritus University of Thrace, Greece. Email: [skonst@med.duth.gr](mailto:skonst@med.duth.gr).

Adam Torbicki, Department of Pulmonary Circulation and Thromboembolic Diseases, Medical Centre of Postgraduate Education, ECZ-Otwock, Ul. Borowa 14/18, 05-400 Otwock, Poland. Tel: +48 22 7103052, Fax: +48 22 710315. Email: [adam.torbicki@ecz-otwock.pl](mailto:adam.torbicki@ecz-otwock.pl).

† Representing the European Respiratory Society

**Other ESC entities having participated in the development of this document:**

**ESC Associations:** Acute Cardiovascular Care Association (ACCA), European Association for Cardiovascular Prevention & Rehabilitation (EACPR), European Association of Cardiovascular Imaging (EACVI), Heart Failure Association (HFA), ESC Councils: Council on Cardiovascular Nursing and Allied Professions (CCNAP), Council for Cardiology Practice (CCP), Council on Cardiovascular Primary Care (CCPC)

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**National Cardiac Societies document reviewers:** listed in the Appendix.

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Patrizio Lancellotti (Belgium), Ales Linhart (Czech Republic), Petros Nihoyannopoulos (UK), Massimo F. Piepoli (Italy), Piotr Ponikowski (Poland), Per Anton Sirnes (Norway), Juan Luis Tamargo (Spain), Michal Tendera (Poland), Adam Torbicki (Poland), William Wijns (Belgium), Stephan Windecker (Switzerland).

Document Reviewers: Çetin Erol (CPG Review Coordinator) (Turkey), David Jimenez (Review Coordinator) (Spain), Walter Ageno (Italy), Stefan Agewall (Norway), Riccardo Asteggiano (Italy), Rupert Bauersachs (Germany), Cecilia Becattini (Italy), Henri Bounameaux (Switzerland), Harry R. Büller (Netherlands), Constantinos H. Davos (Greece), Christi Deaton (UK), Geert-Jan Geersing (Netherlands), Miguel Angel Gómez Sanchez (Spain), Jeroen Hendriks (Netherlands), Arno Hoes (Netherlands), Mustafa Kilickap (Turkey), Viacheslav Mareev (Russia), Manuel Monreal (Spain), Joao Morais (Portugal), Petros Nihoyannopoulos (UK), Bogdan A. Popescu (Romania), Olivier Sanchez<sup>†</sup> (France), Alex C. Spyropoulos (USA).

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### Keywords

Guidelines • Pulmonary embolism • Venous thrombosis • Shock • Hypotension • Chest pain • Dyspnoea  
• Heart failure • Diagnosis • Treatment – Anticoagulation • Thrombolysis

**Web Table 1 Predisposing factors for VTE (data modified from refs. 9, 15)**

Strong risk factors (odds ratio >10)
Fracture of lower limb
Hospitalization for heart failure or atrial fibrillation/flutter (within previous 3 months)
Hip or knee replacement
Major trauma
Myocardial infarction (within previous 3 months)
Previous venous thromboembolism
Spinal cord injury
Moderate risk factors (odds ratio 2–9)
Arthroscopic knee surgery
Auto-immune diseases
Blood transfusion
Central venous lines
Chemotherapy
Congestive heart or respiratory failure
Erythropoiesis-stimulating agents
Hormone replacement therapy (depends on formulation)
<i>In vitro</i> fertilization
Infection (specifically pneumonia, urinary tract infection and HIV)
Inflammatory bowel disease
Cancer (highest risk in metastatic disease)
Oral contraceptive therapy
Paralytic stroke
Postpartum period
Superficial vein thrombosis
Thrombophilia
Weak risk factors (odds ratio <2)
Bed rest >3 days
Diabetes mellitus
Hypertension
Immobility due to sitting (e.g. prolonged car or air travel)
Increasing age
Laparoscopic surgery (e.g. cholecystectomy)
Obesity
Pregnancy
Varicose veins

**Web Table 2 Adjustment of unfractionated heparin dosage based on the aPTT (adapted from ref. 277)**

Activated partial thromboplastin time	Change of dosage
<35 seconds (<1.2 times control)	80 U/kg bolus, increase infusion rate by 4 U/kg per hour
35–45 seconds (1.2–1.5 times control)	40 U/kg bolus, increase infusion rate by 2 U/kg per hour
46–70 seconds (1.5–2.3 times control)	no change
71–90 seconds (2.3–3.0 times control)	reduce infusion rate by 2 U/kg per hour
>90 seconds (>3.0 times control)	stop infusion for 1 h, then reduce infusion rate by 3 U/kg per hour

aPTT = activated partial thromboplastin time; U = units.

**Web Table 3 Approved thrombolytic regimens for pulmonary embolism**

<b>Streptokinase</b>	250 000 IU as a loading dose over 30 minutes, followed by 100 000 IU/h over 12–24 hours
	Accelerated regimen: 1.5 million IU over 2 hours
<b>Urokinase</b>	4400 IU/kg as a loading dose over 10 min, followed by 4400 IU/kg per hour over 12–24 hours
	Accelerated regimen: 3 million IU over 2 hours
<b>rtPA</b>	100 mg over 2 hours; or
	0.6 mg/kg over 15 minutes (maximum dose 50 mg)

IU = international units; rtPA = recombinant tissue plasminogen activator.

**Web Table 4 Contraindications to thrombolytic therapy (adapted from ref. 312)**

<p><b>Absolute contraindications:<sup>a</sup></b></p> <ul style="list-style-type: none"> <li>• Haemorrhagic stroke or stroke of unknown origin at any time</li> <li>• Ischaemic stroke in the preceding 6 months</li> <li>• Central nervous system damage or neoplasms</li> <li>• Recent major trauma/surgery/head injury in the preceding 3 weeks</li> <li>• Gastrointestinal bleeding within the last month</li> <li>• Known bleeding risk</li> </ul>
<p><b>Relative contraindications</b></p> <ul style="list-style-type: none"> <li>• Transient ischaemic attack in the preceding 6 months</li> <li>• Oral anticoagulant therapy</li> <li>• Pregnancy, or within one week postpartum</li> <li>• Non-compressible puncture site</li> <li>• Traumatic resuscitation</li> <li>• Refractory hypertension (systolic blood pressure &gt;180 mm Hg)</li> <li>• Advanced liver disease</li> <li>• Infective endocarditis</li> <li>• Active peptic ulcer</li> </ul>

<sup>a</sup>Absolute contraindications to thrombolysis might become relative in a patient with immediately life-threatening high-risk PE.

**Web Table 5** Techniques and devices for percutaneous catheter-directed treatment of pulmonary embolism (adapted from ref. 169 and 334)

Catheter interventions without local thrombolysis		Catheter interventions with local thrombolysis	
Technique	Device examples	Technique	Device examples
Thrombus fragmentation	Pigtail catheter fragmentation  Balloon angioplasty using peripheral balloon catheters	Catheter-directed thrombolysis (continuous infusion with or without bolus)	UniFuse® (AngioDynamics, Latham, NY, US)  Cragg-McNamara® (ev3 Endovascular, Plymouth, MN, USA)
Rheolytic thrombectomy	AngioJet 6 F PE® (Bayer, Germany)	Ultrasound-assisted catheter-directed thrombolysis (continuous infusion with or without bolus)	EkoSonic® (EKOS, Bothell, WA, USA)
Suction embolectomy	Manual aspiration using sheath with detachable haemostatic valve (Argon Medical Devices, Athens, TX, USA)	Pharmacomechanical thrombolysis	AngioJet 6 F PE® Power Pulse™ thrombolysis and thrombectomy (Bayer, Germany)
Rotational thrombectomy	Aspirex® thrombectomy (Straub Medical, Switzerland)		
Combined techniques	Pigtail fragmentation (SF) plus AngioJet 6 F PE® thrombectomy (Bayer, Germany)	Combined techniques	Pigtail fragmentation (SF) plus AngioJet 6 F PE® Power Pulse™ thrombolysis and thrombectomy (Bayer, Germany)