

Clinical Guideline

Virtual Acute Care Unit: Pulmonary Embolism Pathway

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Other relevant corporate or procedural documents: nil at present

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1.0 Introduction

Outpatient management of patients with confirmed pulmonary embolism (PE) is supported by the British Thoracic Society (BTS)¹ and the European Cardiology Society (ESC)² for low risk patients. This is defined as patients with a Pulmonary Embolism Severity Index (PESI) risk class I or II, a simplified PESI (sPESI) of <1, or meeting Hestia criteria. Assessment of right ventricular (RV) function is usually not required, but where RV dilatation/dysfunction has been identified on CT/echocardiogram, cardiac biomarkers such as troponin or BNP can be used to aid risk stratification. Normal values of these biomarkers can be used to identify low-risk patients.¹ The BTS also endorses early discharge of moderate risk patients (PESI risk class III) once their haemodynamics improve and when recalculated, they fall into PESI risk class I or II prior to discharge. However, the BTS guidelines from 2018 recognise that there is an increasing need to provide a decision aid for clinicians on whether moderate-to-high risk patients (PESI \geq III) can be discharged early. A small retrospective analysis of outcomes in intermediate-to-high-risk patients has shown no mortality benefit has been demonstrated for these patients if they remain hospitalised.³

In the advent of direct oral anticoagulants (DOACs), therapeutic anticoagulation can be achieved with single doses. This obviates the need for repeated monitoring of clotting parameters and thus makes outpatient management more straightforward. Identifying patients who are suitable for early discharge provides an opportunity to improve patient experience, reduce length of stay in hospital, and prevent hospital-acquired infections, especially in the era of COVID-19.

2.0 About the triage pathway

We propose a pathway to identify moderate-to-high risk patients suitable for early discharge based on their Hestia score, after a period of 24 hours of monitoring after they have been established on anticoagulation and their trajectory is deemed stable or trending upwards. This is always contingent on senior clinician judgement that it is safe to discharge the patient.

3.0 About virtual assessments

We further propose an approach to monitor these patients virtually to identify early deterioration. Early morbidity and mortality from PE is due to (i) haemodynamic decompensation due to right heart failure requiring rescue reperfusion therapy, (ii) recurrent DVT due to subtherapeutic anticoagulation, and (iii) major bleeding due to overanticoagulation.¹ Patients are discharged with a pulse oximeter, a blood pressure monitor, and a comprehensive leaflet including warning signs and emergency contact details. Patients' heart rate, blood pressure, and oxygen saturations are monitored and a daily assessment of signs and symptoms of bleeding and recurrent DVT is carried out. This allows for early recognition of changes in haemodynamics, and development of complications from anticoagulation. Patients can be brought back for reassessment quickly to prevent further decline. An oxygen level of < 95% has been shown to predict mortality in inpatients, and patients with levels < 95% should be considered for readmission.

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4.0 Scoring systems

Pulmonary embolism severity index (PESI) score

Clinical feature	Points
Age (in years)	+ x (e.g., 65)
Male gender	+ 10
History of cancer	+ 30
Heart failure	+ 10
Chronic lung disease	+ 10
Pulse ≥ 110 /min	+ 20
Systolic blood pressure < 100 mmHg	+ 30
Respiratory rate ≥ 30 /min	+ 20
Temperature $< 36^\circ$ Celsius	+ 20
Respiratory rate ≥ 30 /min	+ 20
Altered mental status	+ 60
Arterial oxygen saturation < 90 percent	+ 20

PESI score	PESI class	Risk category
< 66	Class I	Low risk
66 to 85	Class II	
86 to 105	Class III	High risk
106 to 125	Class IV	
> 125	Class V	

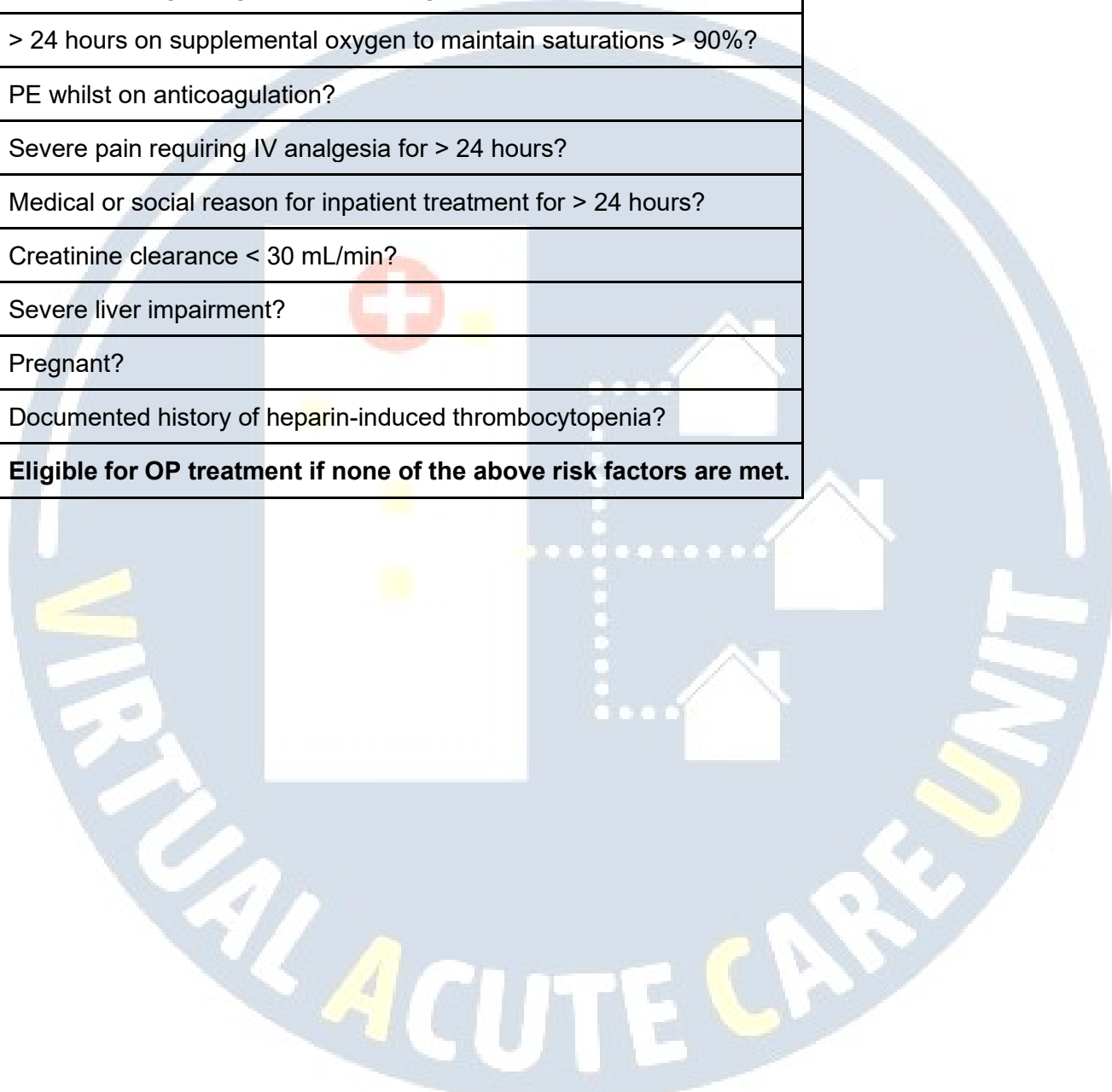
Simplified PESI score (sPESI)

Clinical feature	Points
Age > 80 years	1
History of cancer	1
Chronic cardiopulmonary disease	1
Pulse ≥ 110 /min	1
Systolic blood pressure < 100 mmHg	1
Arterial oxygen saturation < 90 percent	1
Interpretation	
Low risk	0
High risk	≥ 1

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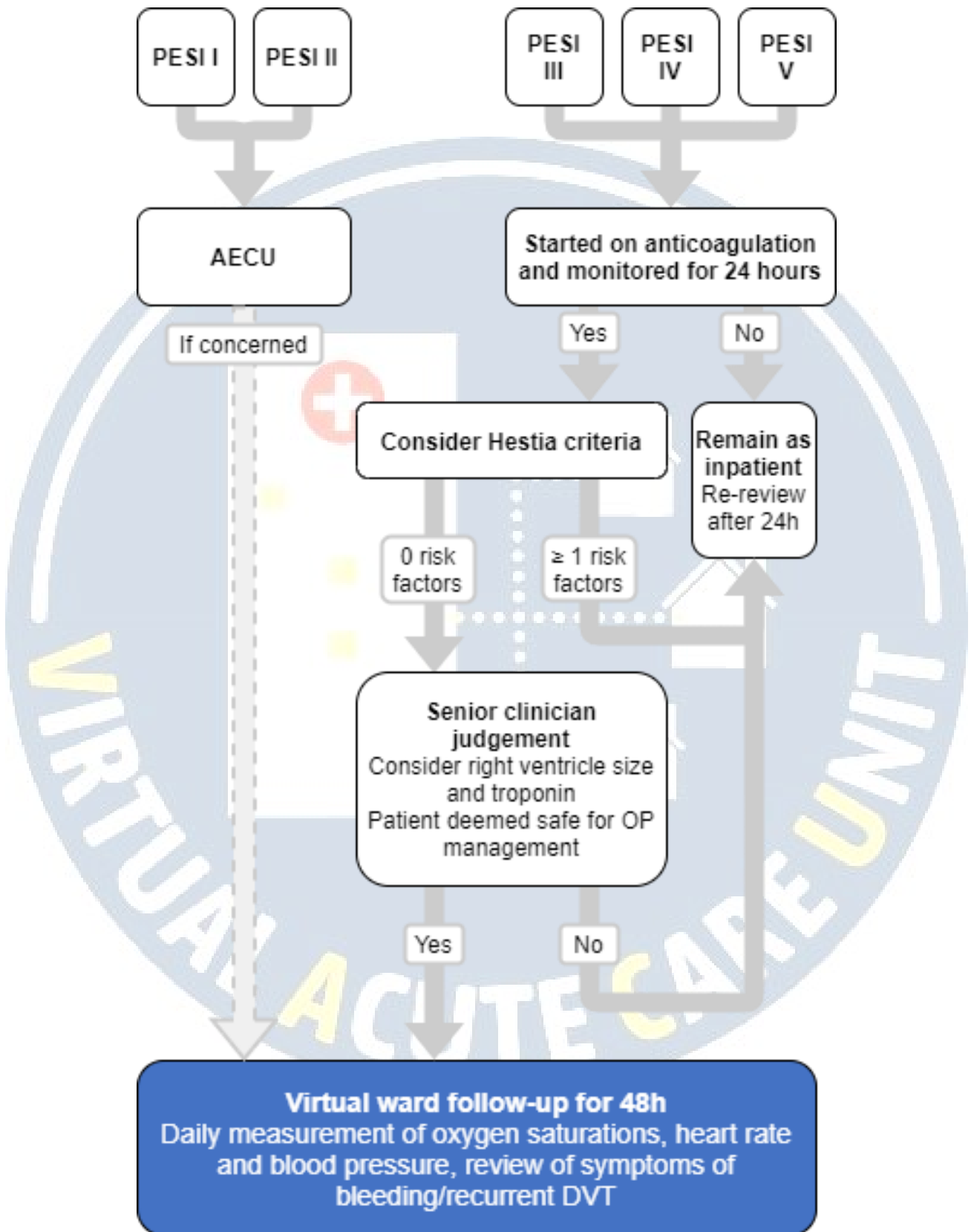
Hestia criteria for outpatient PE management

Hemodynamic instability?
Thrombolysed or embolectomy?
Active bleeding or high risk of bleeding?
> 24 hours on supplemental oxygen to maintain saturations > 90%?
PE whilst on anticoagulation?
Severe pain requiring IV analgesia for > 24 hours?
Medical or social reason for inpatient treatment for > 24 hours?
Creatinine clearance < 30 mL/min?
Severe liver impairment?
Pregnant?
Documented history of heparin-induced thrombocytopenia?
Eligible for OP treatment if none of the above risk factors are met.



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5.0 Referral pathway: To be used by senior clinician or consultant



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Exclusion criteria

- Oxygen requirement
- Haemodynamic instability

Consider keeping as inpatient if/additional exclusion criteria:

- Abnormal troponin and/or NT-proBNP
- Large central pulmonary artery clot
- Large DVT clot burden
- Social reasons including inability to return home, inadequate care at home, lack of telephone communication, concerns over compliance, etc.
- Any other clinical concern

Checklist prior to discharge:

- Documented resting target sats
- Documented phone number
- Patient has the cognitive and physical ability to use pulse oximeter, blood pressure monitor and take phone calls.
- Provide patient with a leaflet, a sats probe and a blood pressure monitor.

6.0 Virtual ward follow-up for patients with pulmonary embolism

- Daily measurements of:
 - Saturations
 - Heart rate
 - Blood pressure
- Daily questions regarding symptoms
 - Signs of bleeding
 - Clinical signs of recurrent DVT

→ Patients who are at risk of erratic anticoagulation (e.g., due to extremes of weight, drug interactions) should be considered for factor Xa levels after discussion with haematology.

7.0 Readmission criteria

- Saturations drops below baseline or 95%
- Systolic blood pressure < 100 mmHg
- HR ≥ 110 bpm
- Suspicion of bleeding or recurrent DVT

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8.0 References

- ¹ Howard LS, Barden S, Condliffe R, Connolly V, Davies C, Donaldson J, Everett B, Free C, Horner D, Hunter L, Kaler J, Nelson-Piercy C, O'Dowd E, Patel R, Preston W, Sheares K, Tait C. British Thoracic Society Guideline for the initial outpatient management of pulmonary embolism. *BMJ Open Respir Res.* 2018 Jun 13;5(1):e000281. doi: 10.1136/bmjresp-2018-000281. PMID: 29955362; PMCID: PMC6018844.
- ² Konstantinides SV, Torbicki A, Agnelli G, Danchin N, Fitzmaurice D, Galiè N, Gibbs JS, Huisman MV, Humbert M, Kucher N, Lang I, Lankeit M, Lekakis J, Maack C, Mayer E, Meneveau N, Perrier A, Pruszczyk P, Rasmussen LH, Schindler TH, Svitil P, Vonk Noordegraaf A, Zamorano JL, Zompatori M; Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC). 2014 ESC guidelines on the diagnosis and management of acute pulmonary embolism. *Eur Heart J.* 2014 Nov 14;35(43):3033-69, 3069a-3069k. doi: 10.1093/eurheartj/ehu283. Epub 2014 Aug 29. Erratum in: *Eur Heart J.* 2015 Oct 14;36(39):2666. Erratum in: *Eur Heart J.* 2015 Oct 14;36(39):2642. PMID: 25173341.
- ³ Reschen ME, Raby J, Bowen J, et al. A retrospective analysis of outcomes in low- and intermediate–high-risk pulmonary embolism patients managed on an ambulatory medical unit in the UK. *ERJ Open Res* 2019; 5: 00184-2018 [<https://doi.org/10.1183/23120541.00184-2018>].

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