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REVIEW ARTICLE

Ambulatory management of acute pulmonary embolism

Javier de Miguel-Díez[1,2,3], Alberto García-Ortega[4,5,*], and Manuel Monreal[3,6]

[1]Respiratory Department, Hospital General Universitario Gregorio Marañón, Madrid, Spain; [2]Instituto de Investigación Sanitaria Gregorio Marañón, Universidad Complutense de Madrid, Madrid, Spain; [3]CIBER Enfermedades Respiratorias (CIBERES), Madrid, Spain; [4]Respiratory Department, Hospital Universitario Doctor Peset, Valencia, Spain; [5]Foundation for the Promotion of Health and Biomedical Research in the Valencian Region (FISABIO), Valencia, Spain; [6]Faculty of Health Sciences, UCAM-Universidad Católica San Antonio de Murcia, Murcia, Spain

ABSTRACT

Ambulatory management offers potential benefits for patients with acute pulmonary embolism (PE), including cost savings, improved patient quality of life, and reduced risk of nosocomial infections, with outcomes comparable to traditional inpatient care. Risk stratification tools help identify low-risk patients for whom outpatient care is feasible, safe, and effective. However, broader adoption of this approach is limited by various barriers, and the rate of ambulatory management for eligible low-risk PE patients remains relatively low. This review examines the current state of outpatient management for acute PE, focusing on the criteria for careful patient selection, with careful consideration of both medical and psychosocial factors, as well as the challenges associated with this approach. It also highlights the importance of clear patient education, robust support infrastructure, and structured follow-up strategies in ensuring the success of outpatient management for acute PE, along with the impact of direct oral anticoagulants in facilitating home therapy.

Keywords: Ambulatory. Anticoagulation. Outpatient. Hospitalization. Pulmonary embolism.

***Correspondence to:**
Alberto García-Ortega
E-mail: albortgva@gmail.com

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INTRODUCTION

Definition

Pulmonary embolism (PE) is the third most frequent cardiovascular disorder, presenting with a high burden of mortality and morbidity. It can manifest in various ways, ranging from asymptomatic incidental findings to severe clinical scenarios such as circulatory collapse and sudden death. Immediate and accurate risk stratification is crucial in managing acute PE, which is typically approached in three steps: identifying patients at a high risk of early mortality who require immediate reperfusion therapy, recognizing those at an increased risk of complications who need hospitalization for close monitoring and potential primary or rescue reperfusion therapy, and identifying low-risk patients who may be safely managed as outpatients[1,2].

In recent years, the introduction of direct oral anticoagulants (DOACs) has revolutionized the treatment of PE, enabling outpatient management for a subset of low-risk patients. The efficacy and safety of these treatments have led to their endorsement by international guidelines, which suggest that low-risk patients can be safely treated at home, provided that appropriate home care arrangements are in place[3,4]. Moreover, recent studies have demonstrated that outpatient treatment is both safe and effective, showing similar rates of recurrence and all-cause mortality to traditional inpatient care[5].

However, the definition of "outpatient" management varies across the literature on PE. It may refer to either early discharge after a short hospital stay (typically within the first 2–5 days) or direct discharge after less than 24 h of observation. This inconsistency reflects the diversity in study designs and definitions used across different research and clinical guidelines, leading to varying interpretations of what constitutes appropriate outpatient care[3,4,6,7].

Epidemiology

It has been estimated that around 85% of the costs related to the management of PE are attributed to hospital stays[8-10]. Beyond reducing healthcare costs, the potential benefits of outpatient management include avoiding the risk of nosocomial infections and minimizing disruptions to the patient's life; nevertheless, the proportion of low-risk PE patients treated as outpatients remains relatively low[11]. For instance, a study conducted in the USA examined 9,15,702 stable patients with a primary diagnosis of PE treated in emergency departments between 2007 and 2012. The study found that only 6.0% of these patients were managed as outpatients[12]. Subsequent studies have shown similarly low rates of outpatient management. In one analysis of 983 patients diagnosed across five emergency departments in the USA between 2013 and 2014, only 1.3% were managed at home, and 12% were hospitalized for 2 days or less[13]. Recent national data from the USA indicate that emergency department discharge rates for acute PE have remained consistent from 2012 to 2020, with only one-third of low-risk patients being discharged for outpatient care[14].

The variability in outpatient management practices across different countries and healthcare settings is significant[15]. For example, in the Florence district of Italy, only 2% of patients with PE were discharged early (within 2 days) in 2013–2014[16], whereas in Ottawa, Canada, approximately 50% of patients with PE are currently managed as outpatients[17]. This disparity highlights the importance of site-specific factors, the intensity and duration of care, and healthcare provider preferences, which can influence the decision-making process regarding outpatient management of acute PE[6].

Current management based on prognostic assessment

Risk assessment models such as the Pulmonary Embolism Severity Index (PESI), the simplified PESI (sPESI) score, and the Hestia criteria (Table 1) are essential tools for identifying subgroups of hemodynamically stable PE patients whose risk of short-term mortality is low (ranging from 0.5% to 2.5%)[2,18]. These tools help clinicians determine whether a patient is eligible for outpatient management. When a low-risk PESI score is combined with the absence of right ventricular (RV) dysfunction, the 30-day mortality rate decreases even further, dropping to approximately 0.2–0.3%[1].

Evidence from recent studies supports the use of these risk stratification tools for safe outpatient management[19]. For example, the Home Treatment of Pulmonary Embolism (HOME-PE) study demonstrated that the Hestia criteria were noninferior to the sPESI criteria for triaging normotensive PE patients for home treatment. While the Hestia criteria categorized fewer patients as eligible for outpatient care, their applicability was higher because fewer home treatment recommendations were overridden by attending physicians. Both strategies led to more than one-third of PE patients being treated at home, with a low 30-day complication rate[20].

Additionally, the *Registro Informatizado de la Enfermedad TromboEmbolica* (RIETE) score is another prognostic score to identify of 10-day incidence of recurrent PE, major bleeding, and mortality[21]. The RIETE score assigns points based on clinical and laboratory variables, including chronic heart failure, recent immobility, cancer, creatinine clearance levels, platelet count, and hemodynamic status. This score has been recently validated in a large real-world registry in Japan[22], further refining the selection process for outpatient management of low-risk patients. However, the study's limitations, such as its conduction prior to the widespread introduction of DOACs, suggest that further validation in contemporary settings is warranted.

Rationale for outpatient management

Home treatment of PE offers numerous benefits, including improved quality of life, enhanced patient satisfaction, and optimized use of healthcare resources. It allows patients to return to their normal physical and professional activities more quickly and reduces the risk of iatrogenic incidents associated with prolonged hospitalization, particularly

Table 1. Hestia criteria, PESI, and sPESI

Hestia criteria	Answer	PESI	Points	sPESI	Points
Hemodynamically unstable: sBP < 100 mmHg and HR > 100 bpm, needing ICU care, or by clinical judgment	Yes/no	Age	Years	Age > 80 years	1
Thrombolysis or embolectomy needed: for reasons other than hemodynamic instability	Yes/no	Male sex	+ 10	History of cancer	1
Active bleeding or high risk of bleeding: GI bleeding or surgery ≤ 2 weeks ago, stroke ≤ 1 month ago, bleeding disorder or platelet count < 75 × 10^9/l, uncontrolled HTN (sBP > 180 mmHg or dBP > 110 mmHg), or by clinician judgment	Yes/no	History of cancer	+ 30	Chronic cardiopulmonary disease	1
> 24 h of supplemental oxygen required to maintain oxygen saturation >90%	Yes/no	History of heart failure	+ 10	Systolic blood pressure < 100 mmHg	1
PE diagnosed while on anticoagulation	Yes/no	History of chronic lung disease	+ 10	HR ≥ 110 bpm	1
Severe pain needing intravenous pain medication required > 24 hours	Yes/no	Heart rate ≥ 110 bpm	+ 20	Arterial oxygen saturation < 90%	1
Medical or social reason for admission > 24 h (infection, malignancy, no support system)	Yes/no	Systolic blood pressure < 100 mmHg	+ 30		
Creatinine clearance of < 30 ml/min according to the Cockcroft–Gault formula	Yes/no	Respiratory rate ≥ 30 /min	+ 20		
Severe liver impairment: by clinical judgment	Yes/no	Temperature < 36 °C/96.8 °F	+ 20		
Pregnant	Yes/no	Altered mental status (disorientation, lethargy, stupor, or coma)	+ 60		
Documented history of heparin-induced thrombocytopenia	Yes/no	Arterial oxygen saturation < 90%	+ 20		
If all questions can be answered with "No," the Hestia criteria are negative, and the patient is eligible for outpatient treatment		If the PESI Class is I (total score of 0–65) or II (total score of 66–85), the patient is eligible for outpatient treatment		If the sPESI = 0, the patient is eligible for outpatient treatment	

Modified from ref. [2]. dBP: diastolic blood pressure; GI: gastrointestinal; HR: heart rate; HTN: hypertension; ICU: intensive care unit; PE: pulmonary embolism; sBP: systolic blood pressure; PESI: Pulmonary Embolism Severity Index; mPESI: modified PESI; sPESI: simplified PESI.

in older populations[13,23,24]. Importantly, outpatient management is also associated with significant cost savings, as it reduces the need for hospital bed occupancy and limits overcrowding in emergency rooms[25].

Despite these advantages, outpatient management is not yet widespread. The current clinical guidelines emphasize the careful selection of low-risk patients for early discharge and home treatment. This approach

Table 2. Potential barriers to outpatient management

Influence of the medical-legal climate.
Patient insurance status.
Perception of standards of care.
Inertia of clinical practice.
Institutional protocol.
Clinician emotions and beliefs.
Clinicians' fear of being an atypical case among their local colleagues.
Support for clinical decision-making.
Availability of outpatient follow-up.
Physician's comfort with follow-up.

Modified from ref[21].

requires robust outpatient care systems, including family or social support, patient education, and facilities for specialized follow-up visits. Barriers to the broader adoption of outpatient management include concerns about follow-up availability, insurance coverage of anticoagulants, and institutional or provider-specific inertia (Table 2)[26,27]. Addressing these barriers is crucial for expanding the practice of outpatient management in eligible patients.

SELECTION CRITERIA FOR OUTPATIENT MANAGEMENT

Criteria for low-risk patients

The selection of patients for outpatient management should be based on a thorough risk assessment, using validated tools such as the PESI or sPESI scores, the Hestia criteria, or the RIETE criteria[28-32]. These criteria help identify low-risk PE patients who are unlikely to suffer from serious complications or require advanced in-hospital care.

The following parameters are typically used to define low-risk patients suitable for outpatient management (Fig. 1).

1. *Clinical stability*: Patients must be hemodynamically stable, without signs of shock or hypotension, which would necessitate emergent intervention.

2. *Risk scores*: Low-risk patients are typically identified using validated scoring systems such as the PESI or sPESI scores. A low-risk PESI score or a sPESI score of zero usually indicates eligibility for outpatient management. Additionally, the Hestia criteria and the RIETE registry's prognostic score can help identify patients with low-risk PE, further refining the selection process[21].

3. *Absence of severe comorbidities*: Patients considered for outpatient management should not have serious concomitant conditions such as recent major surgery, severe COPD, or active cancer, as these conditions may increase the risk of complications.

4. *Echocardiographic and biomarker findings*: The absence of RV dysfunction on echocardiography and normal levels of cardiac biomarkers (e.g., troponin) further support the decision for outpatient management[33].

5. *Social and home environment*: Adequate home circumstances, including the presence of a caregiver and access to medical facilities for follow-up, are also important considerations. These factors ensure that

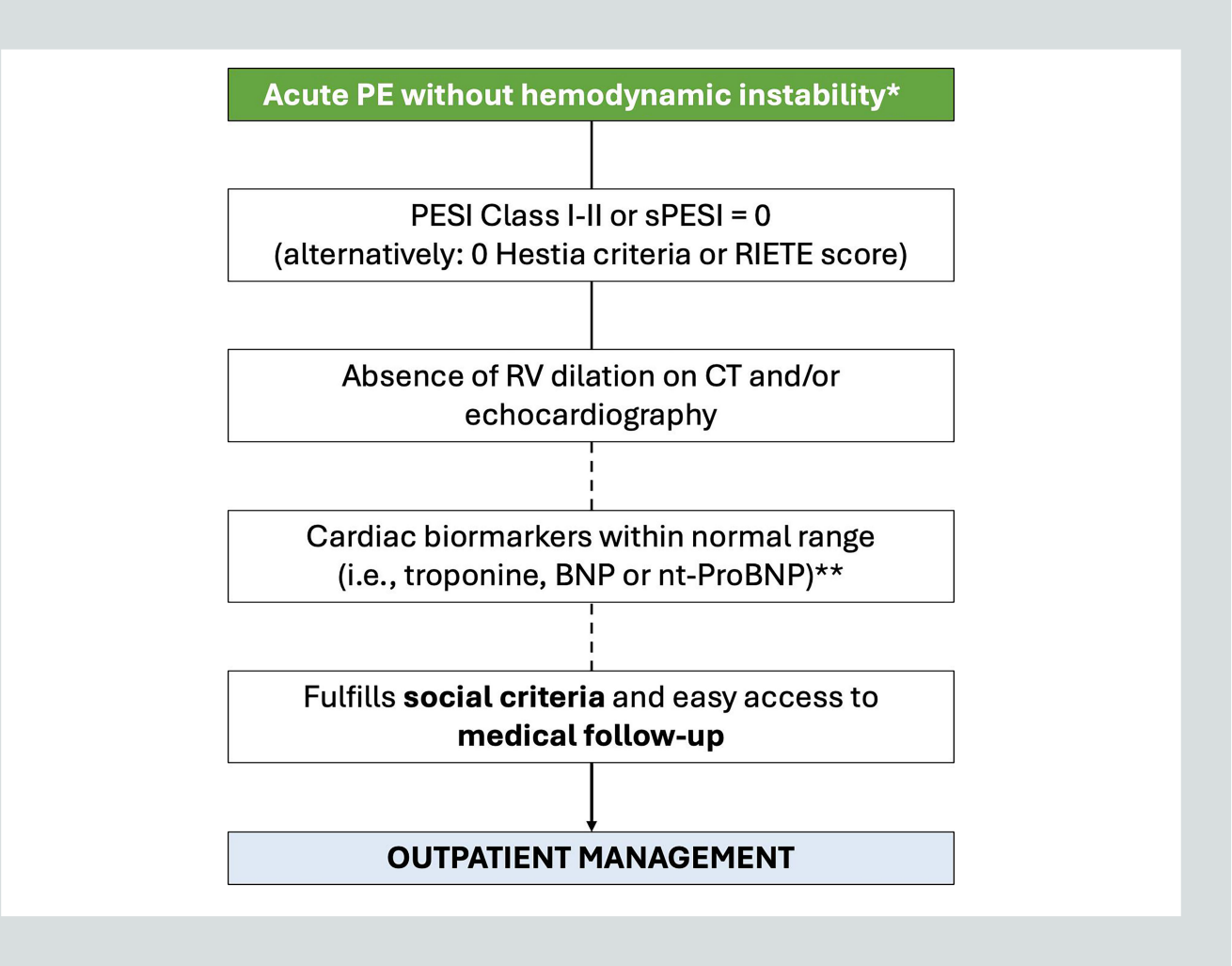

Figure 1. Proposal for the accurate identification of patients with symptomatic acute PE eligible for outpatient treatment. *Hemodynamic instability: need for cardiopulmonary resuscitation, obstructive shock (i.e., systolic blood pressure < 90 mmHg or vasopressors required to achieve a blood pressure ≥ 90 mmHg despite adequate filling status, and end-organ hypoperfusion) and/or persistent hypotension (i.e., systolic blood pressure < 90 mmHg or systolic blood pressure drop ≥ 40 mmHg lasting > 15 min and not caused by new-onset arrhythmia, hypovolemia, or sepsis). **It is not considered mandatory to obtain blood cardiac biomarkers. CT: computed tomography; PE: pulmonary embolism; PESI, Pulmonary Embolism Severity Index; RV: right ventricle; sPESI: simplified Pulmonary Embolism Severity Index.

the patient has the necessary support and resources to manage their condition effectively outside of a hospital setting.

Management of incidental pulmonary embolism

Incidental PE refers to cases where PE is discovered accidentally, often during imaging studies conducted for other reasons. These patients may be asymptomatic or have minimal symptoms related to PE. The management of incidental PE presents unique challenges, as these cases are often not associated with the same acute symptoms that guide the treatment of symptomatic PE.

1. *Risk assessment and clinical judgment*: As with symptomatic PE, risk stratification is

essential in incidental cases. Many patients with incidental PE can be categorized as low risk using the same criteria and scoring systems as symptomatic cases. However, the decision to manage these patients in an outpatient setting should be based on clinical judgment, considering the size and extent of the embolism and the patient's overall clinical status.

2. *Literature gap*: There is currently a lack of robust literature supporting the justification for home therapy in patients with incidental PE. This lack of robust evidence necessitates a cautious approach, heavily reliant on clinical judgment and individual risk assessment.

3. *Clinical judgment*: The decision to manage incidental PE in an outpatient setting should be based on clinical judgment, considering both the size and extent of the PE and the patient's overall clinical status.

4. *Follow-up and monitoring*: Establishing a follow-up plan is crucial, involving regular monitoring of symptoms and potential complications. Patients should be educated about the signs of worsening conditions and when to seek immediate care.

5. *Anticoagulation therapy*: As with other PE patients, those with incidental PE typically require anticoagulation therapy. The choice of anticoagulant and duration of therapy should be tailored to the individual patient based on their risk profile and renal function.

In conclusion, the selection of patients for outpatient management should be cautious, prioritizing safety and considering both medical and psychosocial factors. Regular reassessment and clear communication with patients about when to return to the hospital are essential components of successful outpatient management of acute PE.

CURRENT EVIDENCE WITH OUTPATIENT CARE FOR PULMONARY EMBOLISM

Outpatient treatment versus hospitalization

Recent evidence from randomized clinical trials (RCTs) and observational studies has provided substantial support for the safety and efficacy of outpatient management of acute PE in selected low-risk patients. These studies compare the outcomes of these patients managed at home or discharged early with those who receive standard in-hospital treatment (Table 3)[19].

For example, Otero et al.[35,39] conducted a multicenter RCT (NCT00214929) to compare the efficacy and safety of early discharge versus standard hospitalization in low-risk PE patients. Although no differences were observed in mortality, venous thromboembolism (VTE) recurrences, or bleeding at 90 days, the study was prematurely halted due to unexpectedly high short-term mortality in the early discharge group, attributed to major bleeding and the presence of cardiac thrombi.

Table 3. Major adverse outcomes in outpatients' cohorts included in randomized clinical trials assessing early discharge management

Study [ref].	Year of publication	Patients, total (n)/ outpatient (n)	Long-term therapy	Mean age (years)	All-cause mortality		PE-related mortality		Recurrent VTE		Major bleeding	
					30 days	90 days	30 days	90 days	30 days	90 days	30 days	90 days
Wells et al.[34]	2005	90/90	VKA	58	0 (0%)	3 (3.3%)	0 (0%)	0 (0%)	ND	2 (2.2%)	0 (0%)	0 (0%)
Otero et al.[35]	2010	132/72	VKA	60	2 (2.8%)[a]	3 (4.2%)	1 (1.4%)	ND	ND	2 (2.8%)	ND	1 (1.4%)
Aujeski et al.[36]	2011	344/171	VKA	47	0 (0%)	1 (0.6%)	0 (0%)	0 (0%)	0 (0%)	1 (0.6%)	2 (1.2%)	3 (1.8%)
Den Exter et al.[37]	2016	550/275[b]	VKA	53	2 (0.7%)	3 (1.1%)	1 (0.4%)	1 (0.4%)	ND	3 (1.1%)	ND	3 (1.1%)
Peacock et al.[38]	2018	114/51	DOAC	49	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Roy et al.[20]	2021	1975/739	DOAC (85%) VKA (2%) LMWH (3%)	57	2 (0.3%)	3 (0.4%)	ND	ND	2 (0.3%)	6 (0.8%)	6 (0.8%)	7 (1.5%)

[a]Within the first 10 days after diagnosis.

[b]Direct discharge (vs. management based on NT-proBNP levels).

DOAC: direct oral anticoagulant; LMWH: low-molecular-weight heparin; PE: pulmonary embolism; VKA: vitamin K antagonist; VTE: venous thromboembolism.

In contrast, the Outpatient Treatment of Pulmonary Embolism (OTPE) trial (NCT00425542), a multi-center open-label RCT, assessed the noninferiority of outpatient management compared to inpatient care for patients with low-risk PE across multiple centers in Switzerland, Belgium, France, and the USA. The study demonstrated that outpatient care can safely and effectively replace inpatient care[36]. Adverse event rates at 90 days were low in the outpatient setting, with mortality at 0.6%, recurrent VTE at 0.6%, and major bleeding at 1.8%. Moreover, this approach shortened the average hospital stay by over 3 days (0.5 vs. 3.9 days)[36].

Another noninferiority RCT, the evaluation of the safety and efficacy of outpatient management for patients with low-risk pulmonary embolism (VESTA) study, compared outpatient and inpatient care based on NT-proBNP levels in 550 patients with low-risk PE, defined by the absence of Hestia criteria. The study observed a low rate of 90-day all-cause mortality, recurrent VTE, and major bleeding, each at 1.1%, in the direct discharge group[37]. A later multicenter open-label RCT, the management of pulmonary embolism using rivaroxaban (MERCURY PE) trial, assessed the outcomes of outpatient care with rivaroxaban in patients with low-risk PE, as defined by the Hestia criteria. The trial reported no deaths, VTE recurrences, or major bleeding events in the entire cohort, with a significant reduction in the length of hospital stay[38].

Risk of complications

Multiple studies, meta-analyses, and systematic reviews have consistently shown that carefully selected low-risk patients treated on an outpatient basis or discharged early experience very low rates of major adverse outcomes, including mortality, recurrent VTE, and significant bleeding[11,19,40].

For instance, Zondag et al.[28] used the Hestia criteria to determine outpatient management for 297 patients with normotensive patients with acute PE. The study reported a low rate of serious adverse events, including all-cause mortality (1%) and VTE recurrences (2%). Another prospective single-arm study, the low-risk pulmonary embolism: outpatient management (LOPE) study, found that outpatient care (early discharge after 12–24 h of observation) is safe for carefully selected low-risk PE patients. Most patients were discharged on DOACs, with no deaths or symptomatic VTE recurrences observed at 90 days, and one major bleeding event reported (0.5%)[41].

A systematic review of 12 studies, including four RCTs involving 1,841 low-risk PE patients treated on an outpatient basis, found few significant adverse effects. The 90-day mortality rate was 0.7%, PE-related mortality was 0.06%, and the rates of recurrent PE and severe bleeding were 0.8% for both criteria. This evidence underscores the safety and feasibility of outpatient management for low-risk PE patients[18].

A more recent phase III clinical trial, the HOME-PE trial (NCT02811237), further confirmed the safety and effectiveness of home treatment for low-risk PE patients, using the Hestia criteria or sPESI score. The primary composite outcome, including 30-day recurrent VTE, major bleeding, or all-cause death, was observed in less than 1.5% of the included patients[20].

Finally, a posthoc analysis of the RCT Intensive versus standard monitoring in patients with intermediate-risk pulmonary embolism (IPEP) study (NCT02733198) identified that using a prognostic assessment based on the sPESI clinical score and management pathways effectively reduced the length of hospital stay for a subgroup of patients with low-risk PE, with no major adverse outcomes in the intervention group[42,43].

Focused on enhancing the safety and precision in selecting eligible patients with acute PE for outpatient management, a Spanish study known as the safety of outpatient treatment in very low-risk patients with acute pulmonary embolism (TRAM-TEP) study (NCT05852119) is currently underway. This study aims to rigorously evaluate the safety of outpatient care for patients with very low-risk PE by utilizing a modified sPESI score. This modified score lowers the heart rate cutoff point to 100 bpm (from the conventional 110 bpm)[44] and incorporates advanced RV dysfunction assessment through computed tomography, specifically evaluating the right/left ventricle ratio of <1.0.

Anticoagulant treatment

Early initiation of anticoagulation is the cornerstone of treatment for acute PE, aimed at reducing the risk of early death and recurrence of symptomatic or fatal PE[45-48]. For patients managed on an outpatient basis, it is crucial that they understand the importance of the treatment, correctly comprehend the method of administration and dosage of their medications, and recognize potential complications related to PE or anticoagulant therapy.

Traditional anticoagulant options have included parenteral anticoagulation (i.e., low-molecular-weight heparin) followed by a vitamin K antagonist (VKA), used concurrently for at least 5 days until the international normalized ratio is between two and three, or parenteral anticoagulation alone. However, the increasing availability of DOACs has simplified the outpatient management of acute PE. Some DOACs eliminate the need for initial self-administration of parenteral therapies and do not require routine laboratory monitoring.

Furthermore, DOACs offer several practical benefits over VKAs, including a better safety profile, fewer dietary restrictions, and reduced drug interactions. Cost-effectiveness studies have also demonstrated favorable outcomes for the treatment of acute PE with DOACs[8]. Combined with the effective application of validated risk stratification tools, DOACs have made outpatient care and early discharge more feasible for patients at low risk of short-term complications[4,49].

The MERCURY-PE trial (NCT02584660), which included 1,918 low-risk patients, evaluated the safety and effectiveness of using rivaroxaban at home and its impact on reducing hospital days compared to standard care[50,51]. The authors reported no differences in length of in-hospital stay or PE-related outcomes, including recurrent VTE, major bleeding, and death within 3 months of diagnosis. However, they found a lower rate of in-hospital complications and lower total costs associated with outpatient management[51].

A recent single-arm multinational phase 4 clinical trial, the HoT-PE trial, confirmed that early discharge (within 48 hours) and ambulatory anticoagulant therapy with rivaroxaban for at least 3 months is effective and safe in carefully selected normotensive low-risk PE patients without RV enlargement or dysfunction[52]. The trial reported a low rate of recurrent VTE or PE-related death within 3 months and a low incidence of major bleeding.

This growing evidence has led the current clinical practice guidelines recommending DOACs (apixaban, rivaroxaban, dabigatran, or edoxaban) over VKAs as the preferred oral anticoagulant therapy in most patients with acute PE, provided that there are no significant contraindications such as severe renal impairment, pregnancy, lactation, or antiphospholipid syndrome. At the time of discharge, clinicians should consider the different dosages of these DOACs and any necessary adjustments based on the patient's clinical situation (Fig. 2)[4,49].

Satisfaction, quality of life, and cost-effectiveness of outpatient treatment

Outpatient management of PE is desirable as soon as possible to avoid the risks associated with hospitalization, such as hospital-acquired infections. Ensuring the safety and effectiveness of ambulatory therapy is crucial for achieving these benefits[9,53]. Within the healthcare system, it is also essential to consider the costs associated with PE treatment, primarily related to hospitalization expenses[10].

The cost of managing PE in a hospital setting has been estimated to be around $3,000 per patient[9,38]. Therefore, beyond convenience, outpatient management has been associated with cost savings, reduced in-hospital complications, and the rationalization of healthcare resource use without compromising patient safety[54]. Additionally, several studies have reported better treatment satisfaction among patients with acute PE treated in an outpatient setting[53]. For example, a recent single-arm prospective multicenter study reported that 89% of patients with acute PE preferred outpatient management over hospitalization[41].

Treatment duration

The current recommendation is to treat patients with acute PE with anticoagulants for at least 3 months. The primary goal of anticoagulation therapy in PE is to resolve the acute episode and prevent VTE recurrences. The duration of treatment should not only depend

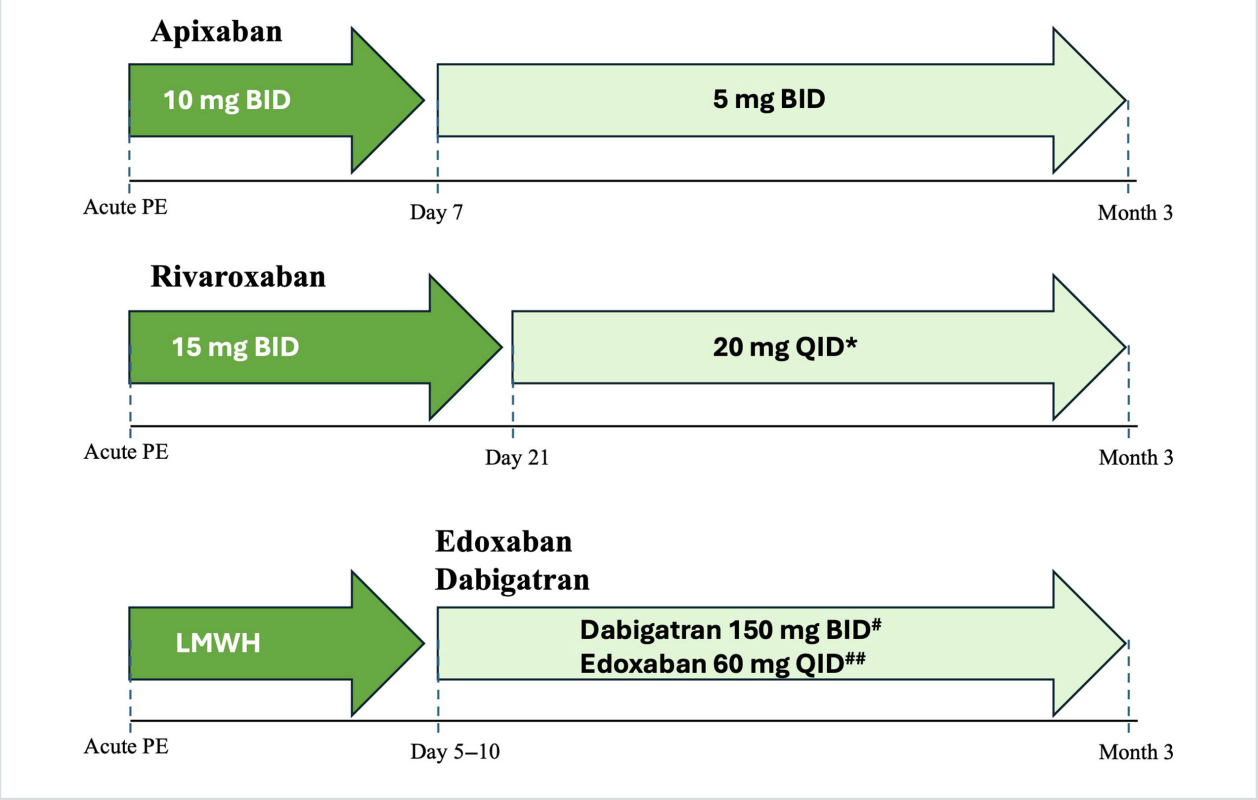

Figure 2. Dosage regimen of direct oral anticoagulants for the treatment of acute pulmonary embolism (*modified from ref.*[49]). *Consider dose reduction to 15 mg/24 h if creatinine clearance is 15–49 ml/min and the risk of bleeding is higher than the risk of recurrence. # 110 mg/12 h in patients > 80 years, or those using verapamil, or with a high risk of bleeding. ## 30 mg/24 h if creatinine clearance is 15–50 ml/min, or weight is < 60 kg, or using P-gp inhibitors: cyclosporine, dronedarone, erythromycin, and ketoconazole. BID: twice a day; LMWH: low-molecular-weight heparin; PE: pulmonary embolism; QID: once a day.

on the initial therapeutic management of acute PE but also should be guided by the presence or absence of risk factors for recurrence.

Anticoagulation is generally discontinued after 3 months for the first episode of PE provoked by a resolved major transient risk factor. Indefinite anticoagulation is recommended for patients with a major permanent risk factor (e.g., active cancer, antiphospholipid syndrome, or a history of two or more idiopathic thrombotic episodes). Indefinite anticoagulation is also recommended for men with idiopathic PE, who have been observed to have an increased risk of recurrence. In contrast, patients with PE secondary to a resolved minor transient risk factor, women with idiopathic PE, patients wishing to discontinue anticoagulation, and those with an uncertain risk/benefit ratio for indefinite anticoagulation may benefit from additional studies to assess their risk of VTE recurrence. These studies may include clinical characteristics, predictive tools of VTE recurrence (e.g., HERDOO2 score), and blood biomarkers (e.g., D-dimer, thrombophilia studies).

Patients with PE managed as outpatients should be reassessed at 3–6 months to evaluate the persistence or new onset of dyspnea or functional limitation, which may warrant further diagnostic workup for chronic thromboembolic pulmonary hypertension (CTEPH) or chronic thromboembolic disease (CTED)[4,55]. Lifelong therapeutic anticoagulation is strongly recommended in patients with CTEPH, primarily with VKAs. However, the efficacy and safety of long-term anticoagulation in CTED remain uncertain, and the choice of therapy must be based on individual decision-making[56].

EDUCATION AND FOLLOW-UP OF PATIENTS WITH ACUTE PULMONARY EMBOLISM UNDER OUTPATIENT MANAGEMENT

Given the shift towards outpatient management for selected low-risk PE patients, the importance of patient education and follow-up cannot be overstated. Upon discharge, patients should receive comprehensive education on their condition, the importance of adherence to anticoagulation therapy, and the recognition of symptoms that may indicate complications or recurrence[5].

Effective follow-up strategies should be established, including regular clinical assessments, laboratory monitoring as needed, and access to healthcare providers for concerns or emergencies[3,4]. Telemedicine and remote monitoring tools can also play a crucial role in ensuring continuity of care and promptly addressing any issues that arise during the outpatient treatment phase.

CONCLUSIONS

In summary, the traditional approach of hospitalizing all patients diagnosed with acute PE is evolving. With the growing body of evidence supporting the safety and efficacy of outpatient management for low-risk PE patients, this approach is increasingly recognized as a viable and valuable strategy to optimize healthcare resources, reduce hospital-related complications, and improve patient outcomes. Risk stratification tools such as PESI, sPESI, and the Hestia criteria are instrumental in identifying patients suitable for outpatient care.

The introduction of DOACs has further facilitated the transition to outpatient management, offering simplified treatment regimens with favorable safety profiles. However, the selection of patients for early discharge and outpatient management should be cautious, with careful consideration of both medical and psychosocial factors. Adequate infrastructure, clear patient education, and structured follow-up plans are essential to ensuring the success of outpatient management for acute PE.

ETHICAL DISCLOSURES

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article. Furthermore, they have acknowledged and followed the recommendations as per the

SAGER guidelines depending on the type and nature of the study.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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