

Managing acute pulmonary embolism in primary care in a patient declining emergency department transfer: a case report

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Background

For patients with acute pulmonary embolism (PE) diagnosed in the primary care setting, transfer to a higher level of care, like the emergency department, has long been the convention. Evidence is growing that outpatient management, that is, care without hospitalization, is safe, effective, and feasible for selected low-risk patients with acute PE. Whether outpatient care can be provided *entirely* in the primary care setting has not been well-studied. We report a case of outpatient management of a low-risk patient with acute PE without emergency department transfer.

Case summary

A 74-year-old woman with a history of recent surgery and immobilization presented to a primary care physician with 10 days of mild, non-exertional pleuritic chest pain. Her D-dimer concentration was elevated. Computed tomography pulmonary angiography identified a lobar embolus without right ventricular dysfunction. She declined emergency department transfer but was classified as low risk (class II) on the PE Severity Index and met the criteria of the European Society of Cardiology (ESC) for outpatient care. Her physician provided *comprehensive* clinic-based PE management, discharging her to home with education, anticoagulation, and close follow-up. She completed her 3-month treatment course without complication.

Discussion

This case describes patient-centred, comprehensive, outpatient PE management in the primary care setting for a woman meeting explicit ESC outpatient criteria. This case illustrates the elements of care that clinics can put in place to facilitate PE management without having to transfer eligible low-risk patients to a higher level of care.

Keywords

Venous thromboembolism • Pulmonary embolism • Outpatient • Ambulatory care • Risk stratification • Case report

Learning points

- Comprehensive management of acute pulmonary embolism (PE) can be safe and feasible in the primary care setting.
- Patients eligible for outpatient care can be identified by using the criteria of the 2019 European Society of Cardiology PE guidelines: haemodynamic stability, low score on the PE Severity Index, and absence of right ventricular dysfunction on imaging.
- Primary care physicians considering comprehensive PE management should evaluate their access to diagnostic resources and their ability to treat, educate, and closely follow the patient.

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Introduction

For patients with acute pulmonary embolism (PE) diagnosed in the primary care setting, transfer to a higher level of care, like the emergency department, has long been the convention. Some primary care clinics have ready access to advanced imaging services, such as computed tomography pulmonary angiography (CTPA), and can secure the diagnosis of PE before transferring patients for definitive management.¹ But what if a patient is not amenable to the recommended transfer of care and requests treatment exclusively at home?

We report a case in which a patient in a primary care clinic did not agree to the recommended transfer and requested comprehensive clinic-based care. By following leading European and US PE guidelines,^{2,3} the primary care physician was able to accommodate the patient's site-of-treatment preferences without compromising high-quality care.

Timeline

Two to three months before (PE) diagnosis	<ul style="list-style-type: none"> • Patient sustained a non-displaced fracture of the tibial plateau and was hospitalized for open reduction and internal fixation. • Transferred to a skilled nursing facility and received 3 weeks of prophylactic enoxaparin. • Discharged home in the care of her family.
Two weeks before diagnosis	<ul style="list-style-type: none"> • Developed non-exertional pleuritic chest pain on deep inspiration with episodic low-grade subjective fever.
Three days before diagnosis	<ul style="list-style-type: none"> • Saw a primary care physician and underwent laboratory testing. A computed tomography pulmonary angiography (CTPA) was ordered.
Day of PE diagnosis	<ul style="list-style-type: none"> • CTPA identified a lobar embolus without right ventricular dysfunction. • Patient declined advice to go to the emergency department for treatment. • Primary care physician, in consultation with a pulmonologist, determined that she met criteria for outpatient PE management and arranged for comprehensive outpatient care.
In the 10 days after diagnosis	<ul style="list-style-type: none"> • In-person follow-up visit in the clinic 2 days after the diagnosis. • Telephone follow-up with primary care physician 9 days after diagnosis.
Three months after diagnosis	<ul style="list-style-type: none"> • Course of anticoagulation completed without recurrence or complication.

Case presentation

A 74-year-old woman presented to a primary care physician with 10 days of mild, non-exertional pleuritic chest pain on deep inspiration and episodic low-grade subjective fever. She denied cough, shortness of breath, lower extremity symptoms, and urinary tract symptoms. She was haemodynamically stable, with normal vital signs as follows: blood pressure 110/69 mmHg, pulse 79 b.p.m., temperature 36.7°C, a normal respiratory rate, and oxygen saturation 98% on room air. Her body mass index was 20 kg/m². Her physical examination was unremarkable, including heart, lung, and extremity evaluations.

The patient had fallen off a ladder 9 weeks earlier and sustained a tibial plateau fracture, which was treated with open reduction and internal fixation. She had completed her course of thromboprophylaxis without complication. At the time of presentation, she was recovering at home with her niece. She had no chronic medical conditions except osteoporosis and had no history of cardiac, pulmonary, renal, or venous thromboembolic disease.

Blood tests and a urinalysis were completed that day. The urinalysis was normal and the complete blood count and estimated glomerular filtration rate were within normal limits. The D-dimer level was elevated at 1653 ng/mL (age-adjusted normal <740 ng/mL). The physician ordered a same-day CTPA at the on-campus radiology suite, but the patient preferred to go home to rest and wanted to defer the imaging for 3 days. The physician explained that the delay was not optimal but would suffice if the patient promised to go to the emergency department if she developed new or worsening symptoms. She agreed. She was not treated with pre-emptive anticoagulation.

The CTPA was performed as re-scheduled and identified a lobar embolus without signs of right ventricular dysfunction. The physician called the patient, explained the results, and advised her to report to the emergency department for evaluation and treatment. The patient, however, felt this was unnecessary because she was feeling better, and she requested comprehensive clinic-based care. The physician said he would call her back after evaluating her eligibility.

The on-call pulmonologist agreed that the patient met the criteria for outpatient care. Her vital signs were all normal. Her PE Severity Index (PESI) score and class of 74 points and class II, respectively, correlate with a low 30-day all-cause mortality.^{4,5} She also lacked evidence of right ventricular dysfunction on imaging, a criterion of the 2019 European Society of Cardiology (ESC) PE guidelines (Table 1).³ Additionally, she owned a phone, had ready access to transportation, and had strong family support, all of which favoured outpatient management.

Her physician consulted the healthcare system's pharmacy-led anticoagulation management service about medication options. On their advice, he prescribed a 5-day course of subcutaneous enoxaparin (60 mg every 12 h) followed by oral dabigatran (150 mg twice daily) for 3 months, which were the medical group's formulary recommendations at the time. The physician communicated the treatment plan to the patient and her niece, along with basic education on anticoagulation, the expected disease course, and the indications to seek medical attention.

The anticoagulation pharmacist called the patient later that afternoon to continue patient and family education. The patient was seen in the clinic 2 days later and had a phone appointment with her primary care physician 1 week following that. She did not experience a recurrence or complications in the ensuing 3 months, after which the

Table 1 The 2019 criteria of the European Society of Cardiology for outpatient management of acute pulmonary embolism³

Clinical risk variable	Outpatient criterion	Status	Comment
Haemodynamics	Haemodynamic stability	Recommended	Normotensive: systolic blood pressure >90 mmHg without need for vasopressors
Thirty-day all-cause mortality	Low-risk classification on a validated prognostic instrument, either the original or simplified Pulmonary Embolism Severity Index (PESI)	Recommended	PESI Class I or II, or simplified PESI score 0
Right ventricle assessment	Absence of right ventricular dysfunction on imaging study	Recommended	On either CTPA or transthoracic echocardiography
Cardiac troponin	Absence of elevation	Optional	Not required in the eligibility assessment

CTPA, computed tomography pulmonary angiography.

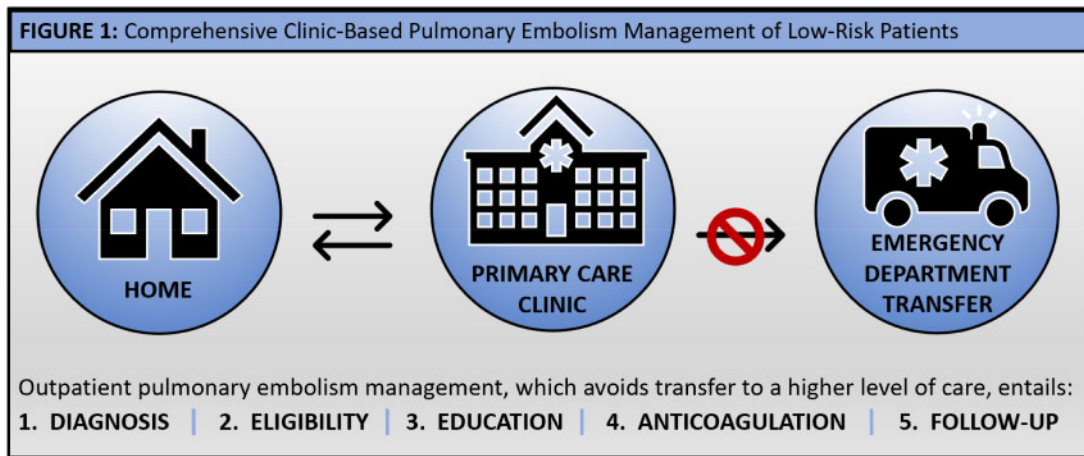


Figure 1 Comprehensive clinic-based management of low-risk patients with acute pulmonary embolism. Patients diagnosed with pulmonary embolism in primary care are usually transferred to the emergency department. However, appropriately selected patients can be treated in the primary care clinic then at home provided that resources are available in the five key areas indicated.

anticoagulation therapy was discontinued. Her D-dimer level shortly thereafter was within normal limits.

Discussion

In this case, we describe comprehensive clinic-based PE management that succeeded without the customary transfer to a higher level of care (Figure 1). The patient’s site-of-treatment preference opened this alternative care pathway, which was not initially considered. Her physician was able to put in place the necessary components to make comprehensive outpatient management safe and feasible. This strategy also aligned with the patient’s preferences, an important component of patient-centred care.⁶

The literature shows increasing evidence in favour of treating selected patients with acute PE without hospitalization. The practice is safe and effective^{4,7,8} and has been endorsed by leading medical societies.^{2,3} Nearly all of the primary research on this topic, however,

has been undertaken in the emergency department, ambulatory care unit, or specialty-based clinic; little research has been performed on comprehensive PE management in the primary care setting,⁸ which makes this case distinctive.

This case raises two questions whose answers will help primary care and other outpatient physicians better manage cases like this: which ambulatory patients are best suited to outpatient care, and what elements should be in place to facilitate comprehensive clinic-based care of patients with acute PE?

The 2019 ESC acute PE guidelines provide clear, structured, evidence-based criteria for identifying eligible patients (Table 1). Such patients must be haemodynamically stable and classified as low risk on validated prognostic instruments. The ESC recommends the well-studied PESI, or its simplified counterpart (sPESI),^{4,5,9} which have both been widely validated in academic and community settings.¹⁰ This risk stratification instrument ‘integrates baseline indicators of the severity of the acute PE episode with aggravating conditions and

the comorbidity of the patient. Overall, a PESI of class I-II or an sPESI of 0 is a reliable predictor of low-risk PE.³ For outpatient management, patients should also lack right ventricular dysfunction on CTPA or echocardiography. Potential psychological, socioeconomic, and geographic barriers to care also need to be taken into consideration to ensure reliable follow-up.^{2,8}

In terms of the necessary resources, this particular primary care clinic had ready access to laboratory, radiology, and anticoagulation management services, as well as to specialty consultation. Engaging in shared decision-making, consulting a thrombosis specialist, initiating appropriate anticoagulation, providing ongoing patient and family education, and close follow-up are all key components of patient-centred, collaborative clinical care.^{6,8} These logistical requirements are similar to those employed for comprehensive clinic-based care of patients with low-risk deep vein thrombosis. They are, however, time- and resource-intensive and may exceed the capacities of some primary care practices. In these cases, transfer to a higher level of care may be the most appropriate course of action.

Conclusion

This case report demonstrates how primary care physicians can effectively and safely manage selected low-risk patients with acute PE entirely in the ambulatory setting without recourse to the emergency department. As the literature emerges on this novel pattern of care, medical practices may develop clinical pathways for exclusively clinic-based care of acute PE. Meanwhile, primary care physicians may benefit from familiarity with outpatient eligibility criteria and the integral components of ambulatory PE care illustrated by this case.

Lead author biography



David R. Vinson is a senior physician with The Permanente Medical Group, an adjunct investigator with the Kaiser Permanente Division of Research, and a co-chair of the CREST Network in Oakland, CA. His primary research interests are the acute management of patients with pulmonary embolism and the care of patients with atrial fibrillation and flutter. He also oversees a mentoring programme for undergraduates, medical students, and residents, two of whom have co-authored this case report.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

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Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The authors confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

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References

- Vinson DR, Bath H, Huang J, Reed ME, Mark DG; on behalf of the CREST Network. Hospitalization is less common in ambulatory patients with acute pulmonary embolism diagnosed before emergency department referral than after arrival. *Acad Emerg Med* 2020;**27**:588–599.
- Kearon C, Akl EA, Ornella J, Blaivas A, Jimenez D, Bounameaux H et al. Antithrombotic therapy for VTE disease: CHEST guideline and expert panel report. *Chest* 2016;**149**:315–352.
- Konstantinides SV, Meyer G, Becattini C, Bueno H, Geersing G-J, Harjola V-P et al.; ESC Scientific Document Group. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *Eur Heart J* 2020;**41**:543–603.
- Aujesky D, Roy P-M, Verschuren F, Righini M, Osterwalder J, Egloff M et al. Outpatient versus inpatient treatment for patients with acute pulmonary embolism: an international, open-label, randomised, non-inferiority trial. *Lancet* 2011;**378**:41–48.
- Aujesky D, Obrosky DS, Stone RA, Auble TE, Perrier A, Cornuz J et al. Derivation and validation of a prognostic model for pulmonary embolism. *Am J Respir Crit Care Med* 2005;**172**:1041–1046.
- Barry MJ, Edgman-Levitan S. Shared decision making—pinnacle of patient-centered care. *N Engl J Med* 2012;**366**:780–781.
- Peacock WF, Singer AJ. Reducing the hospital burden associated with the treatment of pulmonary embolism. *J Thromb Haemost* 2019;**17**:720–736.
- Vinson DR, Aujesky D, Geersing GJ, Roy PM. Comprehensive outpatient management of low-risk pulmonary embolism: Can primary care do this? A narrative review. *Perm J* 2020;**24**:19–163.
- Jimenez D, Aujesky D, Moores L, Gomez V, Lobo JL, Uresandi F et al. Simplification of the pulmonary embolism severity index for prognostication in patients with acute symptomatic pulmonary embolism. *Arch Intern Med* 2010;**170**:1383–1389.
- Vinson DR, Ballard DW, Mark DG, Huang J, Reed ME, Rauchwerger AS et al. Risk stratifying emergency department patients with acute pulmonary embolism: does the simplified Pulmonary Embolism Severity Index perform as well as the original?. *Thromb Res* 2016;**148**:1–8.