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Faria Ahmed Nitol
Medisys Health Network, Queens, NY, USA, nitol.faria@gmail.com

Holman Li DO
Research, Education & Innovation, Medisys Health Network, Queens, N

Mohammad Raja
Research, Education & Innovation, Medisys Health Network, Queens, NY

Andrew Miele
Research, Education & Innovation, Medisys Health Network, Queens, NY, USA, amiele@jhmc.org

Craig Thurm
Research, Education & Innovation, Medisys Health Network, Queens, NY

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RESEARCH ARTICLE

Home Treatment for Low-risk Pulmonary Embolism: Is it Happening?

Faria A. Nitol [a,*], Holman Li [b], Mohammad Raja [b], Andrew Miele [c], Craig Thurm [b]

[a] Medisys Health System, Queens, NY, USA
[b] Jamaica Hospital Medical Center, Queens, NY, USA
[c] Research, Education & Innovation, Medisys Health Network, Queens, NY, USA

Abstract

Patients with pulmonary embolus (PE) can be stratified into low, intermediate, and high risk based on such factors as hemodynamics and the status of the right ventricle. Low risk patients who meet appropriate criteria can potentially be discharged home with oral anticoagulation, avoiding unnecessary hospitalization and associated complications and costs. However, limited data suggest early discharge of low-risk patients has not gained widespread traction. This retrospective study reviewed 138 patients seen in a high-volume emergency department (ED), 29 of whom were considered low-risk. Of these, 24 (82.7%) were still admitted to the hospital despite meeting appropriate criteria for early discharge. This suggests early discharge of low-risk PE patients is underutilized. A variety of quality improvement measures can be implemented to increase adoption of this approach.

Keywords: Pulmonary embolism, HESTIA score, Early discharge, Quality improvement

1. Introduction

Recent data suggests pulmonary embolus (PE) accounts for over 364,000 hospital admissions annually in the United States of America (US).[1] In 2021, there were 10,409 hospital admissions related to PE in New York State alone, costing a total of $168,521,910.[2] Current guidelines, including those from the American College of Chest Physicians,[3] American Society of Hematology (ASH),[4] and European Society of Cardiology and the European Respiratory Society (ESC/ERS),[5] recommend identification of patients with low-risk PE who are potentially suitable for outpatient treatment. The Pulmonary Embolism Severity Index (PESI), simplified PESI, or HESTIA criteria, alone or in combination with additional cardiac assessments can be utilized to facilitate early discharge of low-risk PE patients using oral anticoagulants, such as direct oral anticoagulants (DOACs). This recommendation is supported by multiple clinical trials providing evidence for the safety of this approach.[6-8] Early discharge and home treatment may minimize hospitalization-related complications, reduce healthcare costs, and improve patients' quality of life.[9] Despite the potential benefits, patients with low-risk PE are still frequently hospitalized for treatment. Our goal was to evaluate the disposition and outcomes of low-risk PE patients meeting criteria for home treatment seen in the ED.

2. Methods

We conducted a retrospective chart review of patients over the age of 18 who presented to the ED at The Jamaica Hospital Medical Center (JHMC) with a diagnosis of PE between July 1, 2020 and January 31, 2022. JHMC is a non-profit community hospital serving a diverse population in Queens, NY. Acceptable modalities to confirm the diagnosis included computed-tomography pulmonary angiogram (CTPA), ventilation-perfusion scan, or pulmonary angiogram. Diagnosis had to be established within the first 24 h of presentation, although

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* Corresponding author.
E-mail address: nitol.faria@gmail.com (F.A. Nitol), hli2@jhmc.org (H. Li), mraja@jhmc.org (M. Raja), amiele@jhmc.org (A. Miele), cthurm@jhmc.org (C. Thurm).

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exceptions were made for COVID-19 patients whose diagnosis was delayed due to logistical factors during the pandemic (the time limit was extended to 72 h for these patients). Patients who were discharged to a skilled nursing facility, a tertiary care hospital, or an inpatient hospice unit were excluded from the study. HESTIA score (Fig. 1) was calculated for all patients using their data on presentation. Charts were reviewed to record labs, imaging abnormalities, complications, length of stay, treatment modalities, discharge medications, and outpatient follow up and management. For patients who were followed in our healthcare system, the clinical course was reviewed to identify bleeding complications, recurrent venous thromboembolism (VTE) events and death occurring in the first 3 months after discharge. Descriptive statistics were reported for the sample using medians and percentages. The study was approved by the hospital's institutional review board (2002663-3).

3. Results

138 patients were identified who met the study criteria. The average age of the sample was 58 (standard deviation = 17) and 51% were male. Of the 138 patients, 29 (21%) had a HESTIA score of 0, meeting criteria for home therapy. Among those, 5 (17%) were discharged from the ED or observation area after a period of observation. Three of these patients were followed within our hospital system and did not have any complications in the 3 months after discharge. The remaining 24 patients were admitted to the hospital, representing 17% (24/138) of the total.

The median length of stay (LOS) among admitted patients with a HESTIA score of 0 was 3 patient days (interquartile range = 1.7, min = 1.25, max = 7). This accounted for a total of 71.8 patient days. Of the patients with a HESTIA score of 0 who were admitted to the hospital (24), none experienced complications (major bleeding, recurrent VTE, or death) during their stay. Of these patients who were followed in our hospital system,[14] none experienced complications in the first 3 months after discharge. However, one of these patients expired 4 months after discharge due to a cardiac arrest. It is unknown whether this was related to VTE. The patient was non-compliant with anticoagulation because of cost. A second patient was readmitted due to rectal bleeding 7 months after discharge. This patient was taking a DOAC at the time.

There were 18 patients with COVID included in the sample. Of these, only 1 had a HESTIA score of 0. This patient was admitted and had no complications. LOS was 3 days.

4. Discussion

Low-risk PE patients can potentially be discharged early with appropriate ambulatory treatment and follow up. Outpatient treatment of low-risk PE patients has been demonstrated to be generally safe in terms of mortality, recurrent VTE,

Hestia Exclusion Criteria for Outpatient Management *
Is the patient hemodynamically unstable?
Is thrombolysis or embolectomy necessary?
Active bleeding or high risk of bleeding?
More than 24 h of oxygen supply to maintain oxygen saturation >90%?
Is PE diagnosed during anticoagulant treatment?
Severe pain needing i.v. pain medication for more than 24 h?
Medical or social reason for treatment in the hospital for >24 h? (infection, malignancy, no support system)
Does the patient have a CrCl of <30 mL/min?
Does the patient have severe liver impairment?
Is the patient pregnant?
Does the patient have a documented history of heparin-induced thrombocytopenia?
If one or more of the answers is yes, then the patient cannot be treated at home.

- Hemodynamic instability: including but not limited to systolic BP <100 mmHg with HR >100 bpm
- High risk of bleeding: GI bleeding in preceding 14 days, recent stroke (under 4 weeks prior), recent operation (<2 weeks prior), bleeding disorder or thrombocytopenia (platelet count <75,000), uncontrolled hypertension (SBP>180 mmHg or DBP>110 mmHg)
- BP = blood pressure; bpm = beats per minute; CrCl = creatinine clearance; DBP = diastolic blood pressure; GI = gastrointestinal; i.v. = intravenous; PE = pulmonary embolism; SBP = systolic blood pressure

*Adapted from Zondag, et al, 2011 (8)

Fig. 1. The HESTIA criteria are a set of exclusion criteria to identify low risk patients diagnosed with PE who may potentially be managed outpatient.[8]

and major bleeding events. Erkens et al. found that in a cohort of 473 patients at Ottawa Hospital in Canada, there was no statistically significant difference in outcomes between the 260 people treated in the outpatient setting and the 213 people treated in the inpatient setting.[8] Multiple other studies support the safety of this approach.[6,7] Even low risk patients with right ventricle (RV) enlargement treated at home experience no significant difference in incidence of adverse events compared to those without RV enlargement.[10]

There are several validated tools (PESI, simplified PESI, HESTIA) that have shown utility in identifying patients who may be suitable for outpatient treatment[11] (Fig. 1). Years ago, patients were placed on intravenous heparin and transitioned to warfarin, which required an inpatient stay that could last a week. Many patients were confined to the hospital despite being minimally symptomatic. With introduction of low molecular weight heparin, which could be administered subcutaneously at home, early discharge of stable patients became possible. However, barriers which included cost, insurance coverage, and the need for the patient or a caregiver to administer the medication, limited the widespread adoption of this approach. More recently, the availability of DOACs have allowed for early discharge from the ED. They have a rapid onset of action and there is evidence supporting their efficacy and safety in the treatment of PE (See Fig 2; Table 1).[12]

Despite the potential for home treatment of low-risk PE with DOACs, it is not clear that this represents current real-world practice. Clinical trial and real-world data suggest that 80%–98% of patients diagnosed with PE are admitted.[9] In one retrospective study performed in 2019 in Michigan, approximately 33.7% and 49.7% of admissions for PE were stratified as low risk based on HESTIA and PESI scores respectively.[13]

Table 1. Descriptive statistics of the sample.

	Hestia <0 (n=24)	Hestia >0 (n=109)	Overall (n=138)
Age (SD)	56.4 (18.4)	59.2 (16.8)	58.6 (17.1)
Female (%)	14 (48.3%)	53 (48.6%)	67 (48.6%)
Discharged from ED/Observation (%)	5 (17.2%)	6 (5.5%)	11 (8%)
Admitted (%)	24 (82.8%)	103 (94.5%)	127 (92%)
LOS (IQR[a])	3 (1.7)	5 (5)	4 (5)

[a] Interquartile range.

In our study, 29 patients (21%) had a HESTIA score of 0 on presentation to the ED. These were patients who potentially could have been managed in an ambulatory setting with oral anticoagulation. Of these, only 5 patients (17%) were discharged from either the ED or the observation unit while 24 patients (83%) were admitted to the hospital. None of the patients admitted to the hospital deteriorated during their stay and none required thrombolysis or thrombectomy. Admitting low risk patients rather than treating them at home leads to an increased risk of hospital acquired conditions, strains resources (bed availability), and increases health care expenses.

Multiple impediments to home treatment exist. Providers may be unfamiliar or uncomfortable with the concept. They may fear medicolegal consequences of a bad outcome. Busy ED staff may find it easier to admit a patient with PE rather than go through a more time-consuming process that leads to discharge. The ability of patients to obtain their anticoagulants must be assured. Early outpatient follow up needs to be arranged with a medical provider, to whom the treatment plan should be clearly relayed. While not evaluated in this study, suggestions for improvement include creating pathways that can be included in the electronic medical records to assist with early

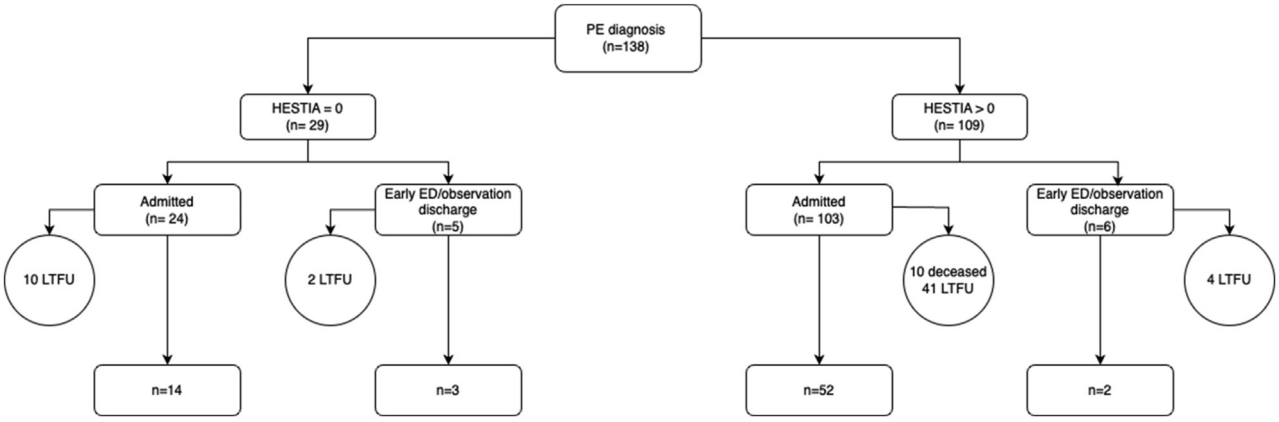

Fig. 2. Outcomes of admission, discharge, and outpatient follow ups. LTFU: Lost to follow up.

discharge. This can include checklists which incorporate HESTIA and/or other criteria. Additionally, patients can be moved to an observation unit and cared for by dedicated personnel while arrangements are made, including ensuring early follow up and availability of anticoagulation for outpatient use.

Limitations of the study includes a relatively small sample size. Despite meeting set criteria for early discharge, there are other factors that may go into making this determination and these may not be captured in a retrospective chart review. For example, factors such as socioeconomic status (SES) have been shown to impact post-hospital transitions and treatment adherence.[14,15] Given the socioeconomic characteristics of the patient population served by the hospital, these factors may have influenced decisions regarding early discharge. A significant number of patients were lost to follow up upon discharge. JHMC is the receiving hospital for John F. Kennedy International Airport, increasing the likelihood that a proportion of patients admitted with pulmonary embolism are travelers who will receive their follow up care elsewhere. Regardless, the primary aim of this study was to evaluate the frequency of hospital admissions of low-risk PE patients. All patients were captured in regard to this outcome. Prior studies have carefully evaluated the safety and efficacy of treatment at home versus in the hospital, which was not the goal of this study.

5. Conclusion

There is evidence to support a strategy of early discharge of low-risk patients from the ED after an initial period of evaluation and arrangements for follow up care have been made. There is a dearth of data on the real-world implementation of this strategy. Our study and others[9,13] suggest that early discharge of appropriate low risk patients is underutilized. We raise potential impediments to this treatment approach and suggest quality improvement measures that may be taken that might improve adoption. Future research on the best methods to achieve this goal is warranted.

Conflict to interest

The authors have no conflicts of interest to declare.

Disclosure information

Parts of this analysis were presented as a poster at the 2023 Jamaica Hospital Research Symposium. Authors have nothing else to disclose.

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Author contribution statement

All authors contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

References

1. Sedhom R, Megaly M, Elbadawi A, et al. Contemporary national trends and outcomes of pulmonary embolism in the United States. *Am J Cardiol*. 2022;176:132–138. https://doi.org/10.1016/j.amjcard.2022.03.060.
2. New York State Department of Health. New York state department of health statewide planning and research cooperative system (SPARCS). Retrieved from: https://navigator.med.nyu.edu/ace/sparcs/; 2021.
3. Stevens SM, Woller SC, Kreuziger LB, et al. Antithrombotic therapy for VTE disease: second update of the CHEST guideline and expert panel report. *Chest*. 2021;160(6):e545–e608. https://doi.org/10.1016/j.chest.2021.07.055.
4. Konstantinides SV, Meyer G, Becattini C, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS) the Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). *Eur Heart J*. 2020;41(4):543–603.
5. Ortel TL, Neumann I, Ageno W, et al. American Society of Hematology 2020 guidelines for management of venous thromboembolism: treatment of deep vein thrombosis and pulmonary embolism. *Blood advances*. 2020;4(19):4693–4738.
6. Peacock FW, Coleman CI, Diercks DB, et al. Emergency department discharge of pulmonary embolus patients. *Acad Emerg Med*. 2018;25(9):995–1003. https://doi.org/10.1111/acem.13451.
7. Barco S, Schmidtmann I, Ageno W, et al. Early discharge and home treatment of patients with low-risk pulmonary embolism with the oral factor Xa inhibitor rivaroxaban: an international multicentre single-arm clinical trial. *Eur Heart J*. 2020;41(4):509–518. https://doi.org/10.1093/eurheartj/ehz367.
8. Erkens PM, Gandara E, Wells P, et al. Safety of outpatient treatment in acute pulmonary embolism. *J Thromb Haemostasis*. 2010;8(11):2412–2417. https://doi.org/10.1111/j.1538-7836.2010.04041.x.
9. Peacock WF, Singer AJ. Reducing the hospital burden associated with the treatment of pulmonary embolism. *J Thromb Haemostasis*. 2019;(17):720–736. https://doi.org/10.1111/jth.14423.
10. Hendriks SV, Klok FA, den Exter PL, et al. Right ventricle-to-left ventricle diameter ratio measurement seems to have no role in low-risk patients with pulmonary embolism treated at home triaged by Hestia criteria. *Am J Respir Crit Care Med*. 2020;202(1):138–141. https://doi.org/10.1164/rccm.202002-0267LE.
11. Zondag W, Mos IC, Creemers-Schild D, et al. Outpatient treatment in patients with acute pulmonary embolism: the Hestia Study. *J Thromb Haemostasis*. 2011;9(8):1500–1507. https://doi.org/10.1111/j.1538-7836.2011.04388.x.
12. Büller HR, Prins MH, Lensin AW, et al. Oral rivaroxaban for the treatment of symptomatic pulmonary embolism. *N Engl J Med*. 2012;366(14):1287–1297. https://doi.org/10.1056/NEJMoa1113572.
13. Brikho S, Zughaib MT, Tsaloff G, Smythe K, Zughaib ME. Evaluating the appropriateness of pulmonary embolism admissions in a community hospital emergency department. *Cureus*. 2022;14(4):e24292. https://doi.org/10.7759/cureus.24292.

14. Madeira de Oliveira S, Altmayer S, Zanon M, et al. Predictors of noncompliance to pulmonary tuberculosis treatment: an insight from South America. *PLoS One*. 2018;13(9):e0202593.

15. Kangovi S, Barg FK, Carter T, et al. Challenges faced by patients with low socioeconomic status during the post-hospital transition. *J Gen Intern Med*. 2014;29:283−289.