Table 2. Characteristics of recent studies of ambulatory nongravid adult patients with acute objectively confirmed pulmonary embolism stratified by site of discharge[a]

Author, y	Design	Country	Academic or community center (no.)	Outpatient cases: No. (%), qualification	Site of discharge	Major criteria for outpatient eligibility[b]	Outpatient anticoagulation	Follow-up after initial discharge[c]	Clinical outcomes (%)
Traditional hospital-based Emergency Department (may include short-term observation or inpatient care)									
Barco,[14] 2019	Prospective single-arm phase 4 management trial	Germany, Italy, the Netherlands, Spain, Portugal, Finland, Greece	Not specified (49)	502 (hospitalized for ≤ 2 nights) among 525 patients included in study with aim of outpatient treatment and 2854 patients with diagnosed PE (17.6)	ED (n = 61) or hospital (n = 441; 219 hospitalized 1 night, 222 hospitalized 2 nights). Total of 11 patients had prolonged hospitalization.	Explicit protocol requiring absence of the following: Hestia criteria; contraindication to rivaroxaban; RV enlargement or dysfunction; and free-floating thrombi in right atrium or ventricle, by echo or CTPA.	DOAC	Not specified; patients were provided a 24-h emergency telephone number and were instructed on how to respond to symptoms suggestive of VTE recurrence or bleeding.	• 90-d VTE recurrence: 3/525 (0.6) • 90-d major bleeding: 6/519 (1.2) • 90-d mortality: 2/519 (0.4) Includes larger cohort of those intended for outpatient care
Kabrhel,[13] 2019	Retrospective and prospective	US	Academic (2)	199 among 1324 patients with diagnosed PE (15.0): 12.0% (pre) and 18.1% (post)	ED (n = 80) and ED observation (n = 119)	Explicit protocol required clinical evaluation, troponin measurement, and selective evaluation of RV function and CUS. Exclusion criteria were abnormal vital signs, cardiac disease, high bleeding risk, elevated troponin, large PE, high-risk DVT, RV dysfunction, and psychological or social barriers to outpatient care.	LMWH, VKA, DOAC, none	Patients received follow-up within 7 d in a clinic staffed by hematologists and vascular medicine physicians.	• 30-d VTE recurrence: 0/197 (0) • 30-d major bleeding: 3/197 (1.5) • 30-d mortality: 2/197 (1.0) Outcomes reported for 197 of 199 patients (7-d outcomes not reported here)
Vinson,[5] 2018	Controlled pragmatic trial comparing centers with decision support (intervention) vs none (control)	US	Community (21)	324 among 1703 patients with diagnosed PE (19.0); 17.8% (pre) and 28.3% (post) in intervention group; 14.9% (pre) and 14.1% (post) in control group	ED (n = 152) and short-term outpatient observation < 24 h (n = 172)	At intervention sites: Physician judgment informed by PESI class with corresponding loose site-of-care recommendation and list of relative contraindications; laboratory testing, CUS, and echo were not required.	LMWH, VKA	Timing of follow-up was left to physician discretion; most patients (> 90%) were called within 3 d by the anticoagulation management service and were seen within 7 d by their primary care physician.[39]	• 30-d VTE recurrence: 3/324 (0.9) • 30-d major bleeding: 4/324 (1.2) • 30-d mortality: 2/324 (0.6)
Bledsoe,[18] 2018	Prospective	US	Academic and community (5)	200 among 1003 patients with diagnosed PE (19.9)	ED (n = 122) or inpatient observation (n = 78) (each 12-24 h in duration)	Explicit protocol required low-risk PESI classification, routine CUS and echo; exclusion criteria included hypoxia (SpO2 < 90%), hypotension, hepatic or renal failure, contraindication to therapeutic anticoagulation, concomitant proximal DVT or RV dysfunction, another condition requiring hospitalization or social barriers to outpatient care.	LMWH, VKA, DOAC	Follow-up with an internal medicine physician specializing in thrombosis care or the patient's primary care physician was scheduled before discharge, although the timing was not reported.	• 90-d VTE recurrence: 0/200 (0) • 90-d major bleeding: 1/200 (0.5) • 90-d mortality: 0/200 (0)
Peacock,[16] 2018	Randomized clinical trial comparing DOAC and expedited discharge vs usual care	US	Academic and community (35)	51 among 1894 patients with diagnosed PE (2.7) vs 63 patients with usual care	ED < 24 h	Explicit protocol required absence of modified Hestia criteria, adapted by removing 24-h requirements and allowing treating physicians to define instability; additional exclusion criteria: Elevated troponin level, contraindications to anticoagulation, or barriers to treatment or follow-up.	DOAC (30% of patients also received LMWH or unfractionated heparin in ED before DOAC)	Study follow-up at 7, 14, 30 and 90 d after inclusion.	• 90-d VTE recurrence: 0/51 (0) • 90-d major bleeding: 0/51 (0) • 90-d mortality: 0/51 (0)
Ghazvinian,[17] 2018	Retrospective	Sweden	Academic (1) and community (7)	245 among 881 patients treated with DOACs for PE (27.8)	ED (≤ 24 h in duration)	Explicit protocol required a low-risk modified sPESI score, with the following exclusion criteria: Affected general condition, abnormal vital signs, presence of cardiopulmonary disease, presence of central PE, obstruction of > 40% on V/Q scan, RV dysfunction, high bleeding risk, poor social support, or compliance problem.	DOAC	Not reported.	• 6-mo VTE recurrence: 0/245 (0) • 6-mo major bleeding: 1/245 (0.4) • 6-mo mortality: 1/245 (0.4)

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Vinson,[15] 2018	Retrospective	US	Community (21)	179 among 2387 ED patients with diagnosed PE included in final cohort (7.5)	ED	Clinician judgment: No protocol was then in place.	LMWH, VKA	Timing of follow-up was left to physician discretion; most patients (> 90%) were called within 3 d by anticoagulation management service and were seen within 7 d by their primary care provider.[39]	• 30-d VTE recurrence: 3/179 (1.7) • 30-d major bleeding: 3/179 (1.7) • 30-d mortality: 2/179 (1.1)
Walen,[19] 2017	Prospective	The Netherlands	Community (1)	250 among 770 patients with diagnosed PE (32.5)	Hospital < 24 h (n = 221; the other 29 patients were hospitalized > 24 h)	Explicit protocol required PESI classes I-II (although 2% were class III); exclusion criteria: Hospital admission > 24 h before PE, prediagnostic use of anticoagulants, residence > 30 km from the hospital, inability to fill in the queries (eg, because of dementia or analphabetism), or pregnancy.	LMWH, VKA	Daily visit of a home health nurse during first 5 d; scheduled visit to the attending physician at 4 wk and 6 mo.	• 30-d VTE recurrence: 0/250 (0) • 30-d "relevant" bleeding: 8/250 (3.2) • 30-d mortality: 1/250 (0.4) (6-mo outcomes not reported here)
Roy,[11] 2017	Retrospective	Canada	Academic (1)	544 among 1127 patients with diagnosed PE (48.3)	ED or outpatient thrombosis unit (n = 485) or hospital < 48 h (n = 59)	Explicit protocol required SBP > 100 mmHg, no sustained tachycardia (≤ 120/min), room-air O_2 saturation > 92%; exclusion criteria: Contraindication to LMWH or DOAC (eg, renal failure), or comorbidity requiring hospitalization.	LMWH, VKA, DOAC (few)	Follow-up visits were scheduled within 24 h, 7-14 d and 90 d at a thrombosis clinic.	Results reported for the 505 in matched cohort. • 90-d VTE recurrence: 24/505 (4.8) • 90-d major bleeding: 4/505 (0.8) • 90-d mortality: 16/505 (3.2)
Hospital-based ambulatory emergency care unit									
Reschen,[12] 2019	Retrospective	United Kingdom	Academic (1)	136 among 199 patients with diagnosed PE (68.3)	Ambulatory care unit	Clinician judgment: no protocol was in place.	DOAC, and some also received a concurrent dose of LMWH at treatment initiation.	Phone follow-up within 7 d.	• 30-d VTE recurrence: not reported • 30-d major bleeding: not reported • 30-d mortality: 1/136 (0.7)

[a] This table includes studies published since January 1, 2017. Earlier studies can be found in Table 3. Studies are presented in reverse chronology of year of publication by study design (prospective, then retrospective) and size of PE cohort. We tried to contact corresponding authors of eligible studies, if needed, to identify table variables not found in the studies.

[b] PESI variables and Hestia criteria are defined in Tables 4 and 5, respectively.

[c] Patients receiving VKA treatment underwent standardized serial laboratory monitoring, details of which are not reported in this table.

CTPA = computed tomographic pulmonary angiography; CUS = compression ultrasonography; DOAC = direct oral anticoagulant (also referred to as novel oral anticoagulants and non-vitamin K oral anticoagulants); DVT = deep venous thrombosis; echo = echocardiography; ED = Emergency Department; LMWH = low-molecular-weight heparin; O2 = oxygen; PE = pulmonary embolism; PESI = Pulmonary Embolism Severity Index; RV = right ventricle; sPESI = simplified Pulmonary Embolism Severity Index; SBP = systolic blood pressure; SpO2 = oxygen saturation measured by pulse oximetry; VKA = vitamin K antagonists (eg, warfarin); V/Q = ventilation-perfusion; VTE = venous thromboembolism.

Table 3. Characteristics of studies (through 2016) of ambulatory nongravid adult patients with acute objectively confirmed pulmonary embolism stratified by site of discharge[a]									
First author, y	**Design**	**Country**	**Academic or community (centers, n)**	**Outpatient cases: n (%), qualification[b]**	**Site of discharge**	**Major criteria for outpatient eligibility[c]**	**Outpatient anticoagulation**	**Follow-up after initial discharge[d]**	**Clinical outcomes**
Traditional hospital-based Emergency Department (may include short-term observation or inpatient care)									
den Exter,[20] 2016	Randomized clinical trial, comparing Hestia criteria with and without addition of NT-proBNP >500 pg/mL as indication for hospitalization	The Netherlands	Academic (2) and community (15)	513[e] among 1102 patients diagnosed with PE and assessed for eligibility (46.6) and among 558 enrolled patients meeting Hestia criteria (91.9)	ED	Explicit protocol required absence of Hestia criteria; additional exclusion criteria: No symptoms, symptoms > 14 d, life expectancy < 3 mo, inability to achieve the required 3-mo follow-up; also NT-proBNP > 500 pg/mL in those randomized to this arm.	LMWH, VKA	Initial clinical follow-up was scheduled at the Outpatient Department 5-9 d after discharge and study visits were arranged at 4-6 wk and 3 mo.	90-d VTE recurrence: 4/513 (0.8) 90-d major bleeding: 3/513 (0.6) 90-d mortality: 5/513 (1.0)
Fang,[21] 2015	Retrospective	US	Community (from 4 integrated health care delivery systems)	494 among 5927 patients with PE as primary diagnosis (8.3)	ED	Not reported.	LMWH, VKA, fondaparinux	Not reported.	90-d VTE recurrence: Not reported 90-d major bleeding: Not reported 90-d mortality: 2/464 (0.4)
Elf,[22] 2015	Retrospective	Sweden	Academic (1)	260 among 416 outpatients diagnosed with PE in the ED (62.5)	ED	Explicit protocol required hemodynamic stability (SBP ≥ 100 mmHg, pulse < 100 bpm, no syncope) and small-to-medium-sized PE (< 40% perfusion defect on V/Q scan); exclusion criteria: O_2 requirement, parenteral analgesia, or contraindications to anticoagulant treatment.	LMWH, VKA	Not reported.	90-d VTE recurrence: 1/260 (0.4) 90-d major bleeding: 6/260 (2.3) 90-d mortality: 6/260 (2.3)
Beam,[23] 2015	Prospective	US	Academic (2)	35 among 131 patients diagnosed with PE (26.7)	ED	Explicit protocol required absence of modified Hestia criteria (eg, platelet count threshold reduced to 50 x 10^9/L, hypotension designation required absence of a history of low blood pressure at baseline, the three 24-hour qualifications were removed); additional exclusion criteria: contraindications to LMWH, history of warfarin skin necrosis, INR > 1.7. Patients with active malignancy were further risk stratified using the POMPE-C tool.[35]	DOAC	Patients received a phone call in 1 d - 2 d and clinic follow-up at 3 wk and 3 mo-6 mo.	90-d VTE recurrence: 0/35 (0) 90-d major bleeding: 0/35 (0) 90-d mortality: 1/35 (2.9)
Zondag,[24] 2011	Prospective	The Netherlands	Academic (3) and community (9)	297 among 581 patients diagnosed with PE and assessed for eligibility (51.1)	ED (n = 229) or inpatient unit < 24h (n = 68)	Explicit protocol required absence of Hestia criteria; additional exclusion criteria: impossibility of achieving the required 90-d follow-up (eg, no fixed address, or foreign citizen) or life-expectancy < 3 mo.	LMWH, VKA	Patients had a scheduled visit at the outpatient clinic at 1 wk and 3 mo.	90-d VTE recurrence: 6/297 (2.0) 90-d major bleeding: 2/297 (0.7) 90-d mortality: 3/297 (1.0)
Aujesky,[4] 2011	Randomized controlled trial, comparing outpatient vs inpatient treatment setting	Switzerland, France, Belgium, the US	Academic (19)	172 (vs 172 in the inpatient group), among 1557 patients diagnosed with PE and assessed for eligibility (11.0% of those diagnosed with PE)	ED or inpatient unit (patients discharged < 24 h from randomization, usually < 36 h from ED arrival)	Explicit protocol required PESI Class I-II; exclusion criteria: SBP < 100 mmHg, hypoxemia, chest pain necessitating parenteral opioids, therapeutic oral anticoagulation, active bleeding or high risk of bleeding, severe renal failure, pregnancy, extreme obesity, history of HIT or heparin allergy, barriers to adherence or follow-up, or imprisonment.	LMWH, VKA	Patients were contacted every day during the initial week, then at 14 d, 30 d, 60 d, and 90 d.	90-d VTE recurrence: 1/171 (0.6) 90-d major bleeding: 3/171 (1.7) 90-d mortality: 1/171 (0.6) 1/172 lost to follow-up

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Agterof,[26] 2010	Prospective	The Netherlands	Academic (1) and community (4)	152 among 351 patients diagnosed with PE and assessed for eligibility (43.3)	ED or inpatient unit < 24h	Explicit protocol required hemodynamic and respiratory stability and NT-proBNP level < 500 pg/mL; exclusion criteria: syncope, SBP < 90 mmHg, heart rate > 100 bpm, O_2 requirement to keep saturation > 90%, pain requiring IV analgesia, need for thrombolysis at presentation, active bleeding or known hemorrhagic diathesis, pregnancy; renal insufficiency, concomitant illness requiring hospitalization > 24 h, likelihood of poor compliance, or no support system at home.	LMWH, VKA	Patients were called at 2 d and 4 d, then seen in the Outpatient Department at 10 d.	90-d VTE recurrence: 0/152 (0) 90-d major bleeding: 0/152 (0) 90-d mortality: 0/152 (0)
Rodriguez-Cerrillo,[27] 2009	Prospective	Spain	Academic (1)	30 among 286 patients diagnosed with PE and assessed for eligibility (10.5)	ED	Explicit protocol required residence in health area and a home-carer available around-the-clock; exclusion criteria: Large PE (involving two or more lobar branches), hemodynamic instability, O_2 saturation < 92% on room air, heart failure, moderate to severe renal failure, hemoptysis, arrhythmia, or contraindication to LMWH.	LMWH, VKA	Patients were admitted in a home-hospitalization unit and were visited daily for 7 d-14 d.	90-d VTE recurrence: 0/30 (0) 90-d major bleeding: 0/30 (0) 90-d mortality: 0/30 (0)
Beer,[33] 2003	Prospective	Switzerland	Academic (2)	43 among 255 patients diagnosed with PE (16.9)	ED	Explicit protocol with the following exclusion criteria: contraindication to anticoagulation or LMWH, drug addiction, psychiatric condition, high probability of noncompliance, body weight > 110 kg, renal impairment, thrombocytopenia, concomitant fibrinolytic therapy, or oral anticoagulant 24 h before the study.	LMWH, VKA	Not reported.	90-d VTE recurrence: 1/43 (2.3) 90-d major bleeding: 0/43 (0) 90-d mortality: 0/43 (0)
Specialty-run clinic									
Ozsu,[29] 2015	Prospective	Turkey	Academic (1)	31 among 213 patients diagnosed with PE (14.6) and among 206 patients enrolled in the study (15.0)	Outpatient pulmonary clinic	Explicit protocol required low-risk sPESI classification and negative troponin; exclusion criteria: hypoxemia, SBP < 100 mmHg, active or high risk of bleeding, renal insufficiency, history of HIT, risk of non-compliance, or concomitant illness requiring hospitalization.	LMWH, VKA	Patients were followed with clinic visits for 3 mo, though the timing was not reported.	90-d VTE recurrence: 0/31 (0) 90-d major bleeding: 0/31 (0) 90-d mortality: 1/31 (3.2)
Werth,[28] 2015	Retrospective	Germany	Academic (1)	49 among 429 patients diagnosed with recent (< 15 d) symptomatic PE (11.2)	Outpatient vascular ward; discharged from hospital < 24 h	Physician discretion; no protocol in place.	Not reported (presumed LMWH, VKA)	Not reported.	6-mo VTE recurrence: 3/49 (6.1) 6-mo major bleeding: Not reported 6-mo mortality: 0/49 (0)
Kovacs.[25] 2010	Retrospective	Canada	Academic (1)	314 among 639 patients diagnosed with PE (49.1)	Outpatient Thrombosis Unit	Explicit protocol required hemodynamic stability; exclusion criteria: requiring O_2 therapy, requiring parenteral opioids, or high risk for a major hemorrhage.	LMWH, VKA	Not reported.	90-d VTE recurrence: 3/314 (1.0) 90-d major bleeding: 3/314 (1.0) 90-d mortality: 9/314 (2.9)

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Wells,[30] 2005	Clinical randomized trial, comparing 2 LMWHs	Canada	Academic (4)	90 among 505 patients with VTE (DVT or PE) enrolled in the study (unknown percentage of patients diagnosed with PE)	Outpatient Thrombosis Unit	Explicit protocol with exclusion criteria: Hypotension, hypoxia on room air, pain needing IV opioids, active bleeding or high risk for major bleeding (eg, stroke < 10 d, gastrointestinal bleeding < 14 d, platelets < $75x10^3/\mu L$), HIT history, creatinine > 2.3 mg/dL, concomitant illness requiring hospitalization, or no fixed address	LMWH, VKA	Patients were contacted by phone every 24-48 h during the first week.	90-d VTE recurrence: 2/90 (2.2) 90-d major bleeding: 0/90 (0) 90-d mortality: 3/90 (3.3)
Siragusa,[31] 2005	Prospective study of patients with active cancer	Italy	Academic (1)	36 among 68 patients referred for evaluation and diagnosed with symptomatic PE (52.9)	Thrombosis and Hemostasis Unit	Explicit protocol with exclusion criteria: Poor clinical condition or compliance, active bleeding or high risk of bleeding, renal insufficiency, acute anemia, pain requiring parenteral opioids, or concomitant illness requiring hospitalization	LMWH, VKA	Not reported	6-mo VTE recurrence: 2/36 (5.6) 6-mo major bleeding: 1/36 (2.8) 6-mo mortality: 11/36 (30.6)
Ong,[32] 2005	Retrospective	Australia	Academic (1)	60 among 194 patients diagnosed with PE (30.9)	Ambulatory Care Program	Explicit protocol with exclusion criteria: Hemodynamic instability, O_2 saturation < 90%, pain requiring IV opioids, active bleeding, concomitant illness that requires admission, likelihood of noncompliance, or lack of telephone, transport or home support	LMWH, VKA	Patients received daily visits by a nurse and once or twice a week by a physician at home or in the outpatient unit until stabilization	90-d VTE recurrence: 3/60 (5.0) 90-d major bleeding: 1/60 (1.7) 90-d mortality: 1/60 (1.7) 1/60 lost to follow-up
Kovacs,[34] 2000	Prospective	Canada	Academic (3)	81 among 158 patients referred for evaluation and diagnosed with symptomatic PE (51.3)	Outpatient Thrombosis Unit	Explicit protocol with exclusion criteria: Hemodynamic instability, pain needing IV opioids, O_2 requirement to maintain saturation > 90%, active bleeding or high risk for major bleeding, risk of noncompliance, or concomitant illness requiring hospitalization	LMWH, VKA	Patients received daily phone calls during the first week, then clinic visits at 1 wk, 1 mo and 3 mo	90-d VTE recurrence: 5/81 (6.2) 90-d major bleeding: 1/81 (1.2) 90-d mortality: 4/81 (4.9)

[a] Studies are presented in reverse annual chronology by study design (prospective, then retrospective) and size of PE cohort. We tried to contact corresponding authors of eligible studies if needed to identify Table variables not found in the studies.

[b] Patients seen in specialty clinics are most often a selected, referred population; eg, unstable ED patients with acute PE would generally not be discharged to a specialty clinic for definitive care.

[c] PESI variables and Hestia criteria are defined in Tables 4 and 5, respectively.

[d] Patients receiving VKA treatment underwent standardized serial laboratory monitoring, details of which are not reported in this Table.

[e] 513 = 550 minus 34 (hospitalized for NT-proBNP value) minus 3 (hospitalized outside protocol); results among the 513 patients were provided by the authors of the study.

bpm = beats per minute; DOAC = direct oral anticoagulant (also referred to as novel oral anticoagulant and non-vitamin-K oral anticoagulant); DVT = deep venous thrombosis; ED = Emergency Department; HIT = heparin-induced thrombocytopenia; INR = international normalized ratio; IV = intravenous; LMWH = low-molecular-weight heparin; NT-proBNP = N-terminal B-type natriuretic peptide; O_2 = oxygen; PE = pulmonary embolism; PESI = PE Severity Index; SBP = systolic blood pressure; sPESI: simplified PE Severity Index; VKA: vitamin K antagonists (eg, warfarin); VTE = venous thromboembolism; V/Q = ventilation-perfusion.