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**Authors**

Shan, Judy  
Isaacs, Dayna J  
Bath, Harjot  
et al.

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# “Outpatient Management” of Pulmonary Embolism Defined in the Primary Literature: A Narrative Review

Judy Shan, BS<sup>1,2</sup>; Dayna J Isaacs, MPH<sup>2,3</sup>; Harjot Bath, MD<sup>2,4</sup>; Elizabeth J Johnson, MD<sup>2,5</sup>; Dani Julien, BS<sup>2,6</sup>; David R Vinson, MD<sup>1,2,7</sup>

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## ABSTRACT

**Purpose:** The evidence for the effectiveness of outpatient treatment of low-risk patients with acute pulmonary embolism (PE) continues to mount. However, lack of definitional clarity may hinder understanding of this emerging management strategy and impede translation into clinical practice. We describe the range of definitions provided in the primary outpatient PE literature.

**Methods:** We undertook a narrative review of the English-language medical literature indexed in PubMed and Embase through the end of 2019. We identified studies of outpatient treatment of patients with acute PE.

**Results:** Fifty-one studies met our criteria. All studies provided some degree of definition of “outpatient,” even if implicit or broad. Forty-six studies (90%) reported 1 or 2 sites of patient discharge (or departure) to home: emergency department (ED)/ambulatory care unit (n = 31), inpatient ward (n = 13), and secondary care clinic (n = 8). Of the 31 ED-based studies, 9 (29%) delimited duration of care (from < 24 to < 48 hours). All inpatient studies placed an outer boundary on the time to discharge within their definition of outpatient care.

**Conclusion:** Definitions of outpatient care in the PE literature vary considerably. The sites, duration, and intensity of care involved in outpatient PE management prior to home discharge range from comprehensive specialty clinic care to an ED evaluation, sometimes coupled with 1 to 5 days of additional inpatient care. Research on the outpatient management of acute PE would benefit from greater definitional clarity as clinicians, departments, and health systems seek to translate this research into real-world clinical practice.

## INTRODUCTION

The evidence continues to mount for the safety and effectiveness of outpatient management of select patients with acute pulmonary embolism (PE).<sup>1,2</sup> Recent society guidelines for PE diagnosis and treatment in North America and Europe recommend outpatient care for many low-risk patients.<sup>3-7</sup> However, what is meant by “outpatient management” of patients with acute PE is not clear.

We describe 2 scenarios of outpatient PE management that depict differing levels of care intensity (eg, access to advanced pulmonary imaging, timeliness of laboratory measurements, and level of cardiac/pulmonary monitoring). 1) A hemodynamically stable ambulatory patient walks into an urban level I academic emergency department (ED) in the US where

she receives a timely diagnosis of PE by an emergency medicine physician. She is evaluated by a hospitalist and admitted to an inpatient unit for 24 hours of telemetry monitoring, frequent vital sign measurements, close nursing attention, serial troponin testing, an echocardiogram, and a pulmonology consult. There is no evidence of right ventricular dysfunction. She is scheduled for follow-up in the thrombosis clinic before being discharged home with an anticoagulation prescription. 2) Imagine the same patient receives a pretest probability assessment from her family physician in a semirural stand-alone primary care clinic without onsite advanced radiology services. She is referred for a next-morning diagnostic imaging study at the county’s only hospital across town. When the study is interpreted as positive, she is called and asked to return to the clinic that afternoon for a shared decision-making conversation about site-of-care preferences. She opts to forgo hospitalization, receives the necessary patient education, and is sent home with an anticoagulation prescription and a timely follow-up appointment with her family physician.

Both the high- and low-intensity treatment scenarios above illustrate outpatient care of acute PE but include different elements between the time of diagnosis and home discharge. The first, with 24 hours of post-ED inpatient care, is in keeping with the definition used by the Cochrane Vascular Group in their 2019 systematic review of outpatient PE management: “We considered outpatients as people who were discharged [from the hospital] within 36 hours after the low-risk acute PE diagnosis and who then completed treatment at home (outpatient care).”<sup>8</sup> The second, with comprehensive care provided in the primary care setting without transfer to a higher

## Author Affiliations

<sup>1</sup> Kaiser Permanente Division of Research, Oakland, CA

<sup>2</sup> CREST Network, Oakland, CA

<sup>3</sup> University of California, Davis, School of Medicine, Davis, CA

<sup>4</sup> Department of Internal Medicine, Saint Agnes Medical Center, Fresno, CA

<sup>5</sup> Department of Emergency Medicine, University of California, Davis, Sacramento, CA

<sup>6</sup> California State University, Sacramento, CA

<sup>7</sup> Department of Emergency Medicine, Kaiser Permanente Roseville Medical Center, Roseville, CA

## Corresponding Author:

Judy Shan, BS ([judyshan@berkeley.edu](mailto:judyshan@berkeley.edu))

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level of care, is not well described in the literature. A recent narrative review found no English-language studies of outpatient PE management in the primary care setting.<sup>9</sup> However, the topic has been described in case reports.<sup>10-12</sup> Ultimately, the second treatment scenario above falls clearly within the boundaries of outpatient care because it provides care without hospitalization.

The current literature leaves many questions unanswered. Are these 2 types of outpatient PE management interchangeable? Can a study that demonstrates good outcomes with high-intensity management be used to support the launch of a low-intensity program? How outpatient PE management is defined significantly affects a study’s external validity, with direct implications for translation to real-world clinical practice. What does the literature have to say? What do primary research studies mean when describing “outpatient management” of patients with acute PE? To answer this, we undertook a focused narrative review of the English-language literature to describe the range of definitions provided for outpatient PE management and evaluate the elements of care between diagnosis and discharge.<sup>13</sup> Results of this narrative review may foster a better understanding of this emerging management strategy and facilitate more careful translation of research to clinical care.

**METHODS**

**Study Selection**

We undertook a focused narrative review of the English-language medical literature on outpatient PE management indexed in PubMed and Embase through the end of 2019. Our search algorithm included a combination of synonyms for the disease “pulmonary embolism” (eg, venous thromboembolism, lung embolism, pulmonary thromboembolism) and the term “outpatient” (eg, early discharge, ambulatory, without hospitalization, home treatment). We excluded non-primary research (eg, reviews and editorials), studies of special populations (ie, pregnant patients, those from a nursing home, or patients with chronic PE), studies of nonambulatory PE (ie, inpatients with hospital-acquired PE), studies not involving outpatient PE management (eg, those focused on PE prevention, diagnostics, or development of prognostic tools among inpatients), and studies re-using data from an original study that was already included in our analysis.

**Data Collection and Review**

We screened titles and abstracts of all references and then full texts as indicated. The principal investigator confirmed appropriateness of study inclusion. Reviewers abstracted data from the selected studies using a structured computerized

**Table 1. Elements of care that may be included between the time of diagnosis and the time of discharge (or departure) for outpatients with acute pulmonary embolism**

Question	Category	Examples illustrating the range of care options
Who?	Specialty	Primary care physician Secondary or tertiary care physician
	Single or multiple providers	Consultations and transfers of care
Where?	Outpatient clinic	Primary care clinic Secondary care clinic, eg, thrombosis unit in Canada
	Emergency care	Urgent care center Ambulatory care unit (eg, in the UK) Emergency department
	Sustained extension of care	Outpatient observation unit
		Inpatient ward
What?	Evaluation and risk stratification	
	Physical examination, including initial set of vital signs	Single or serial vital signs Continuous cardiac rhythm monitoring (via telemetry)
	Additional imaging	Echocardiography to evaluate for right ventricular dysfunction
	Additional laboratory testing	Cardiac biomarkers, eg, troponin
	Patient and family education	
How long?	Shorter duration	Outpatient clinic
	Intermediate duration	Emergency department (may extend to 24-48 h)
	Longer duration	Outpatient observation unit
Inpatient ward		

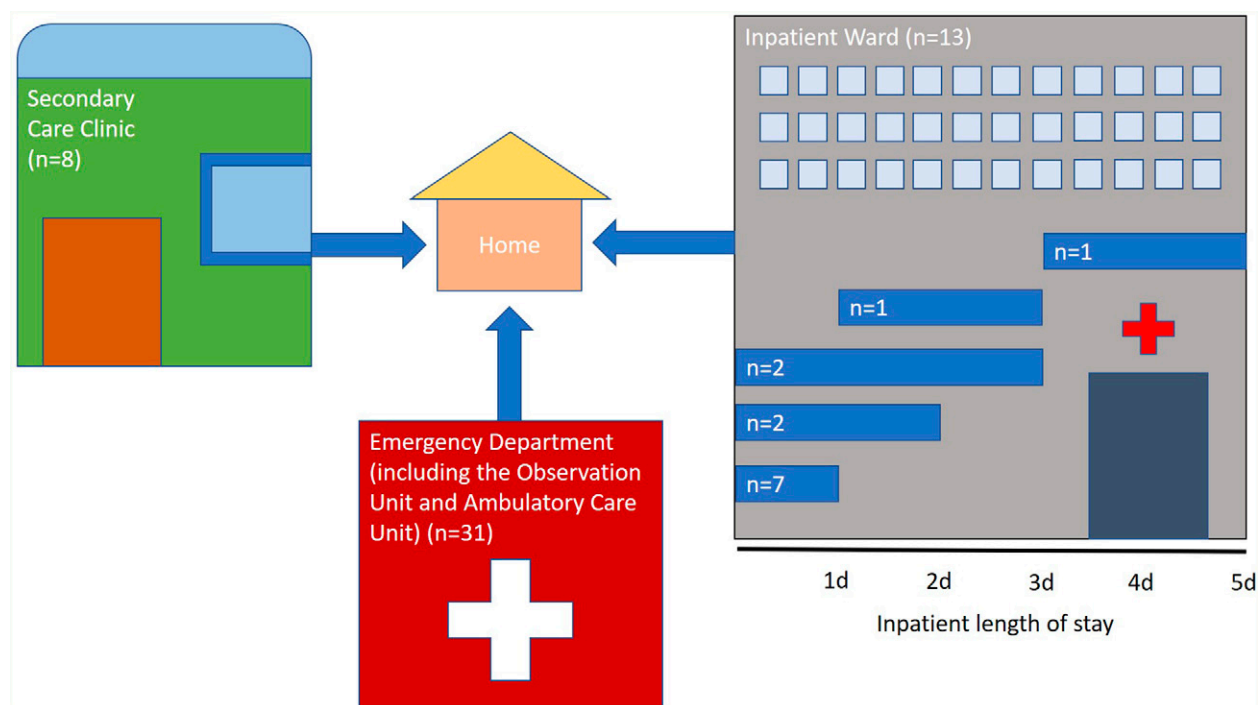


Figure 1. Clinical sites of discharge (or departure) to home among studies of outpatient management of acute pulmonary embolism.\* \*\*Five studies were not included in the figure because their sites of patient discharge were not reported. Six studies are represented twice in the figure because they reported 2 sites of patient discharge to home, that is, the emergency department and inpatient ward.

data collection instrument. Variables of interest included journal type (categorized by specialty), outpatient definition (if present), sites and duration of care, temporal endpoints, and site(s) of patient discharge.

## RESULTS

Our search algorithm identified 385 papers. Fifty-one studies met our review criteria (Appendix Table A1). These were published in a variety of journals: thrombosis ( $n = 19$ ), medicine ( $n = 15$ ), general medicine ( $n = 7$ ), pulmonology ( $n = 6$ ), emergency medicine ( $n = 6$ ), oncology ( $n = 3$ ), cardiology ( $n = 1$ ), and patient preference and adherence ( $n = 1$ ). All studies provided some degree of definition of *outpatient*, even if implicit or broad. We identified the common elements of care (duration, intensity of care, discharge site) included between diagnosis and discharge, and report them in Table 1, categorized by the questions: who, where, what, and how long.

Forty-six studies (90%) reported 1 or 2 sites of patient discharge to home (we included departure from an outpatient clinic visit as a discharge-equivalent): ED or ambulatory care unit (sometimes including an observation unit;  $n = 31$ ), inpatient ward ( $n = 13$ ), and specialty (or secondary care) clinic ( $n = 8$ ; Figure 1 and Appendix Table A1). Six studies were grouped in both the ED and inpatient categories, because their definition of outpatient care allowed home discharge from

either site. Specialty care clinics included a thrombosis clinic ( $n = 5$ ), pulmonology/cardiology clinic ( $n = 1$ ), oncology clinic ( $n = 1$ ), and 1 that was not clearly specified. Of the 31 ED-based studies, 9 (29%) delimited duration of care (from < 24 hours to < 48 hours) that would qualify as outpatient care. Whether this extended care transpired exclusively in the ED, without transfer of care to another provider or another site, was not always clear. All the inpatient studies placed an outer boundary on the time to discharge within their definition of outpatient care (Figure 1). Of the inpatient studies, 10 also specified when the clock started (eg, patient presentation, time of PE diagnosis, hospital admission).

## DISCUSSION

Definitions of outpatient care in the PE literature vary considerably. The nature of care involved in outpatient PE management between diagnosis and home discharge (or departure) range from comprehensive specialty clinic care to ED management, often coupled with 1 to 5 days of inpatient care. That is, *outpatient* management, broadly conceived, often includes *inpatient* care. Discharge home directly from the ED without hospitalization was the most common definition.

No studies involved comprehensive care in the primary care setting, but the practice has been described in case reports.<sup>10–12</sup> One can draw from the specialty clinic and ED-based

literature for guidance regarding outpatient PE care in the primary care setting.<sup>9</sup>

The diversity entailed in outpatient PE management in terms of site, intensity, and duration of predischARGE care (Table 1) might hamper comparison of studies, including analysis of health care outcomes and cost savings compared with conventional hospitalization. Lack of definitional clarity may limit external validity and impede translation into clinical practice. Others have also raised this concern, noting in a literature review that "a clear definition of outpatient was lacking."<sup>14</sup>

Recent society guidelines (2016 to 2019) from Europe and North America are careful to distinguish *outpatient* management (by which they mean management without hospitalization) from *early discharge* after a short inpatient stay.<sup>3-5</sup> However, further specification can be lacking. When immediate discharge and home treatment are discussed, the site of discharge (eg, clinic vs ED) is not often identified. Along with location of care, the intensity and level of care are also poorly described and widely variable. When early hospital discharge is discussed in the guidelines, the duration of inpatient care varies significantly, from < 24 hours after admission or study randomization, to < 5 days from admission (as shown in Figure 1). A 5-day inpatient stay may not be interchangeable with a 12-hour observation. To our knowledge, no English-language society guidelines discuss comprehensive primary care clinic-based PE management.<sup>9</sup>

### Limitations

Our literature review has several limitations. It was restricted to English-language studies and used relatively focused search terms. We adopted this approach in light of pragmatic resource constraints. Whatever primary studies our search may have overlooked, however, would be unlikely to undermine our observation that outpatient PE management is not uniformly defined in the literature and encompasses a breadth of sites, intensity, and duration of care.

### CONCLUSION

In conclusion, the meaning of outpatient varies broadly in the primary English-language literature of PE management. Greater attention to specifying sites, intensity, and duration of care will assist readers in understanding the nature of care that occurs for patients with acute PE between diagnostic confirmation and return to home. The results of this narrative review have implications for clinicians providing patient care as well as for those in operations designing management pathways. Comparative research may help guide translation from

higher-intensity care studies of PE management to lower-intensity settings like the primary care clinic. ❖

### Supplemental Material

Supplemental Material is available at: [www.thepermanentejournal.org/files/2021/20.303supp.pdf](http://www.thepermanentejournal.org/files/2021/20.303supp.pdf)

### Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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### Author Contributions

David R Vinson conceptualized the study, designed the study, interpreted the data, and wrote the paper. Judy Shan designed the study, collected the data, interpreted the data, and wrote the paper. Dayna J Isaacs, Harjot Bath, Elizabeth J Johnson, and Dani Julien collected the data. All authors reviewed and revised the paper and approved the final version.

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