PANEL DISCUSSION

Common Logjams in PE Patient Throughput (and How to Overcome Them)

Where delays occur across the pulmonary embolism care pathway and the strategies to overcome them, including a streamlined PERT program, timely anticoagulation, and emerging clinical evidence.

With Andrew J. P. Klein, MD; Sanjum S. Sethi, MD, MPH; and Catalin Toma, MD

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Where do the most significant delays occur in the modern pulmonary embolism (PE) patient pathway?

Dr. Toma: Let's look at the different steps in PE care and the opportunities for improvement.

Recognizing PE in the emergency department has become relatively straightforward. In fact, one could argue that CT imaging is now overutilized. However, an area that remains largely unexplored is prehospital diagnosis. I can envision a future in which artificial intelligence–assisted applications help emergency medical services personnel identify patients with suspected higher-risk PE and direct them to designated PE centers of excellence.

Initiation of effective anticoagulation is sometimes delayed because of concerns that patients may require advanced therapies. This should not be the case. Current guidelines, as well as our institutional practice, strongly support the immediate initiation of low-molecular-weight heparin (LMWH) in appropriate patients.

Activation of the local PE response team (PERT) remains perhaps the most important limiting factor. Delays may be related to either lack of local expertise or insufficient awareness of existing PE pathways. Increasing awareness of these concepts, particularly among emergency medicine physicians, is likely the single intervention that could most significantly reduce time to treatment.

Finally, follow-up during the postacute phase is both equally important and equally overlooked. Few patients receive specialized follow-up care after their acute

event. This is critical not only for ensuring adherence to anticoagulation therapy but also for identifying and managing residual pulmonary vascular obstruction and other long-term sequelae.

Dr. Klein: The most significant delays occur in bed allocation more than anything. We have instituted an immediate LMWH change for all patients minus extracorporeal membrane oxygenation (ECMO), which has helped patients get fully anticoagulated. The issue is getting patients to the level of care that is needed. We are a huge system, and patients often linger at outside hospitals awaiting a bed to open. Even more difficult is making certain that our local, smaller hospital PERT does not attempt higher-risk patients without ECMO backup, which is part of the growing pains across large hospital systems. We are unifying our PERT at a system level, which is an active and evolving process and should improve care across our 29-hospital system. Navigating local politics will likely be the largest issue in the future.

Dr. Sethi: Even though tremendous progress has been made, there are still several areas of delay in modern PE care. One of the most significant actually occurs prior to the patient being introduced to medical care. Because the presenting symptoms of PE can be vague or nonspecific, many patients don't even realize they should seek medical care until there has been significant deterioration.

Once in the hospital, diagnosis and risk stratification remain a challenge. We have evolved risk stratification schema over the last decade; however, quickly understanding those who are at the highest risk for decompensation remains a challenging task as our risk stratification tools remain crude.

Finally, delays can occur in mobilizing the proper resources to care for the highest acuity patients. While ST-segment elevation myocardial infarction (STEMI) and stroke systems of care have been formalized over several decades, those systems are still nascent when it comes to PE.

What changes have been most effective in improving PE patient throughput at your institution?

Dr. Sethi: Our PERT was implemented in 2015 and remains a constant work in progress. It all starts with education. Every year, we receive another batch of fresh trainees across the institution. It is incumbent upon us to educate them on PE so that high-acuity patients can be recognized promptly.

We have created a single-consult activation system that can be used by any clinician in the hospital. By centralizing the calls, we have created a streamlined system for activation that can provide prompt support for diagnosis and treatment. Lastly, we have created pathways to get these patients into the procedural space quickly when necessary, regardless of the time of day, utilizing some of the STEMI team framework already in place.

Dr. Klein: Hands down the change to LMWH across the system to ensure patients are therapeutic. Also, we have pulmonary critical care take all calls and an endovascular-capable person on call every night. Certainly, we still have improvements to make.

Dr. Toma: The most important change has been the development of a streamlined and easily accessible PERT program, coupled with ongoing efforts to ensure that providers are aware of the consultation service available for PE patients.

Another important factor has been our deliberate approach to physician training and patient selection for intervention. Consistently achieving favorable clinical outcomes over time builds institutional confidence, establishes expertise, and creates demand for specialized consultation. This, in turn, helps facilitate more efficient and timely care.

What single practice (whether operational, technological, staffing-related, data driven, etc.) would have the greatest impact on improving remaining persistent PE pathway logjams?

Dr. Toma: The factor most likely to fundamentally change the way we care for patients with PE is the emergence of high-quality randomized clinical trial data.

This year, we saw the publication of the HI-PEITHO study,[1] and by 2027, we anticipate the completion of several additional landmark trials, including PEERLESS II, PE-TRACT, and PEITHO-3 in intermediate-risk PE, as well as PERSEVERE and TORPEDO-NL in patients with high-risk, hemodynamically unstable PE. Together, these studies are likely to create a more structured, evidence-based, and protocolized approach to PE care that can be broadly adopted across health care systems, similar to the treatment pathways currently established for myocardial infarction.

Dr. Sethi: The single most impactful change would be refining our risk stratification schema to quickly and accurately diagnose those who are facing impending cardiovascular decompensation. While automated workflows and algorithmic protocols do help in standardization and inefficiency, we still lack the refine-

ment of our tools to accurately predict outcomes in all patients. Secondarily, early and accurate understanding of clot morphology in terms of acute versus subacute versus chronic would greatly help in deciding the most appropriate therapy for a given patient.

Dr. Klein: As data and practice evolve, I think we will have an all-modality–capable team that can provide the full array of therapeutic interventions. Our PE team has been in place for so long that we have some members not comfortable with thrombectomy who fall back to catheter-directed thrombolysis (CDT), which is a valid technique with great data. However, there is a time and a place for thrombectomy, and trials will help us further delineate this exact spot; we want to be able to provide all appropriate therapies.

How have the American College of Cardiology (ACC)/American Heart Association (AHA) guidelines for acute PE[2] and the HI-PEITHO pivotal trial data[1] impacted care delivery for PE at your institution?

Dr. Klein: The guidelines are phenomenal. I am biased as one of the authors, but I do think they help better delineate the wide spectrum of intermediate-risk PE patients and help guide patients to perhaps a higher level of care and/or more aggressive care, such as ECMO first and then intervention.

The HI-PEITHO study suggested that we are moving in the right direction by intervening. However, we need to be aware of how sick these patients are. I think many patients who undergo catheter-based procedures are not within a National Early Warning Score > 7; most fall within category C1 or C2 severity, where the guidelines say "maybe" for therapy. CDT works. It's safe, and it helps patients. How this will impact care in the long term will be interesting to see.

Dr. Toma: Although the current ACC/AHA guidelines may be somewhat premature given the limited amount of new high-level evidence available to fundamentally alter PE management, they do introduce a more granular approach to risk stratification. In particular, the incorporation of a classification system similar to SCAI SHOCK has gained some momentum in the United States. It will be interesting to see how this framework is received in Europe and whether it will be incorporated into the forthcoming European Society of Cardiology guidelines, anticipated in 2027. Equally important will be prospective clinical validation of this classification system. As noted previously, the ongoing randomized clinical trials will provide greater clarity regarding which patients truly benefit from an up-front intensive treatment strategy and which can be managed conservatively.

The HI-PEITHO trial represents an important milestone in establishing the role of catheter-based intervention for intermediate-risk PE patients with additional high-risk features. At our institution, we continue to favor mechanical thrombectomy over CDT in most cases. As demonstrated in the PEERLESS randomized trial, thrombectomy offers several potential advantages over catheter-directed lysis, particularly in sicker patients. HI-PEITHO also provided some more nuanced data on risk stratification, especially from subgroup analyses showcasing that sicker (more dilated right ventricles), younger patients are likely to benefit most from the intervention. Importantly, we strive to enroll every patient referred for intervention into an appropriate clinical trial whenever possible. Maintaining an unbiased approach to enrollment is critical to advancing the evidence base and improving care for future patients with PE.

Dr. Sethi: The new guidelines were very welcome considering it had been 15 years since the previous iteration. While the more granular risk stratification schema initially garnered some skepticism, we find it to be a very helpful tool to succinctly and accurately describe the clinical presentation of the patients. The guidelines also highlighted the procedural options available, and hopefully, future guidelines will help refine these recommendations further.

HI-PEITHO is a very important study as it is the first to demonstrate the efficacy of a procedural intervention on higher-acuity PE patients versus anticoagulation alone. This study confirms our collective hypothesis that we can prevent decompensation safely by acting expediently in appropriate patients. Previous data had focused on surrogate endpoints, but the 7-day endpoint involving important clinical outcomes was exactly the trial that was needed. This will allow for more nuanced and appropriate discussion with patients and families when discussing procedures and hopefully lead to better long-term outcomes overall. ■

1. Rosenfield K, Klok FA, Piazza G, et al; HI-PEITHO Investigators. Ultrasound-facilitated, catheter-directed fibrinolysis for acute pulmonary embolism. N Engl J Med. 2026;394:1979-1990. doi: 10.1056/NEJMoa2516567
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Disclosures
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Dr. Sethi: Honoraria/consultant for Penumbra, Boston Scientific, and Inari; National PI for Akura Medical.
Dr. Toma: Consultant to Jupiter Endovascular; receives institutional educational grant/on steering committee and speakers bureau (uncompensated) for Inari Medical.