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New Horizons in Pulmonary Embolectomy

Response Team Management of Acute Serious Pulmonary Embolism

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Pulmonary embolism (PE) is underrecognized and undertreated by clinicians, possibly because patients have widely varying clinical presentations and because different physician specialties are involved. In addition, there is little consensus about first-line therapies.[1] Compounding these challenges are institutional and systemic impediments to delivering appropriate, timely therapy. These include fear of complications, failure to recognize potential benefits of treatment and to integrate data in real time, and physician bias. The collective consequence is a treatment gap in which few patients with PE receive appropriate advanced therapy, even when clear indicators such as hypotension and right ventricular dysfunction are present. Accordingly, PE remains associated with adverse sequelae and substantial morbidity and mortality rates.

The Pulmonary Embolism Response Team (PERT) model has reduced the morbidity and mortality rates associated with PE and has improved evidence-based management.[2-4] We briefly detail the rationale for establishing PERTs within institutions, describe associated challenges, and discuss the future of PE treatment within the PERT model.

How Do We Currently Decide Which Therapy to Offer a Patient?

The best treatment for severe acute PE is unknown because there are no standardized approaches, few level-one data, and no appropriate-use criteria. Therapeutic alternatives include systemic anticoagulation, systemic and catheter-directed thrombolytic therapy, mechanical thrombectomy, surgery, and adjunctive treatments. Decision-making strategies vary in accordance with physician specialty, the size and location of hospitals, and perceived risks of therapies to the patient.

What Is a Pulmonary Embolism Response Team?

A PERT is a multidisciplinary group of providers who manage PE and deliver optimal patient care amid numerous challenges. The objectives of the initial PERT concept were to coordinate and expedite the response to patients seriously ill with massive and submassive PE; consider and provide the best therapeutic options available; benefit from the input of a multidisciplinary team of experts; develop protocols for all available therapies; and collect data on clinical presentations, treatment effectiveness, and short- and long-term outcomes. Thus, the team and process would fill unmet clinical needs and close gaps in the PE-treatment evidence base.

The pilot PERT program, at Massachusetts General Hospital in Boston, sought to create a standard care algorithm while making the best decisions for patients with severe acute PE.[2] When a potentially severe case of PE was identified (internally or at another hospital), the PERT was activated. After baseline data were gathered, the PERT members joined the meeting through a telephone number and video link embedded in an e-mail message. The PERT decided on a treatment approach after reviewing the patient's clinical presentation, medical history, physical examination, and laboratory and imaging results (Fig. 1), and a team member provided the care. Thirty-day follow-up became part of patient care. The pilot program was successful, and the PERT model was publicized for potential adoption by other hospitals.[2]

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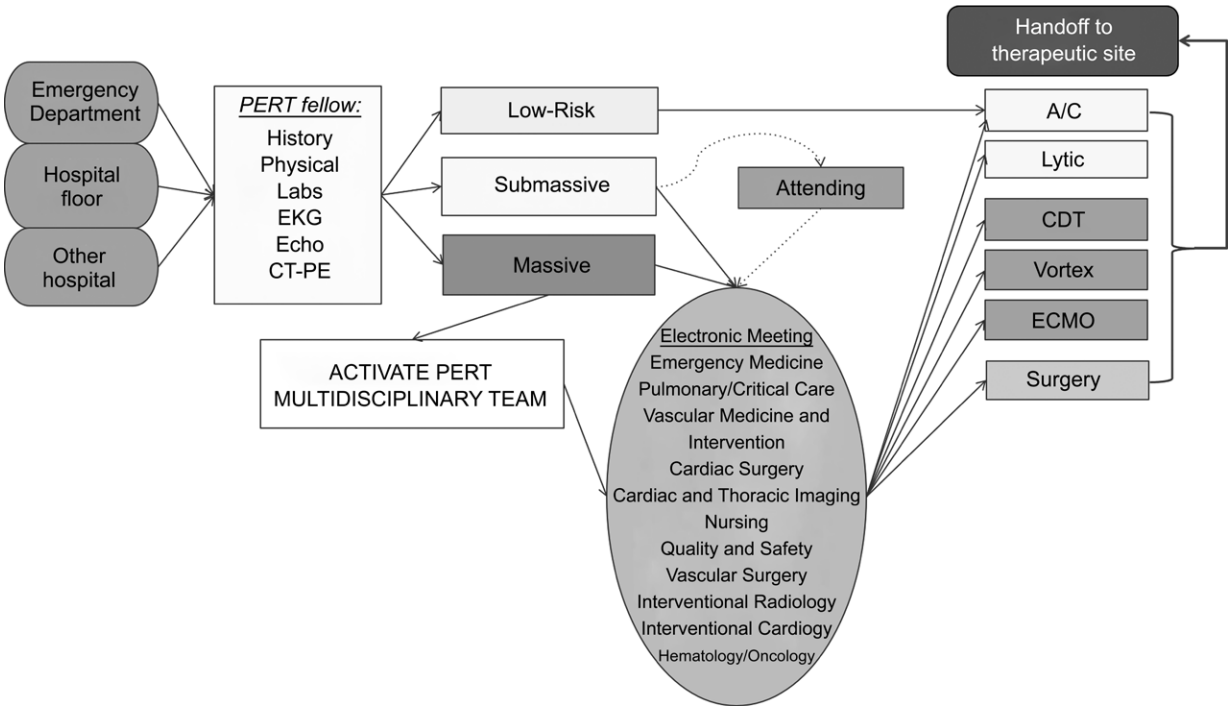

Fig. 1 *Flow chart shows sample decisions for a Pulmonary Embolism Response Team (PERT).*

A/C = anticoagulation; CDT = catheter-directed thrombolysis; CT-PE = computed tomography for pulmonary embolism; Echo = echocardiography; ECMO = extracorporeal membrane oxygenation; EKG = electrocardiography

The PERT Consortium

After the PERT model was adopted by hospitals nationwide, the National PERT Consortium was founded. At the Consortium's inaugural meeting in May 2015, 85 providers from 41 member PERTs defined its structure, mission, and goals. The Consortium now provides guidance and data almost in real time[5] for more than 100 member sites. It has full responsibility for its own annual scientific PE meeting and presents satellite symposia at national medical meetings. It offers webinars, an online reference library with access to published manuscripts, a multicenter prospective quality data registry, clinical practice protocols, and partnership in clinical trials.

Advantages and Challenges

A major advantage is the increased coordination and rapid initiation of care for patients who present with serious PE. The hallmarks of patient care include collaboration among experts; cross-disciplinary consensus; improved communication; better transitions between members of the care team; a single destination for treatment; involvement and commitment from providers in various specialties; increased institutional awareness; and rapid access to extracorporeal membrane oxygenation, catheter-directed therapies, and surgical pulmonary thromboembolectomy. Consequent advantages include greater consistency in patient treatment; more appropriate decisions regarding whether, when, and how to intervene; improved follow-up; the development of algorithms; and education for trainees, to ensure continuation of the PERT model.

In contrast, one of the major hurdles in establishing and maintaining a PERT is ensuring that relevant personnel are engaged and committed to the model. The reasons why individuals and departments resist participating include having to surrender autonomy, to sacrifice established beliefs, to invest additional effort and time to ensure team success, and to accept the lack of reimbursement for each member of the PERT. Teams need to ensure rapid multidisciplinary response, obtain institutional support, and show that the PERT improves outcomes (Fig. 2). This last challenge is complicated by the inability to randomize patients and to evaluate data due to differences in data collection before and after the PERT is established.

Future Management of Pulmonary Embolism

Implementing the PERT model is associated with better survival in patients with acute PE,[3] so the PERT Consortium's goals include developing mechanisms for large-scale data collection and defining research initiatives that will advance the evidence base needed to optimize patient care. Much remains to be done, however, because diagnosing and managing acute PE is challenging. The PERTs have highlighted the need for a coordinated, multidisciplinary, institutional approach to a complex, life-threatening medical condition.

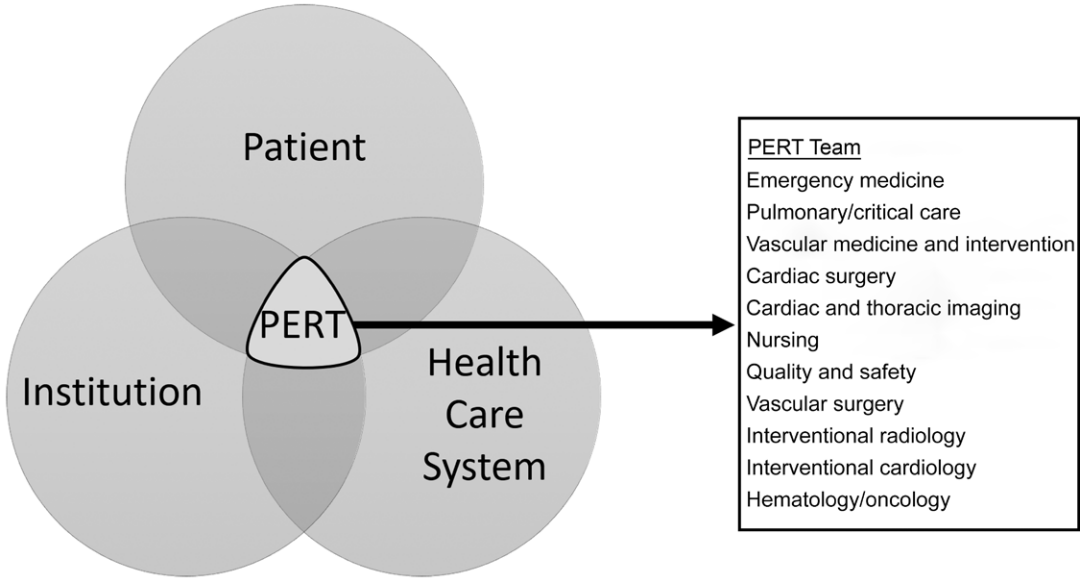

Fig. 2 *Diagram shows the multidisciplinary composition of a Pulmonary Embolism Response Team (PERT) within an institution.*

A continuing goal for PERTs is to incorporate the most recent treatments into clinical decisions—for example, ultrasound-assisted catheter-directed thrombolysis (USAT).[6] Although the safety and efficacy of USAT in treating massive and submassive PE have been established through multiple trials,[7-10] further investigation is warranted.

It is also necessary to use the highest levels of science to guide clinical care. An example of this commitment is the HI-PEITHO study,[11] a 3-way partnership between the National PERT Consortium, the Johannes Gutenberg-Universität Mainz, and Boston Scientific Corporation. This prospective, international, multicenter randomized controlled trial is comparing USAT with concomitant use of the EkoSonic Endovascular System (Boston Scientific) and systemic anticoagulation (best medical therapy) against a control arm of systemic anticoagulation alone, with one year of planned follow-up. The outcomes of this and other carefully designed trials will help us to define the optimal treatment of patients whose submassive PE may progress and lead to clinical decompensation. These results should benefit PERTs around the world.

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