

The emerging role of a pulmonary embolism response team (PERT) in the contemporary management of acute pulmonary embolism: PERT Greece

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Abstract:

Pulmonary embolism (PE) has a heterogeneous range of clinical presentation, ranging from full absence of symptoms to hemodynamic instability or even sudden death. Clinical evaluation and risk stratification are necessary to define the appropriate treatment. Currently, treatment approaches are inconsistent and uncoordinated. This, combined with a wide and increasing variety of treatment modalities, created the need for a multidisciplinary approach to PE management. The current review summarizes the rationale behind the creation of a Pulmonary Embolism Response Team, its functionality and its implementation in Greece.

Keywords: Pulmonary embolism, PERT, pulmonary embolism response team, multidisciplinary care

INTRODUCTION

Pulmonary embolism (PE) represents the third most common cause of cardiovascular death in Western countries, following ischemic heart disease and stroke¹. The annual incidence of PE is roughly 60 new patients per 100,000 population, and it is associated with high rates of hospitalization and mortality². Pulmonary embolism has a heterogeneous range of clinical presentation, ranging from full absence of symptoms to hemodynamic instability or even sudden death².

Clinical evaluation and risk stratification are necessary to define the appropriate treatment approach². While the standard of care for low-risk PE is anticoagulation alone, increasing severity and higher risk of decompensation or death require additional advanced therapies that carry higher operational risks and are less evidence based: systemic or catheter directed thrombolysis, catheter embolectomy, surgical embolectomy, and mechanical circulatory support, such as extracorporeal membrane oxygenation (ECMO)³.

Currently, there is a deficiency in high level recommendations and systematic ways to evaluate therapy response. As a result, treatment approaches are inconsistent and uncoordinated, leading to paralysis in therapeutic decision-making⁴. This combined with a wide and increasing variety of treatment

modalities created the need for a multidisciplinary approach to PE management^{4,5}.

In order to improve patient care by streamlining it to a group of experts (instead of a single physician) and by individualizing or minimizing heterogeneity, the Pulmonary Embolism Response Team (PERT) concept has been rapidly expanding over the past 5 years in US and more recently in Europe. A PERT is composed of experts from different specialties who convene to offer multidisciplinary consultation and management strategy for non-low risk PE patients⁶.

PERT Foundation

The first PERT was launched in 2012, in Massachusetts General Hospital in Boston and currently the concept has been implemented in a lot more than 100 centers worldwide⁶. The US PERT Consortium was later created and was the first organization to capture and spread the PERT concept and need to establish such team in tertiary institutions managing PE^{6,7}. The PERT Consortium was inaugurated in May 2015 when different institutions across the United States met in Boston, Massachusetts, with the intent to guide and influence PE management and research. Since then, it has been the guiding force to create a framework for consensus practice in clinical care, research and a world registry⁶. Inspired by the US PERT Consortium, teams and organizations dedicated to the recognition and management of acute PE have been created, such as The Massive and Submassive Clot On-call Team (MASCOT), who was formed at Beth Israel Deaconess Medical Center, in August 2015⁸.

PERT Logistics

Typically, PERTs have 3 to 5 specialists involved^{4,6}. The exact composition and operating mode of a PERT are not fixed, depending on the resources and expertise available in each hospital for the management of acute PE. The lead is typically the

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internal medicine/pulmonary physician, and the team consists of at least one interventionalist (vascular surgeon and/or interventional cardiologist, and/or interventional radiologist), critical care physicians, cardiologists, cardiac surgeons, hematology and emergency medicine (if first responders)^{4,6,8-9}. PERT is activated when the lead physician (pulmonologist) is consulted for a submassive or massive PE. The lead physician launches a virtual multidisciplinary meeting or a conference call, typically with the interventionalist on call. The clinicians collaborate in a real-time discussion, to decide the optimal therapeutic approach, individualized on the patient's profile and resource availability (e.g. deterioration of vital signs, echocardiographic findings, contraindications to thrombolytics, interventional team readiness).

Although the initial PERT program description suggested the installation of a "virtual meeting" software, most hospitals rely on real life phone calls to become less technologically and personnel dependent⁸⁻¹¹.

Approximately, 20% of PERT centers allow nurses to activate a PERT call; this is facilitated by established criteria that differentiate the cases that are appropriate for PERT activation⁸⁻¹¹.

It needs to be stressed that a PERT's role in case management is far beyond just a decision to intervene or not. What type of intervention? Does the patient need caval interruption (filter)? Should the ECMO team be involved? These are all questions a PERT call can address. In addition, a PERT helps establish a PE follow up clinic and identify patients that may develop long-term PE sequelae^{2,4,6,8-11}.

All these functions together end up in a solid PE program and eventually a higher quality care for patients, previously treated on the basis of individual expertise.

PERT Outcomes

The increasing availability of institutional PERTs has affected patient management practices and outcomes. The advent of PERTs has been associated to an increase in advanced therapies, a decrease in the use of IVC filters and an overall decrease of bleeding events^{4,9-13}. Emergency room and ward metrics have also improved and time to initiation of anticoagulation has shortened significantly¹². Remarkable in some series is the improvement in 30-day mortality (from 10% to 5%) and the decreased duration of hospital (from 9 to 6 days) and ICU stay (from 7 to 4 days)¹³⁻¹⁵. Given the shorter ICU and hospital stay the costs of the advanced therapies is outweighed.

The rapid expansion of PERTs and the acknowledged benefits deriving by their function led to the introduction of a new guideline recommendation in the most recent guideline of the European Societies of Cardiology and Respiratory Medicine: "Set-up of a multidisciplinary team and a programme for the management of high- and (in selected cases) intermediate-risk PE should be considered, depending on the resources and expertise available in each hospital (Class IIa, Level C)"¹⁴.

PERT Greece

There are few reports on pulmonary embolism statistics and

practice patterns in Greece. The PE annual prevalence has been recently estimated to 23.8 per 100,000 population. The reported trends are lower than those reported in US literature, however researchers from the Department of Respiratory Medicine of the University of Thessaly have demonstrated a significant annual increase in PE prevalence. PE prevalence raised from 5.4 cases per 100,000 population in 2013 to 23.8 in 2017¹⁵. The increase has been attributed to the wide availability and use of CT imaging among clinicians and an otherwise aging population. In the same context, a slight increase was observed in the prevalence of non-low risk PE. Such an observation raises the need for a higher demand on advanced therapies.

Anecdotally, in Greece, advanced therapies and specifically interventions for PE are scarce, sporadic and non-centralized in both public and private practice. Patients with PE choose 51% of public health services versus 48% (and what about the resting 1%??) of the private sector. Patients with PE are followed-up usually by a pulmonologist rather than by other specialties¹⁵. This probably reflects the distribution of PE hospitalizations in Greece where there is evidence that patients suffering from PE are hospitalized mainly in Respiratory Medicine Departments. Multidisciplinary PE teams are still at their infancy.

The first PERT in Greece has been recently created (December 2020), at Athens Medical Center, under the auspices of the US PERT Consortium. It is one of the 5 active European PERTs incorporating all specialists (pulmonology, internal medicine, cardiology, vascular surgery, cardiac surgery, interventional radiology, critical care and hematology). All patients presenting with a PE are streamlined to the PERT call team and action is taken as needed. There is an algorithmic approach to all intermediate and high-risk PEs, eliminating individual decision making. The PERT members meet once every 3 months sharing interesting cases, literature updates and relevant educational content by all specialists. Embracing by the hospital and the community has been impressive. Action is now taken to transfer knowledge and experience in other tertiary centers.

CONCLUSION

PERT represents an initiative strategic process, which is in constant evolution and improvement. PERT is gradually being adopted and accepted as standard of care by medical societies, all over the world including Greece¹⁶. This is a strong indicator that PERT has introduced a successful approach to pulmonary embolism management. As these teams continue to evolve, more evidence-based information will be generated to better guide future management of an otherwise poorly treated population.

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