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Emergence of Multidisciplinary Pulmonary Embolism Response Teams: Potential Role of the Pharmacist

Rachel P. Rosovsky, MD, MPH and George A. Davis, PharmD, BCPS

December 2016

American Society of Health-System Pharmacists.

Learning Objectives

- Justify the rationale and background for developing a multidisciplinary Pulmonary Embolism Response Team (PERT)
- Describe the goals of the National PERT Consortium for advancing the care of patients with pulmonary embolism
- Assess the potential role of a pharmacist on a PERT.

Disclosures

Rachel P. Rosovsky, MD, MPH

- No disclosures

George A. Davis, PharmD, BCPS

- No disclosures

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Pulmonary Embolism Response Team:
A Comprehensive, Management Approach

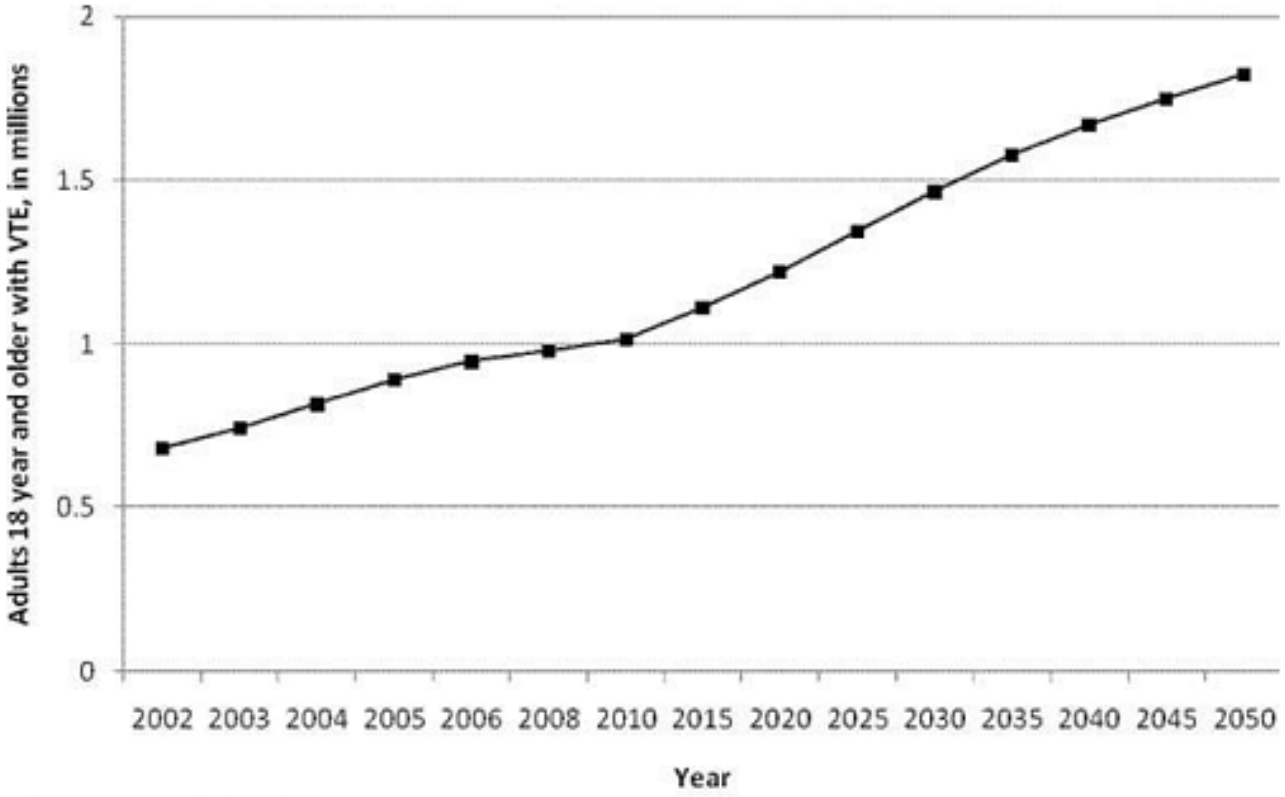
Rachel P. Rosovsky, MD, MPH
Massachusetts General Hospital
December 2016

American Society of Health-System Pharmacists.

Agenda

- Pulmonary Embolism Response Team (PERT)
  - Scope of the problem
  - Description
  - Research: Advancing the science of PE care
  - National PERT Consortium

Venous Thromboembolism is Common



VTE cases per 100,000:

2002	2003	2004	2005	2006	2008	2010	2015	2020	2025	2030	2035	2040	2045	2050
317	341	371	401	422	426	432	453	478	505	527	544	556	563	567

Am J Hematol. 2011 Feb;86(2):217-20

The New York Times

Tennis

Williams Was Treated for Blood Clot in Lungs

By CHRISTOPHER CLAREY
Published: March 2, 2011

Serena Williams, out of action since winning Wimbledon in July, has experienced another significant health problem that could further delay her return to the game she once dominated. Williams's representatives confirmed Wednesday that she was hospitalized last month in Los Angeles because of a pulmonary embolism and that she then required emergency treatment Monday for a hematoma, a pocket of blood that swells under the skin.

Enlarge This Image

Jon Super/Associated Press

Foot injuries kept Serena Williams from playing a match since winning Wimbledon in July.

A pulmonary embolism — a clot that blocks blood flow to the lungs — can be life threatening in severe cases, but Williams's spokeswoman, Nicole Chabat, said in a statement Wednesday that "thankfully everything was caught in time" and that Williams was resting and recovering at her home in Los Angeles.

"This has been extremely hard, scary, and disappointing," Williams said in a statement. "I am doing better. I'm at home now and working with my doctors to keep everything under control. I know I will be O.K., but am praying and hoping this will all be behind me soon. While I can't make

The Washington Post

Sports

Jerome Kersey, Virginia-born NBA star, dies at 52

February 19 at 8:00 PM

Jerome Kersey, who in the 1990s helped take the Portland Trail Blazers to the National Basketball Association finals twice and won the title in 1999 with the San Antonio Spurs during a 17-year playing career, died Wednesday at a hospital in Tualatin, Ore. He was 52.

His death was reported on the Trail Blazers' Web site. According to the Portland Oregonian, the state medical examiner's office said a blood clot traveled from his leg and lodged in his lung, causing a pulmonary embolism. Mr. Kersey reportedly had knee surgery earlier this week. Larry Lewman, the deputy state medical examiner, said he had not yet determined whether the two events were related.

The New York Times


Accuser's Acquaintances Testify as Derrick Rose Trial Nears End


Glamour on the Gowanus: Nets Really Call Brooklyn Home


In Rape Case, Derrick Rose Says Sex Was Consensual

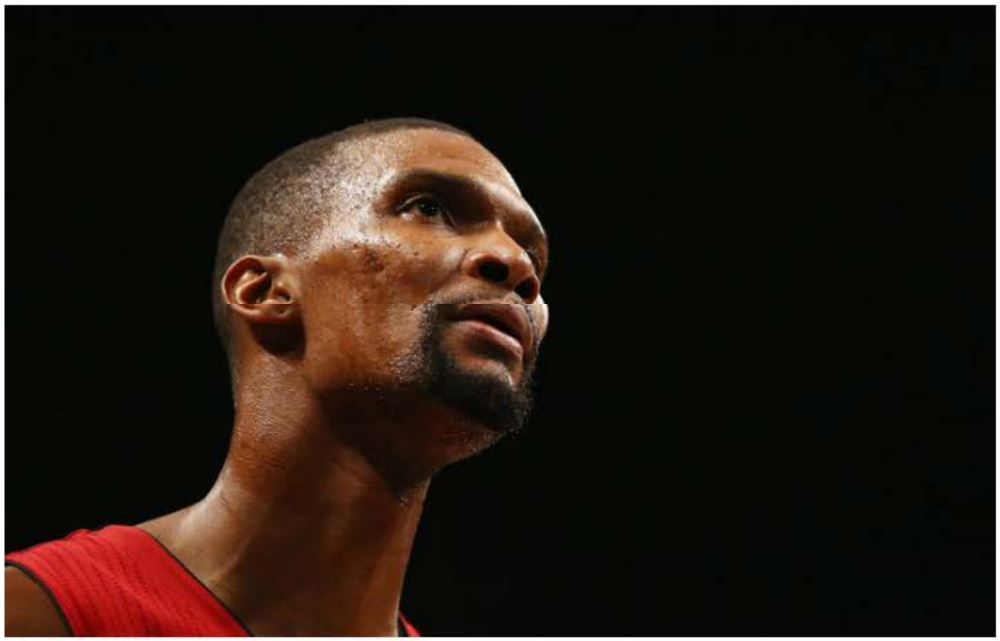

ON PRO BASKETBALL
Derrick Rose and Joakim Noah Distract Knicks, Right on Schedule

PAID POST: TYLENOL
Why These Musicians Play Through Their Joint Pain

PRO BASKETBALL

Chris Bosh's Desire to Play Leaves Heat at an Ethical Crossroads

By SCOTT CACCIOLA SEPT. 26, 2016



RELATED COVERAGE


KEEPING SCORE
Chris Bosh's Return Presents the Heat With an Enviable Puzzle MARCH 12, 2016


Blood Clots in Lung Bring End to Bosh's Season FEB. 21, 2015


Bruised Hip of Nets' Teletovic Leads to Blood Clot Awareness MARCH 2, 2015

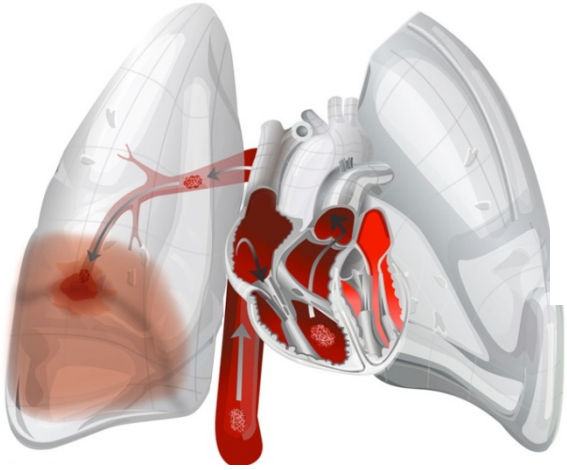
Chris Bosh in January. A few days before the All-Star Game in February, he awoke with a sore calf. He was soon found to have a recurrence of blood clots, and team doctors told him his career was probably over.

Why worry about Pulmonary Embolus?

- Fatal within 1 h after the onset of symptoms in 10% of cases
- Untreated PE mortality rate ~30%
- Early recurrent PE is closely linked to probability of mortality

Pulmonary Embolism Types

MASSIVE
Shock / Hypotension

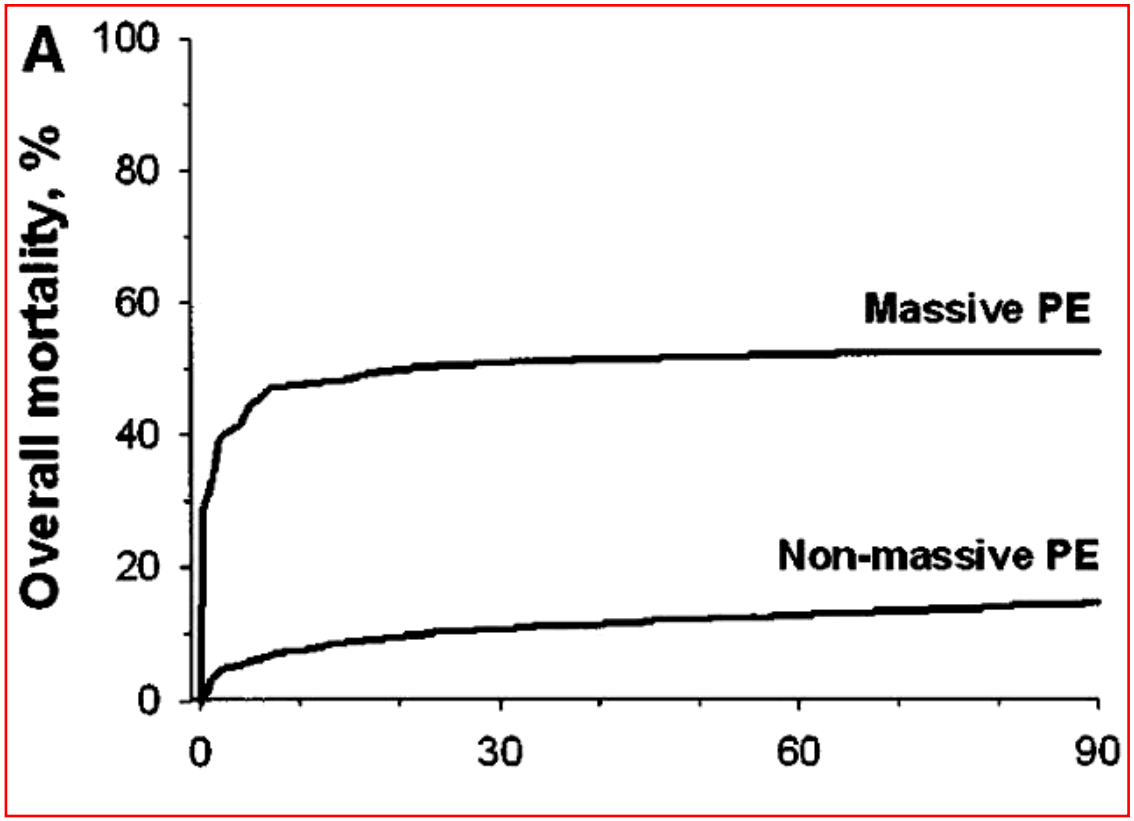


SUBMASSIVE
Normotensive + Right Ventricluar Strain

LOW RISK
None of the above

No pressors, No O2, subseg PE

PE Mortality (ICOPER)



52.4%*

15%

*62.5% from recurrent PE

Kucher et al Massive PE Circulation 2006.

Therapeutic Alternatives in Acute Venous Thromboembolism

Anticoagulation

- Unfractionated Heparin
  - Continuous Intravenous
  - Full-Dose Subcutaneous
- Low-Molecular-Weight Heparin
- Direct Thrombin Inhibitors
- Synthetic Pentasaccharide Xa Antagonist
- Warfarin
- New oral Factor Xa inhibitors

Thrombolytic Therapy

- Systemic
- Catheter Directed (CD)
- Pharmacomechanical CD Thrombolysis (PCDT)

Mechanical

- Thromboaspiration
- Surgical Thrombectomy

Adjunctive Therapy

- Vena Caval Filter
- Extracorporeal support

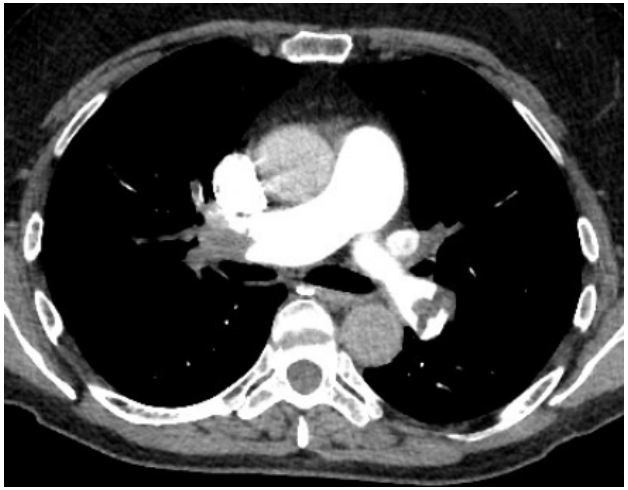
How does one choose?

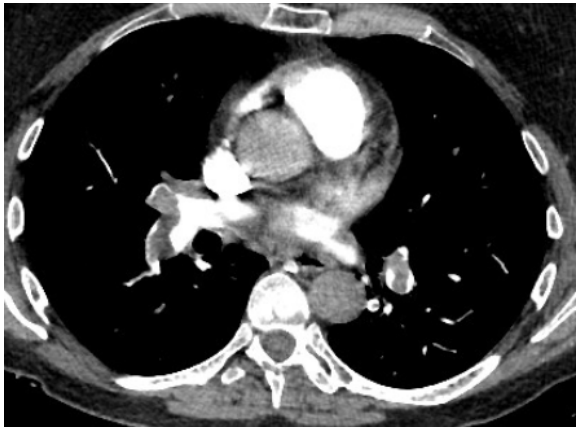
Case 1

- 61 woman h/o provoked RLE DVT after long flight in 2001
- SOB x 4-5 weeks
- Worsened with travel
- House
- PE CTA: clot in the bilateral main pulmonary artery
- ECHO and biomarkers: Right heart strain
- Hemodynamically stable

SOB = shortness of breath
RLE DVT = right lower extremity deep vein thrombosis

Case 1



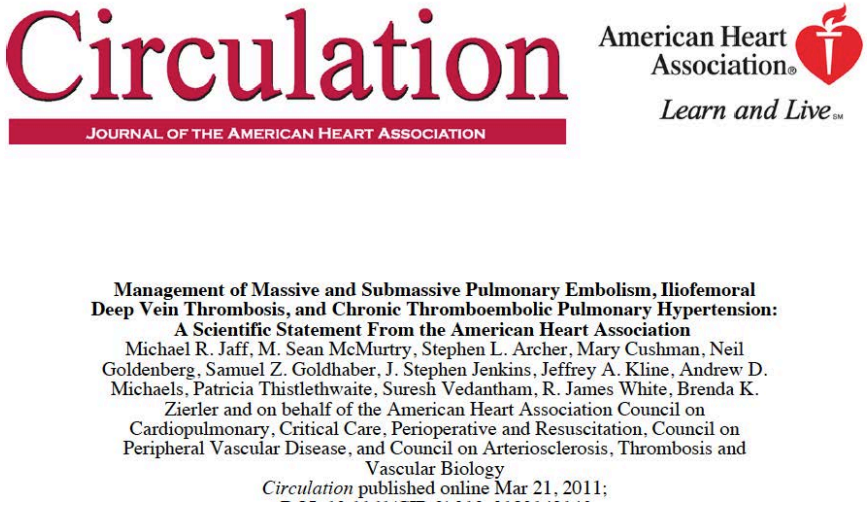


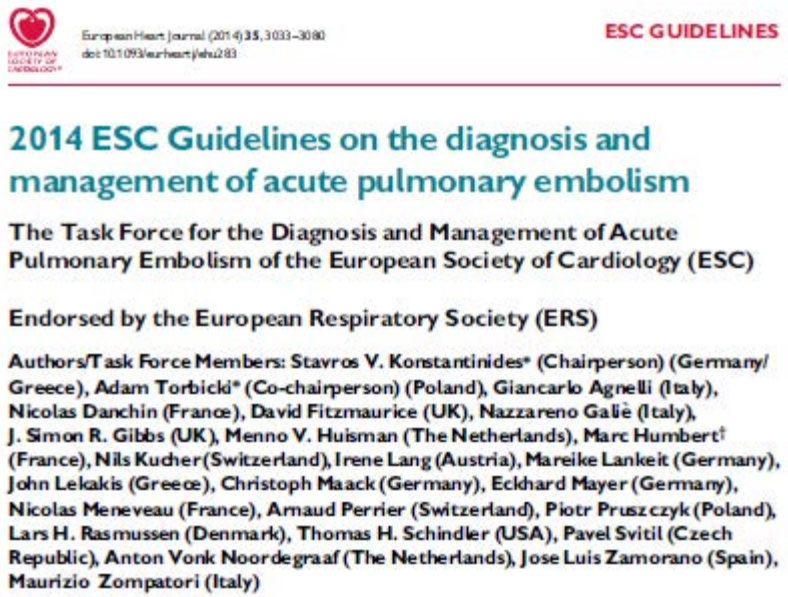
Case 1

- PERT: MGH staff, OSH staff and patient.
- Management options
  - systemic anticoagulation with or without catheter-directed thrombolysis.
- Risk/benefit discussed extensively.
- VS stable, but symptoms → MGH for catheter-directed thrombolysis to decrease risk of CTEPH.

OSH = outside hospital
CTEPH= chronic thromboembolic pulmonary hypertension

Guidance in the Literature for Treatment of Massive/Submassive PE: Very Little



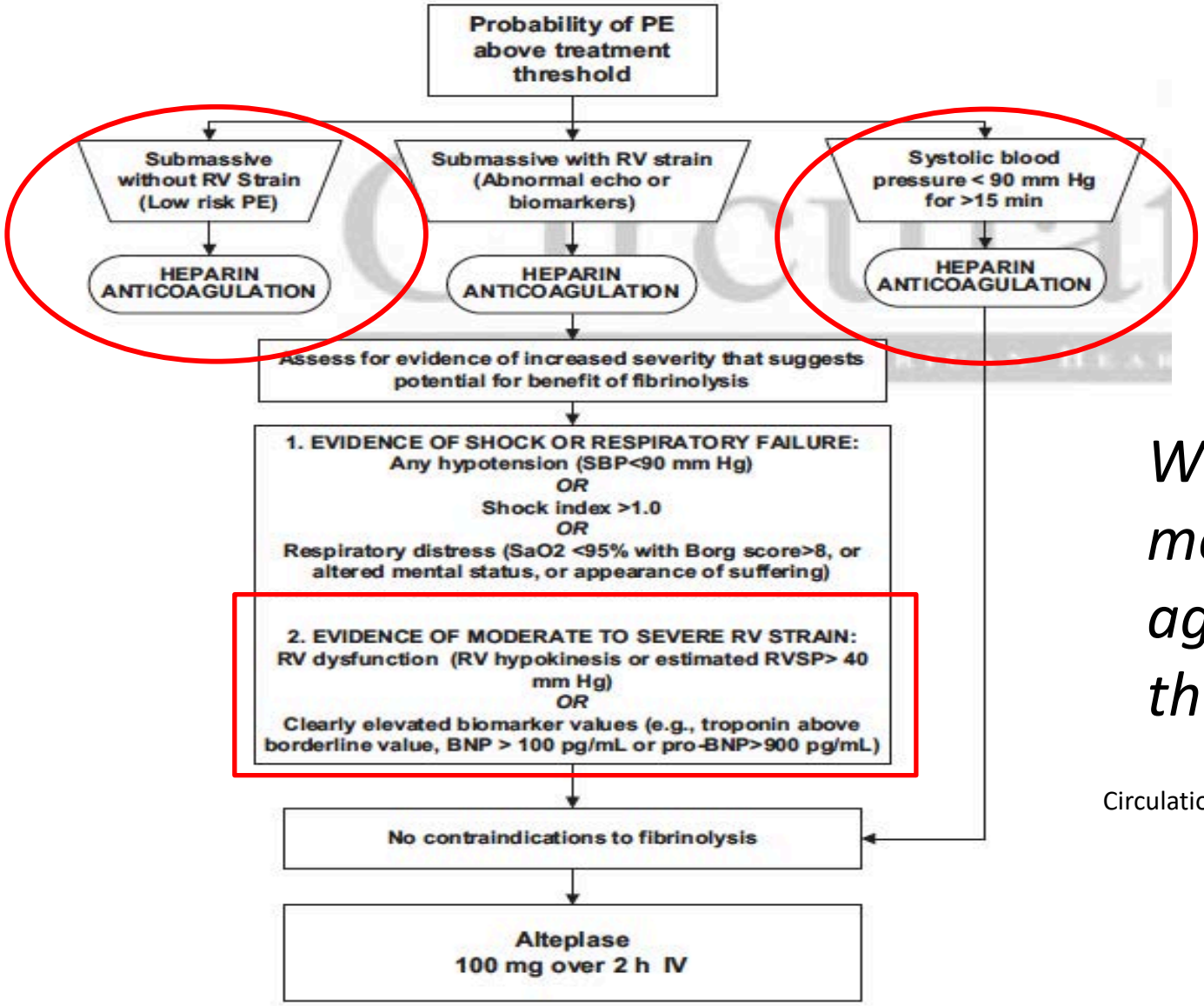


- Number of options: Who decides? How decide?
- Lack of guidance

Circulation 2011;123:1788-830

European Heart Journal (2014) 35, 3033–3080

Acute Massive/Submassive PE Therapy



Who warrants more aggressive therapy?

Circulation 2011;123:1788-830

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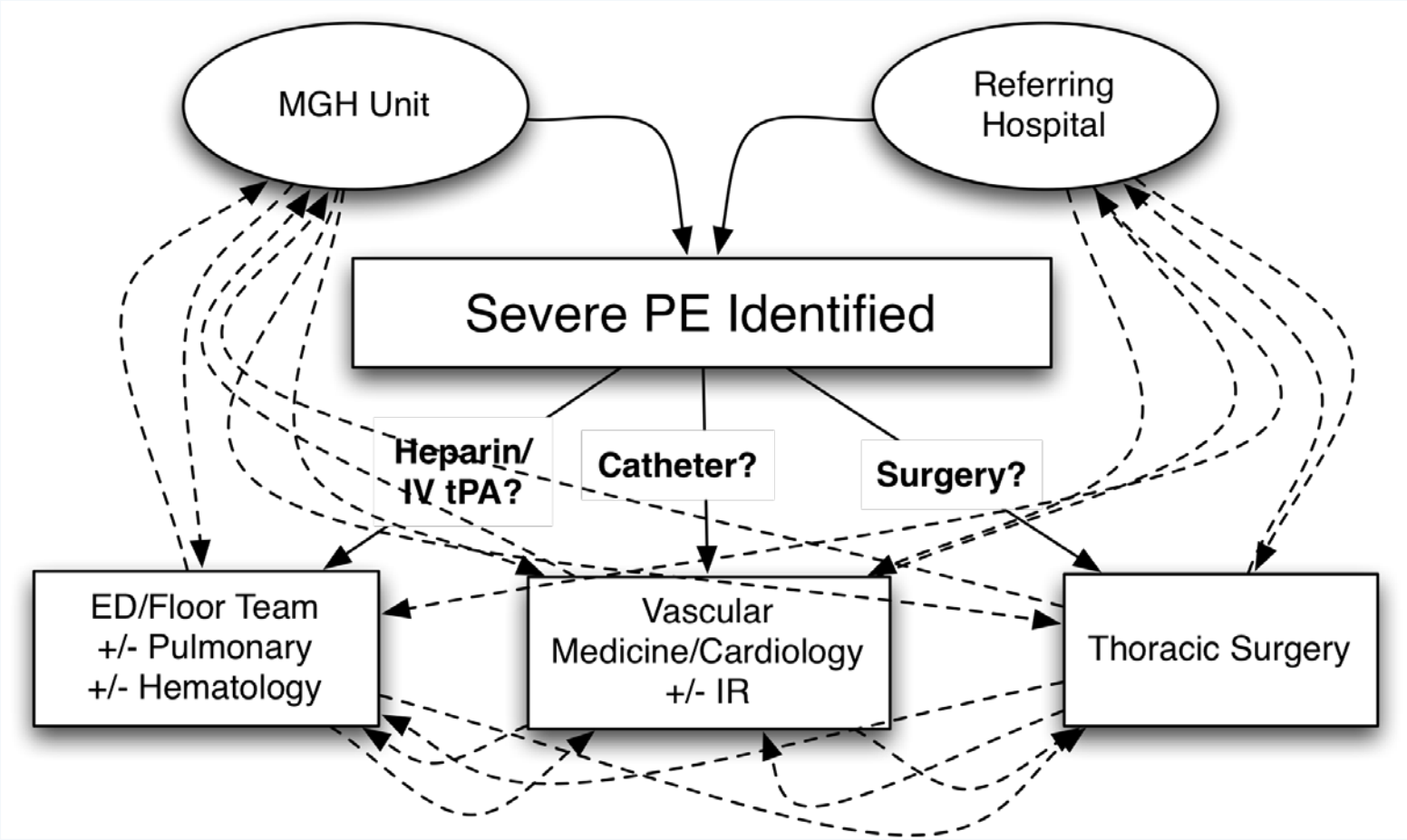
Pulmonary Embolism: Which therapy to use?

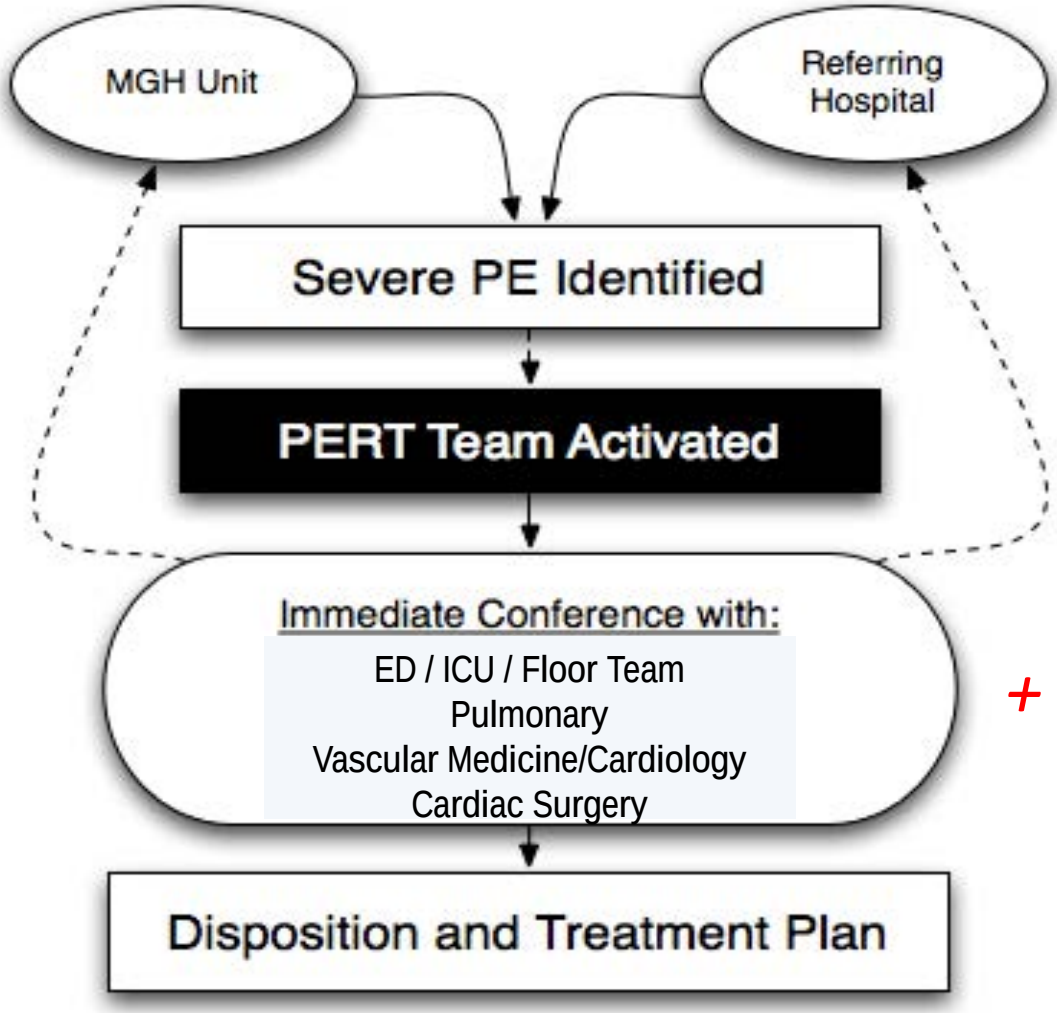
- Best treatment unknown - no "standard approach"
- MGH example - strategies "all over the map"
  - Varied by medical service, location
  - No consistency in decision-making
  - No single "team"
  - No accepted algorithm
  - No centralized location for care
  - No systematic evaluation of results

We looked around country and found no coordinated way to treat PE: Impetus for PERT

Pulmonary Embolism Response Team (PERT)

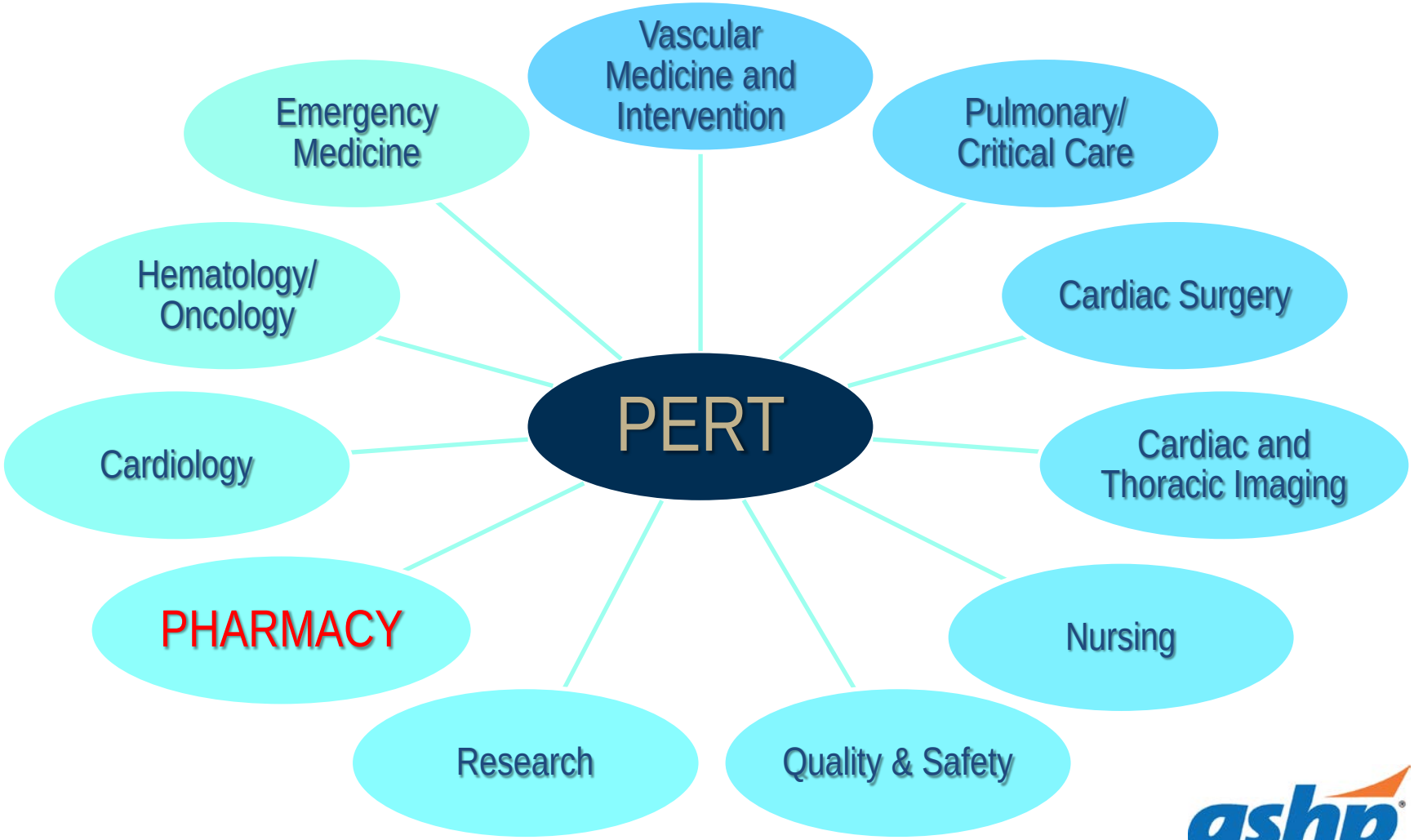


Pulmonary Embolism Response Team (PERT)



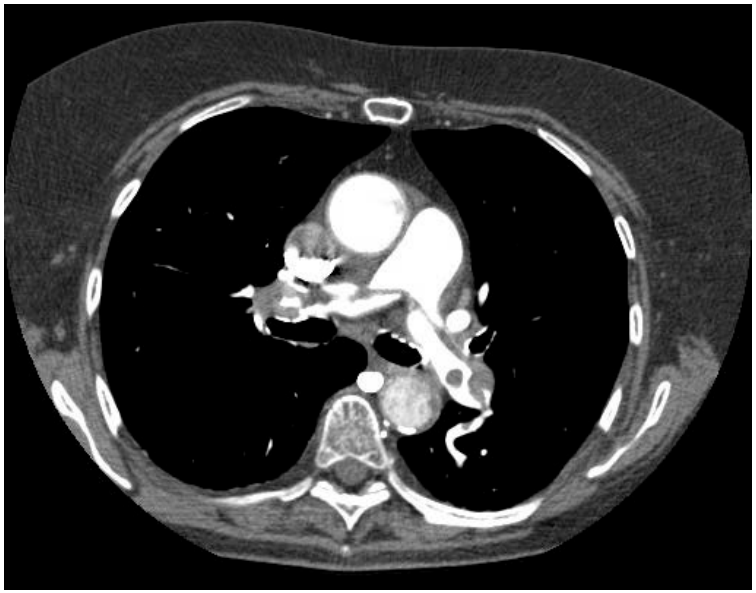
+ pharmacy

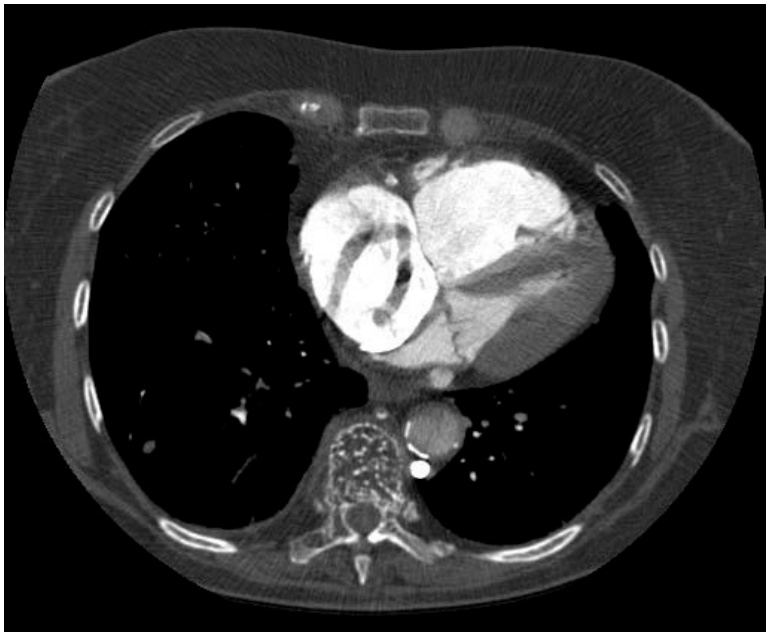
Multidisciplinary Collaboration



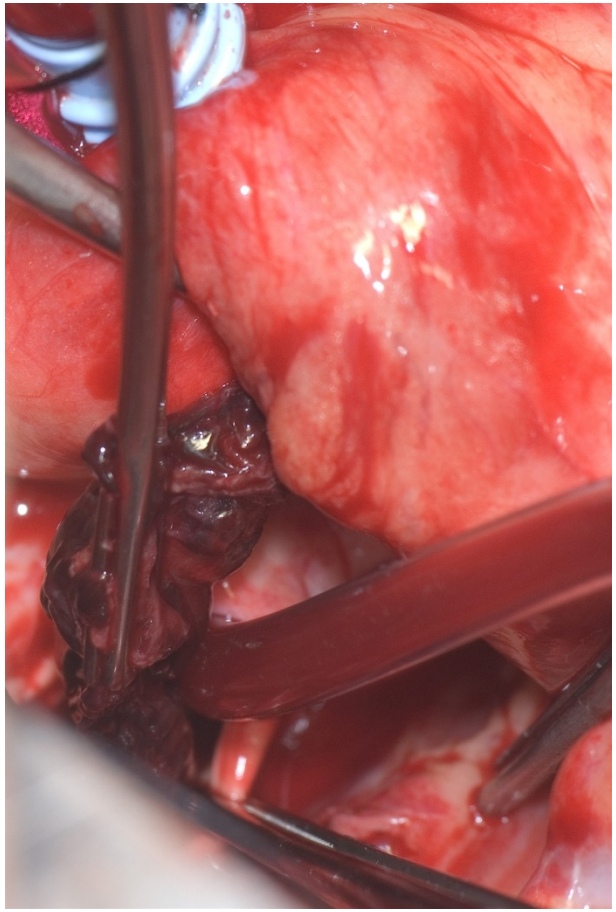
Case 1

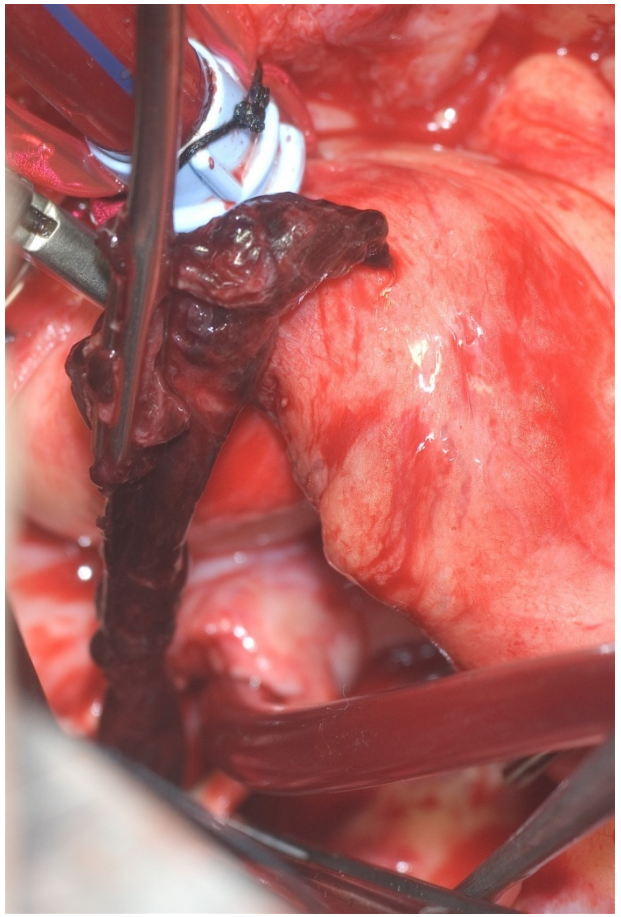
- 32 M s/p knee surgery, syncopized
- Hypoxic, tachycardic, tachypneic, hypotensive
- While waiting …



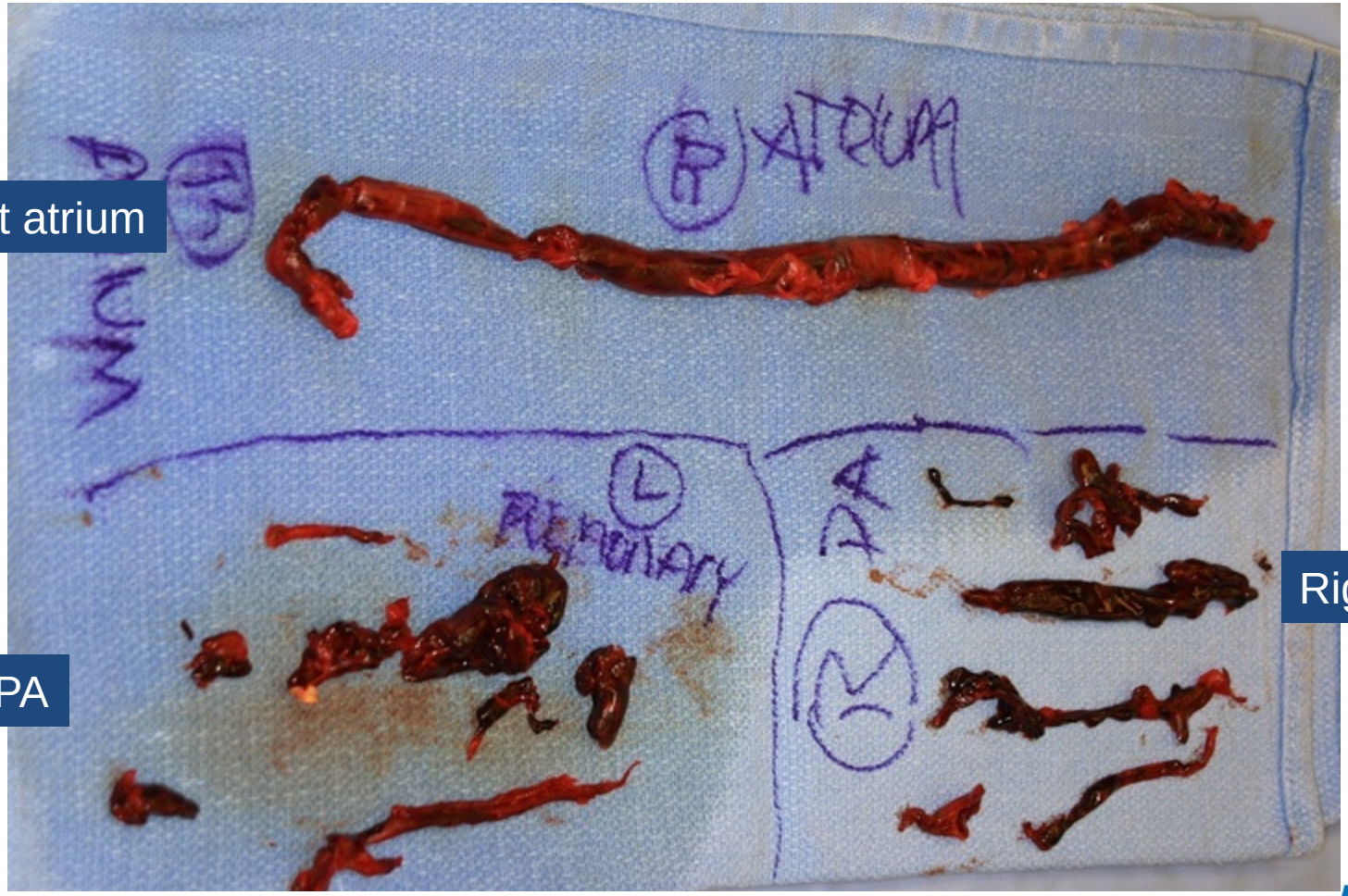


Pulmonary Embolectomy





Embolic Material



Pulmonary Embolism Response Team

Mission

To advance the diagnosis, treatment and outcomes of patients with severe pulmonary embolism (PE)

Vision

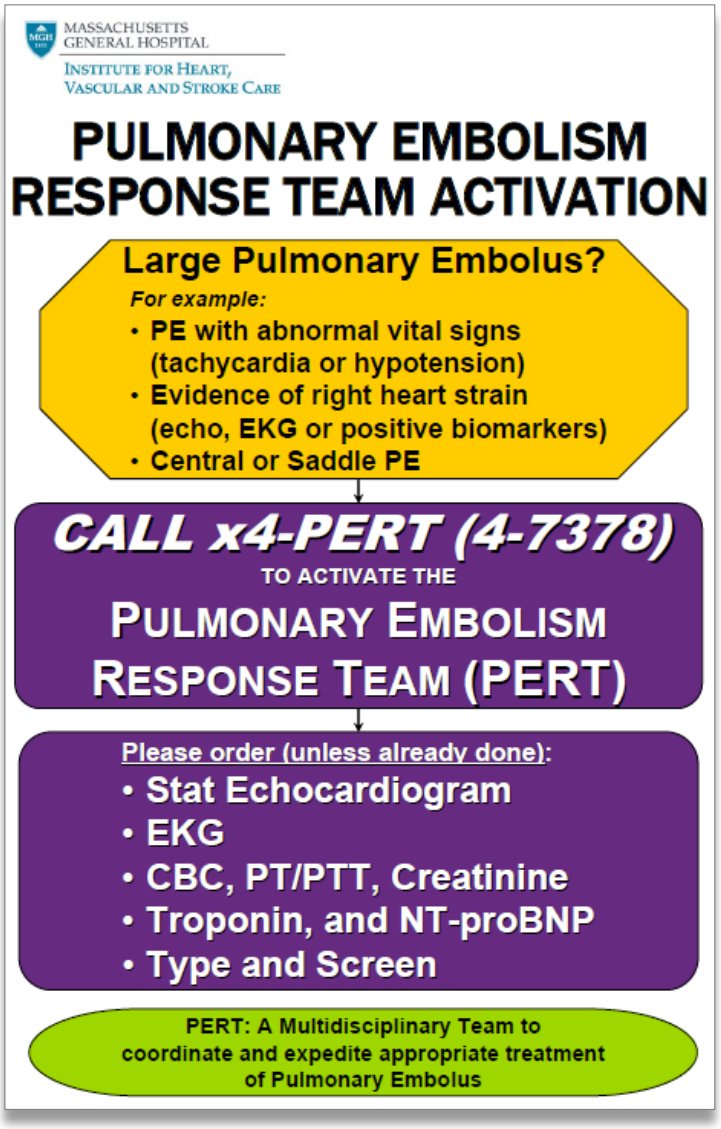
To become the center of excellence in the science of pulmonary embolism care through multidisciplinary collaboration in clinical care, education and research

Pulmonary Embolism Response Team

Objectives

- Respond expeditiously to treat patients with massive and submassive PE
- Provide best therapeutic options available for each patient
- Leverage the input of a multidisciplinary team of experts
- Coordinate care among services involved in care of PE
- Develop protocols for the full range of therapies available
- Collect data on clinical presentation, treatment efficacy, and outcomes (short and long-term)

PERT Activation

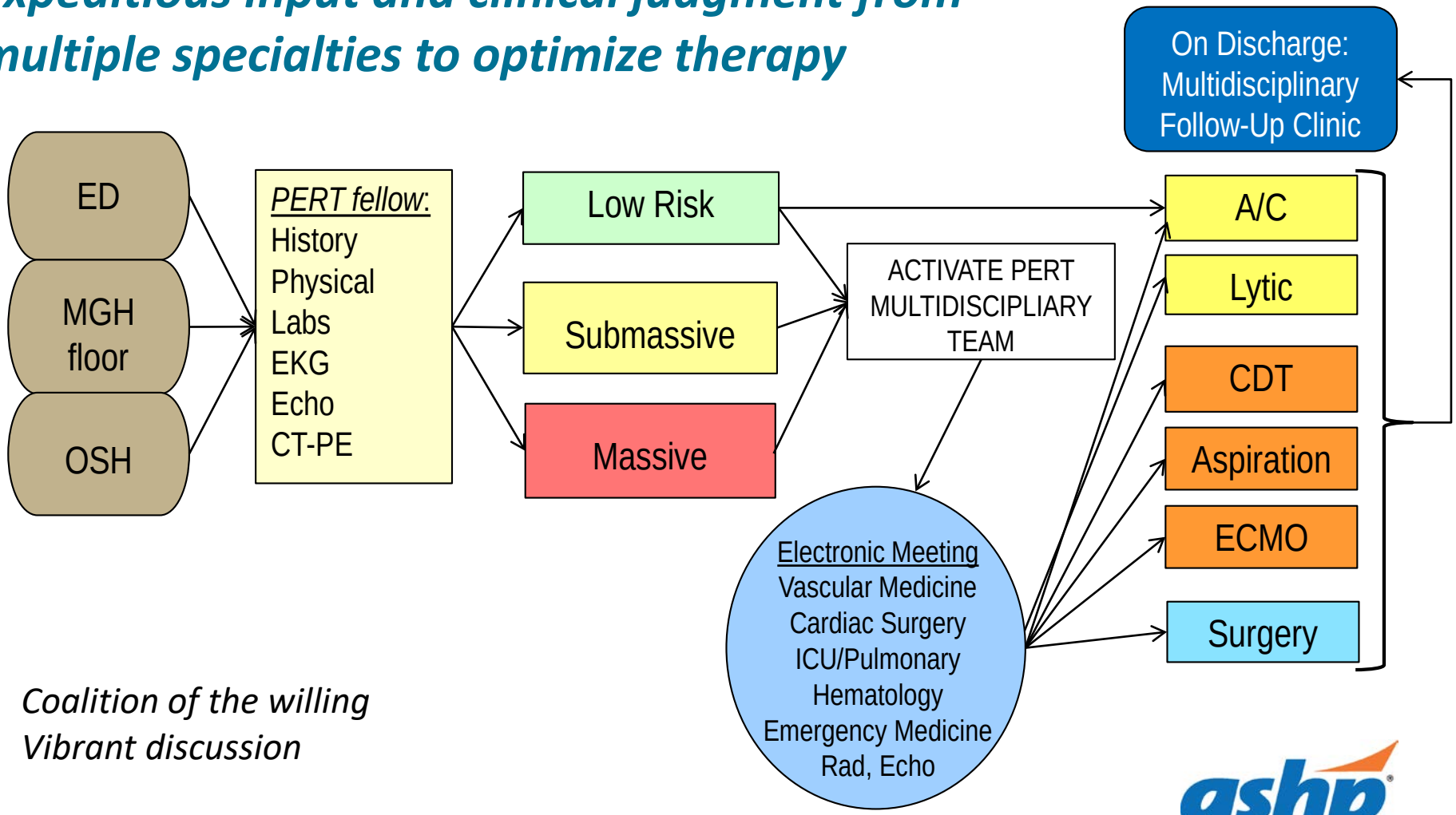


One telephone number

Answered 24/7 by answering service

PERT Program Flow Map

Expeditious input and clinical judgment from multiple specialties to optimize therapy



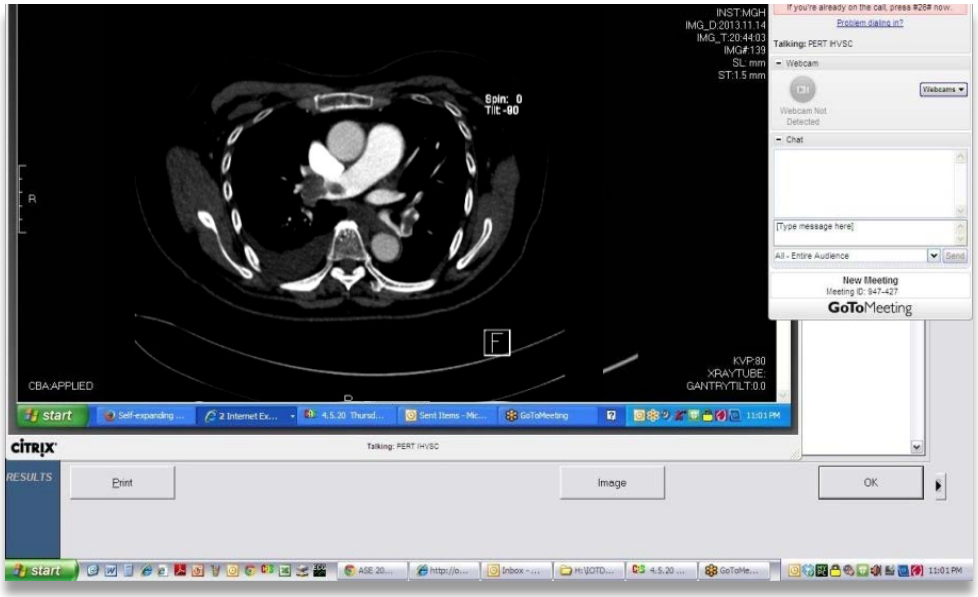
Coalition of the willing
Vibrant discussion

+ pharmacy

PERT Activation

Multidisciplinary Virtual Consultation

- Web-based HIPAA compliant videoconferencing

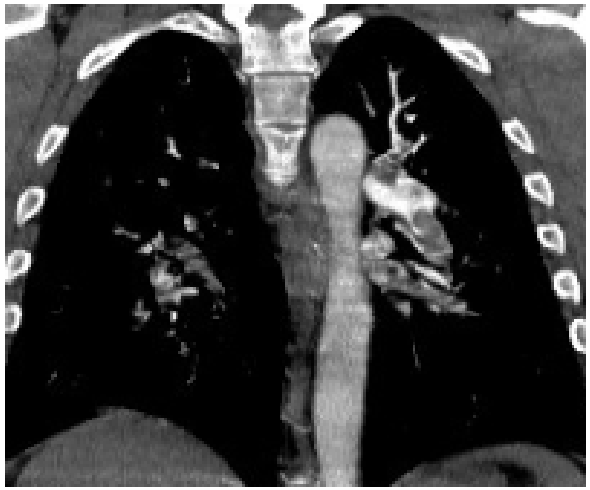


PERT Activations at MGH
October 2012 Launch through November 2016

- Total activations: 716
  - Mostly from ED
- Multidisciplinary virtual consults: 451 / 63% of activations
  - Number of participants: 6 – 15 physicians
  - Average length of consult: 25 mins.

Case 3 … importance of close follow up

- 48 M h/o idiopathic Guillain-Barré Syndrome 3 years prior, resolved presented to OSH with acute SOB.
- CTA showed bilateral PE. Given one dose lovenox and sent to MGH.



OSH = outside hospital
SOB = short of breath

Case 3: Importance of Close Follow Up

- At MGH:
  - 87% on RA, HR 150, RR 28, BP 140/79.
  - Had to take a breath every few words
  - ECHO: severe right heart strain
- Given his hypoxia, tachypnea, hypokinesis → proceed with CDT thrombectomy and lysis (16 mg tpa).
- Discharged next day on novel oral anticoagulant.

CDT = catheter directed

Case 3: Importance of Close Follow Up

- In hospital, HCT 26.8.
- Follow up clinic one month later, HCT still 26.8.
- Work up revealed:
  - IgG 5328, IgA 22, IgM 6,
  - serum free kappa/lamda = 601/1.5 = 400 ratio
  - M spike: 4.31 IgG Kappa

PERT Multidisciplinary Follow Up Clinic

Purpose

- To continue multidisciplinary collaboration for the long term follow up and treatment.

Structure

Data

- Began August 2014
- 1-2 clinics/month depending on number of patients
- 40 clinics from August 2014 through November 2016
- Over 250 patients seen

Multidisciplinary PERT Follow Up Clinic

Unique Clinic

- True multidisciplinary effort
- We all learn from each other
- Ensures appropriate short and long term follow up and treatment
- Research

PERT Research: Advancing the Science of PE Care

Goals

- PERT: unique/exciting … but want to demonstrate impact & explain what we've accomplish
  - Can it change treatment/effect outcomes of PE?
- Collect data from beginning to share
- Published small case series in CHEST explaining this new concept of caring for patients with PE.

Operational Approach

Chest. 2013 Nov;144(5):1738-9. doi: 10.1378/chest.13-1562.

A multidisciplinary pulmonary embolism response team.

- 12 weeks
- 30 patients

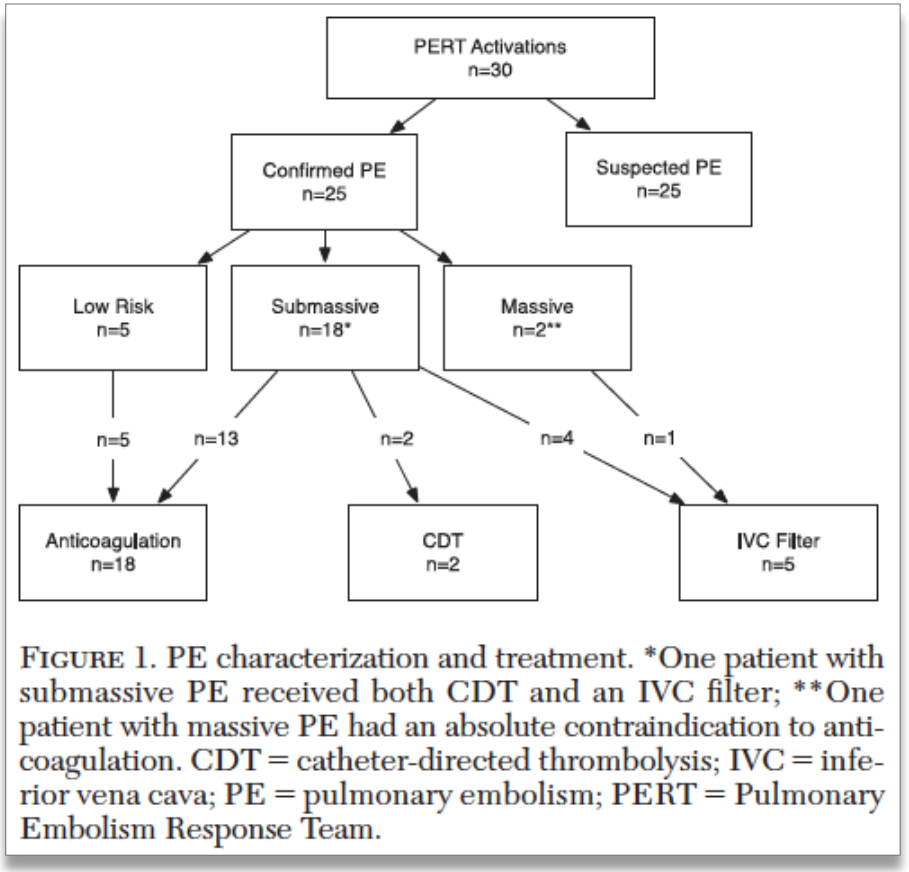


FIGURE 1. PE characterization and treatment. *One patient with submassive PE received both CDT and an IVC filter; **One patient with massive PE had an absolute contraindication to anticoagulation. CDT = catheter-directed thrombolysis; IVC = inferior vena cava; PE = pulmonary embolism; PERT = Pulmonary Embolism Response Team.

Operational Approach

Hospital Practice (1995). 2014 Feb;42(1):131-7. doi: 10.3810/hp.2014.02.1089.

The Massachusetts General Hospital Pulmonary Embolism Response Team (MGH PERT): Creation of a Multidisciplinary Program to Improve Care of Patients With Massive and Submassive Pulmonary Embolism.

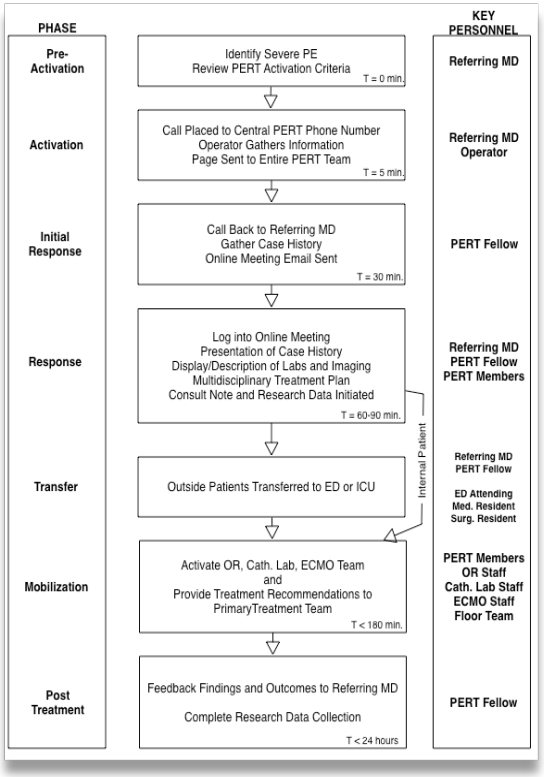


Table 2. Suggested Hospital Stratification by Availability of PERT Faculty, Resources, and Specialists

PERT Level 1:	
24/7	Vascular medicine and cardiac interventional (catheterization laboratory) services
	Cardiothoracic surgery services
	Transthoracic and transesophageal echocardiography services
	Medical and surgical ICUs staffed 24/7 by intensivists
PERT Level 2:	
Non-emergent	Vascular medicine and cardiac interventional services
	Cardiothoracic surgery services
	Transthoracic and transesophageal echocardiography services
	Medical and surgical intensive care units
PERT Level 3:	
Lacking either cardiac interventional, cardiothoracic surgery, echocardiography, or ICU services	

Follow up paper on logistics and operations.

What multidisciplinary team entails.

How works, get 10-15 people.

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Invited Presentations/Papers

- Hospitals , grand rounds and local meetings all over United States
- Societies all over USA and beyond
  - American Thoracic Society
  - Internatl Society for Thrombosis and Haemostasis
  - American Heart Association
  - VEITH Symposium
  - CHEST National Meeting
  - American College of Cardiology
  - VIVA
  - **ASHP**
  - Too many to list:
    - TCT, LINC, SIR, ISET, SVS, SMACC, SVM, C3, SAEM, Paraguayan Internal Med, NATF, VTEDeblin

Real focus: show if what we are doing makes a difference

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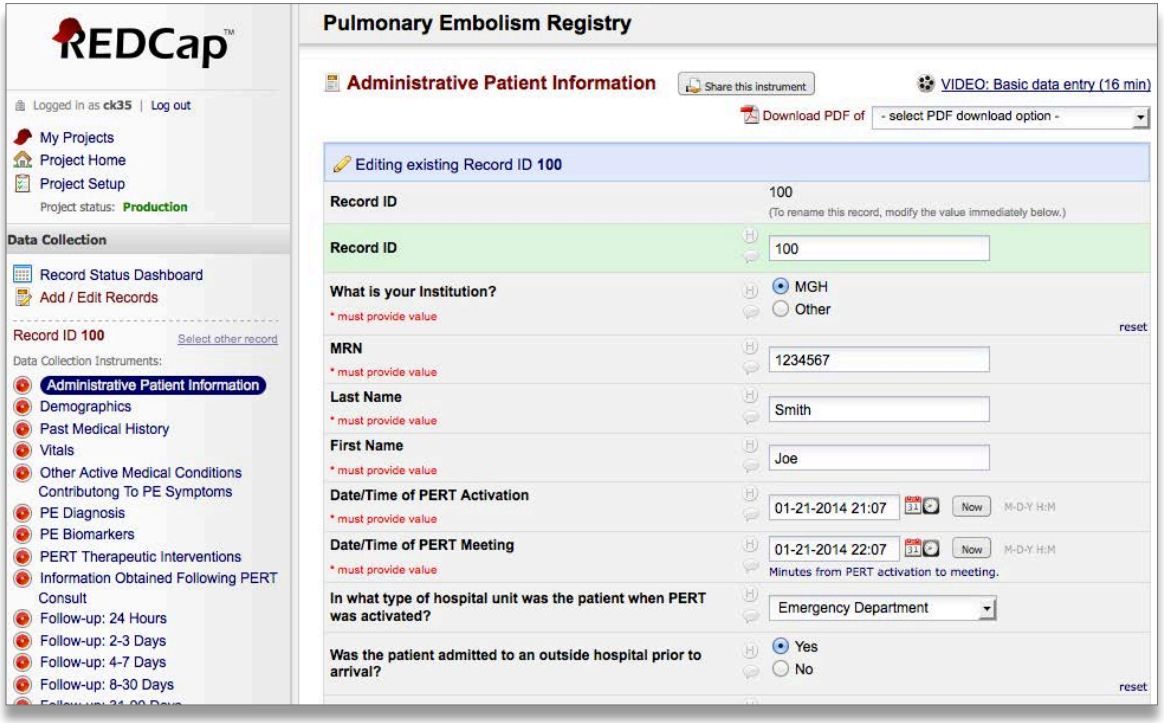
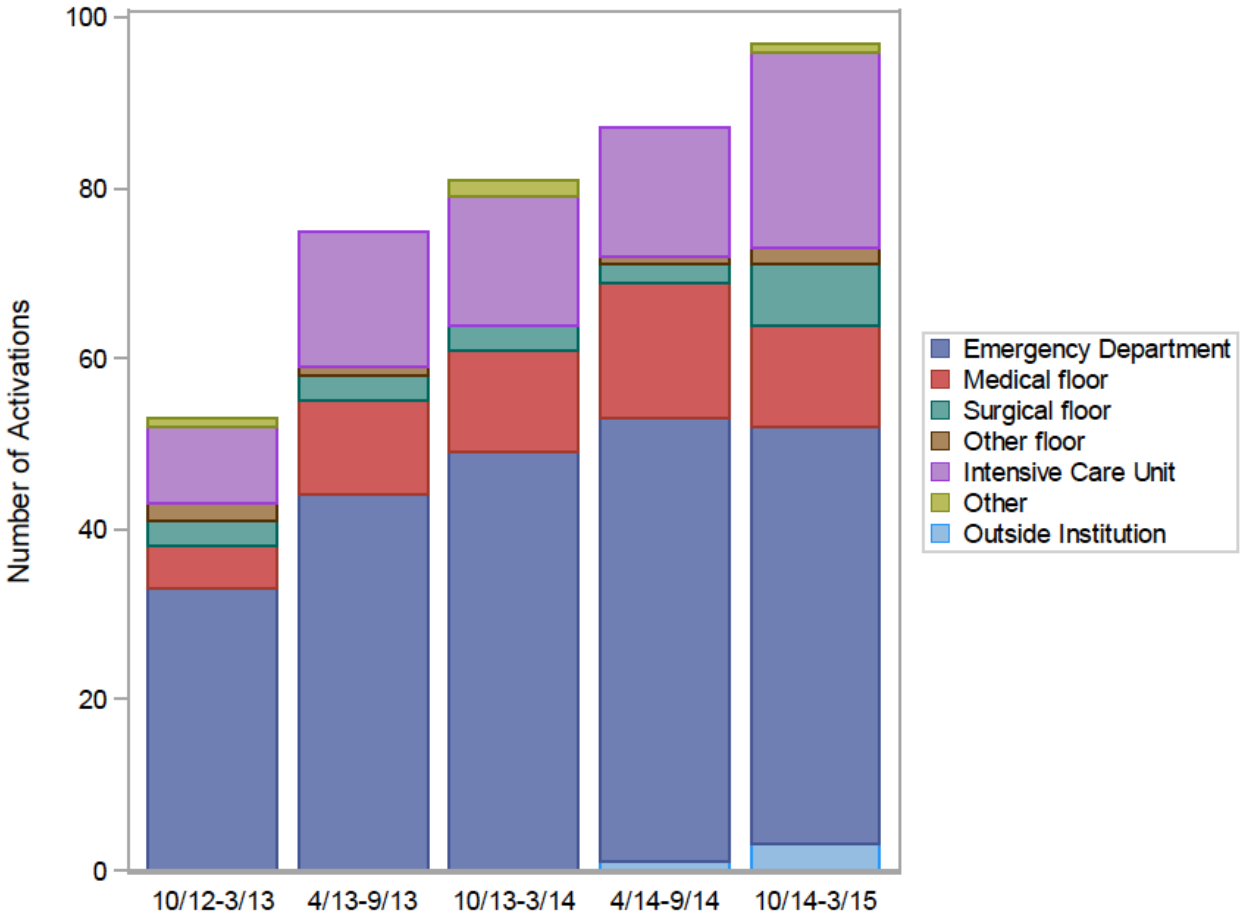
PERT Database

- Web-based, REDCap
- HIPAA compliant
- Piloting



PERT Data

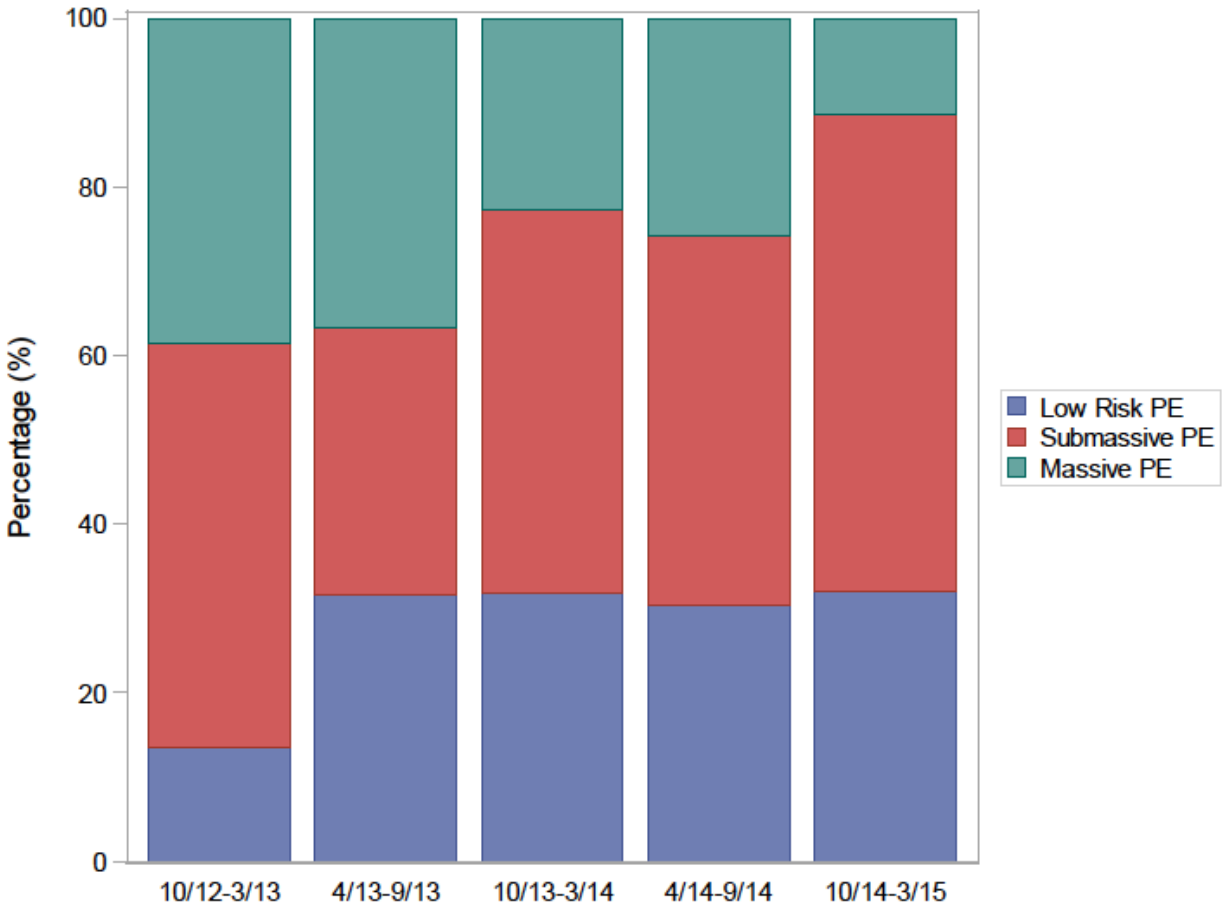
- PERT launched
  - Immediate response
  - Grown 16% each time period



Kabrhel, Rosovsky et al. Chest. 2016

PERT Data

- Majority are severe,
- Recent increase in low risk: represents complex cases

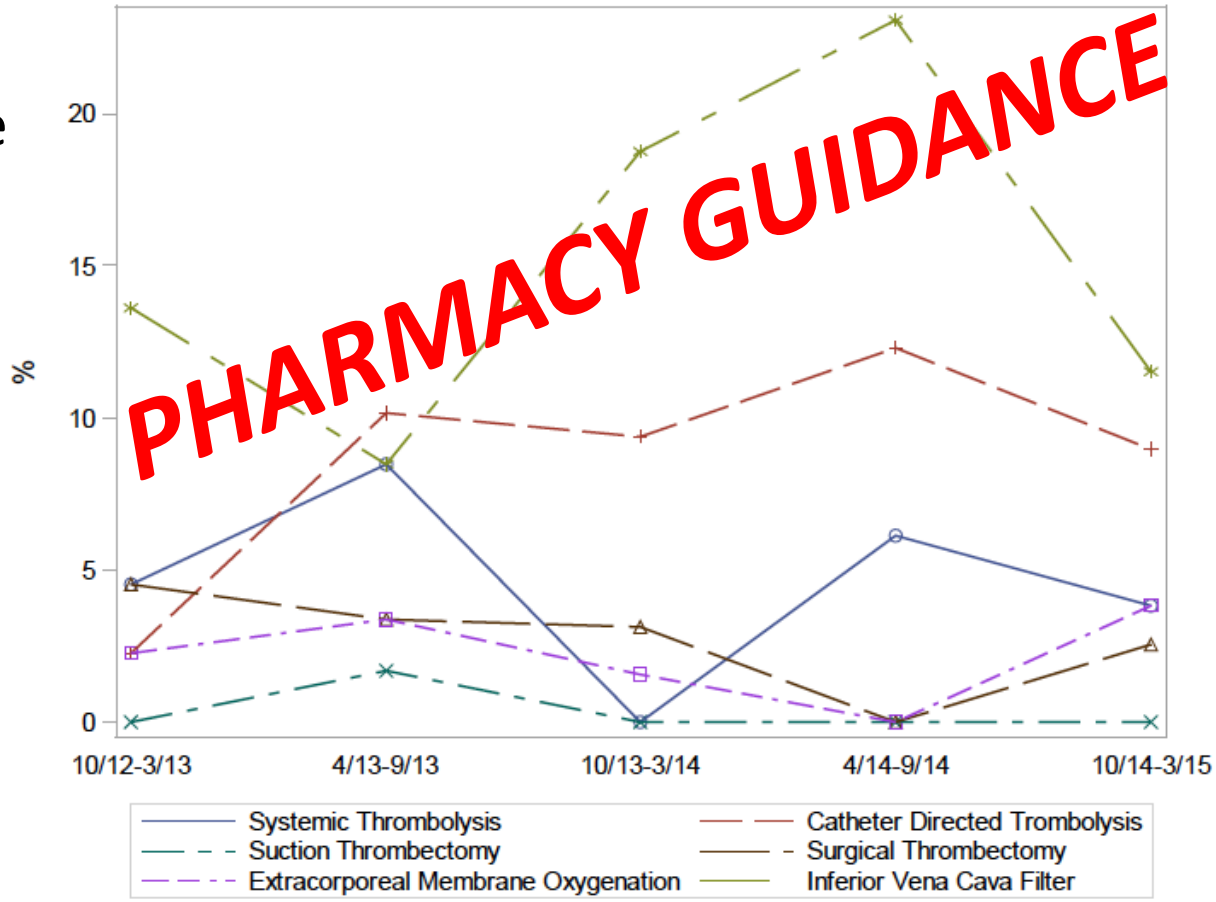


Kabrhel, Rosovsky et al. Chest. 2016

PERT Data: Treatment Provided

Advanced Rx

- More National average
- National registries
  - 2% of all PE get thrombolysis (TL)
  - 9% of massive
- Underused
- Expertise/comfort
- Our data: TL
  - 16% of all
  - 23% of massive

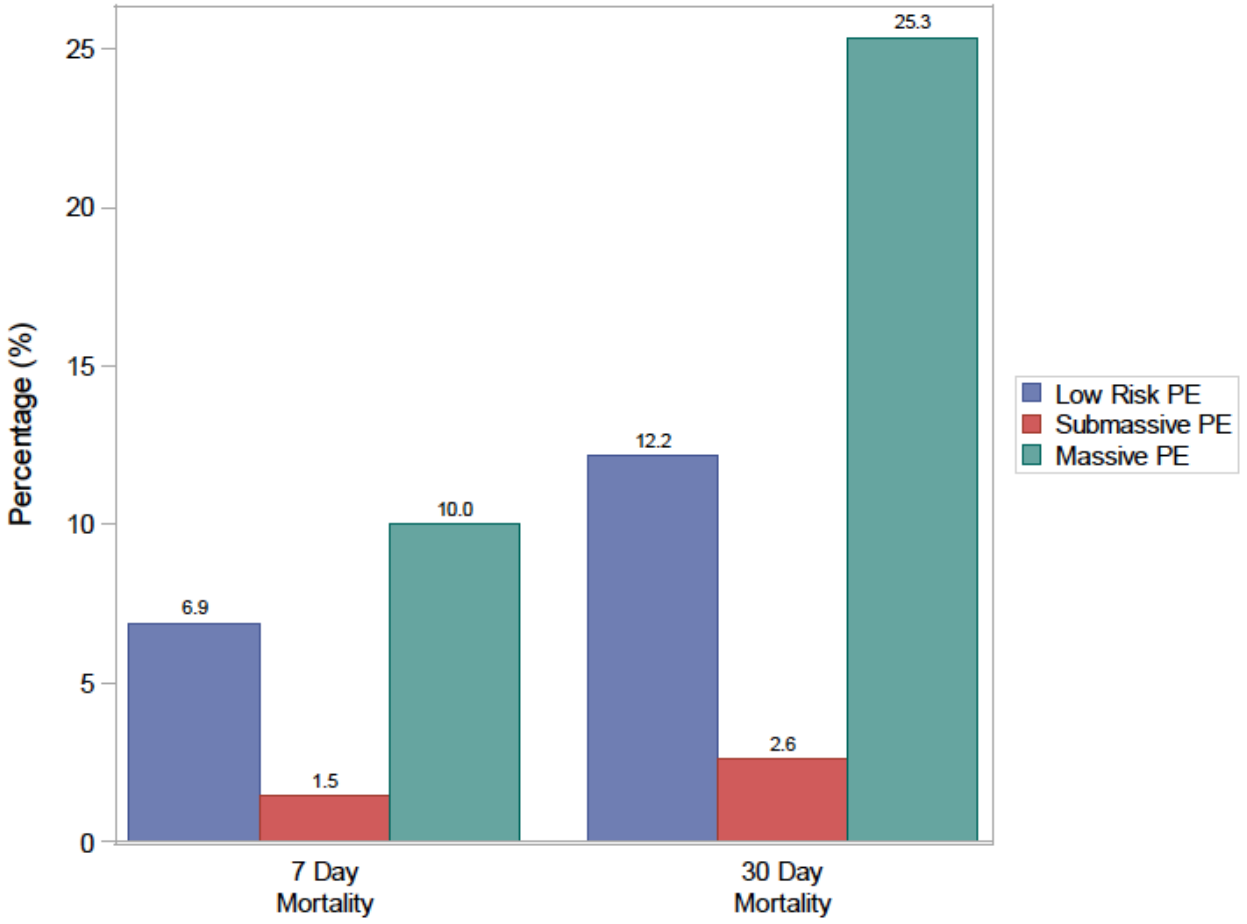


Kabrhel, Rosovsky et al. Chest. 2016

PERT Data: Mortality

Does our approach improve outcomes?

- Even among massive PE, mortality is still high: 25%
- **Lower than National average of 52%**
- Very early data.

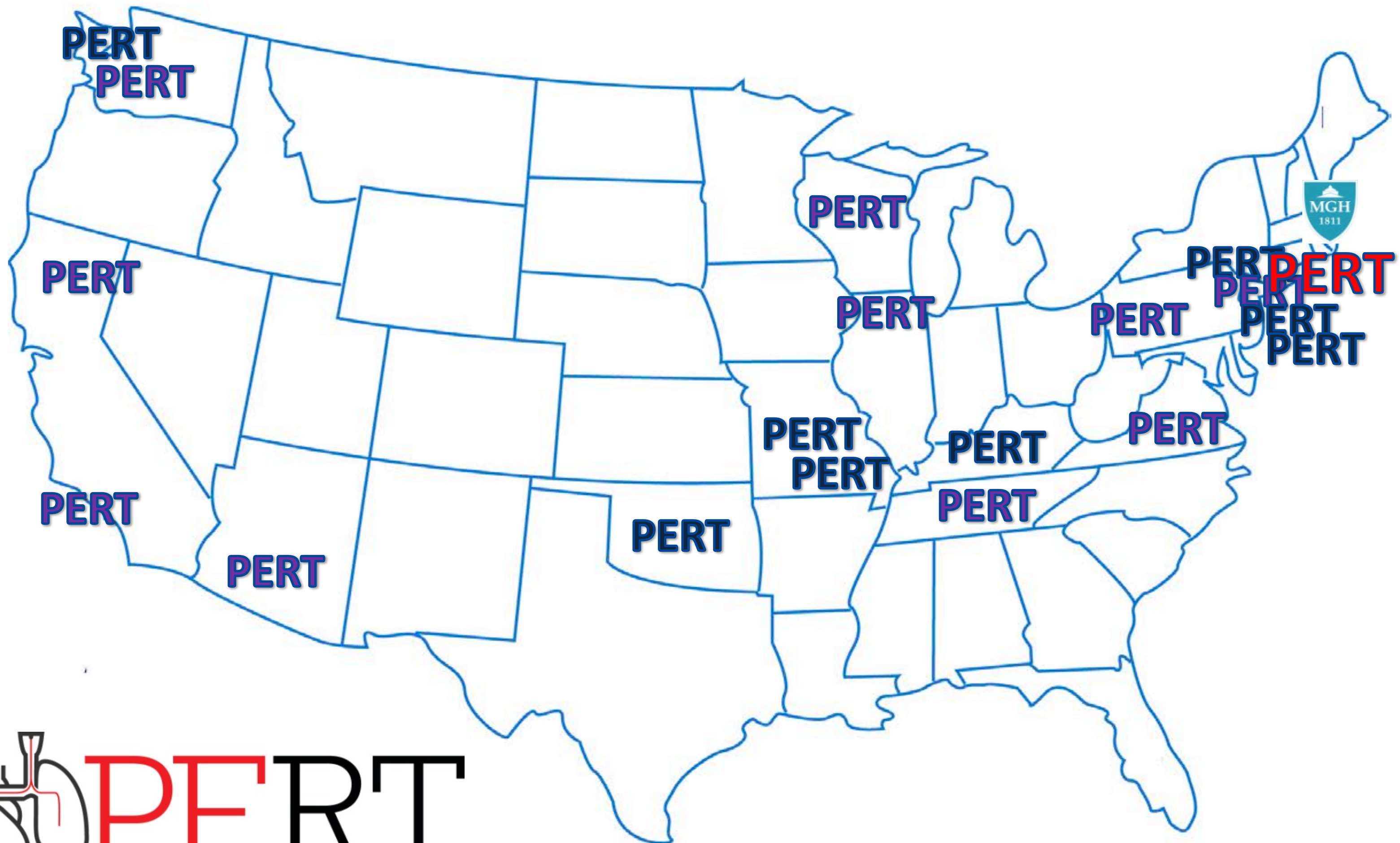


Kabrhel, Rosovsky et al. Chest. 2016

Most exciting … not just happening at MGH

Expand PERT Nationally and Internationally…

PERT ™ Consortium



PERT
Pulmonary Embolism Response Team Consortium

Launched May 2015

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PERT ™ Consortium

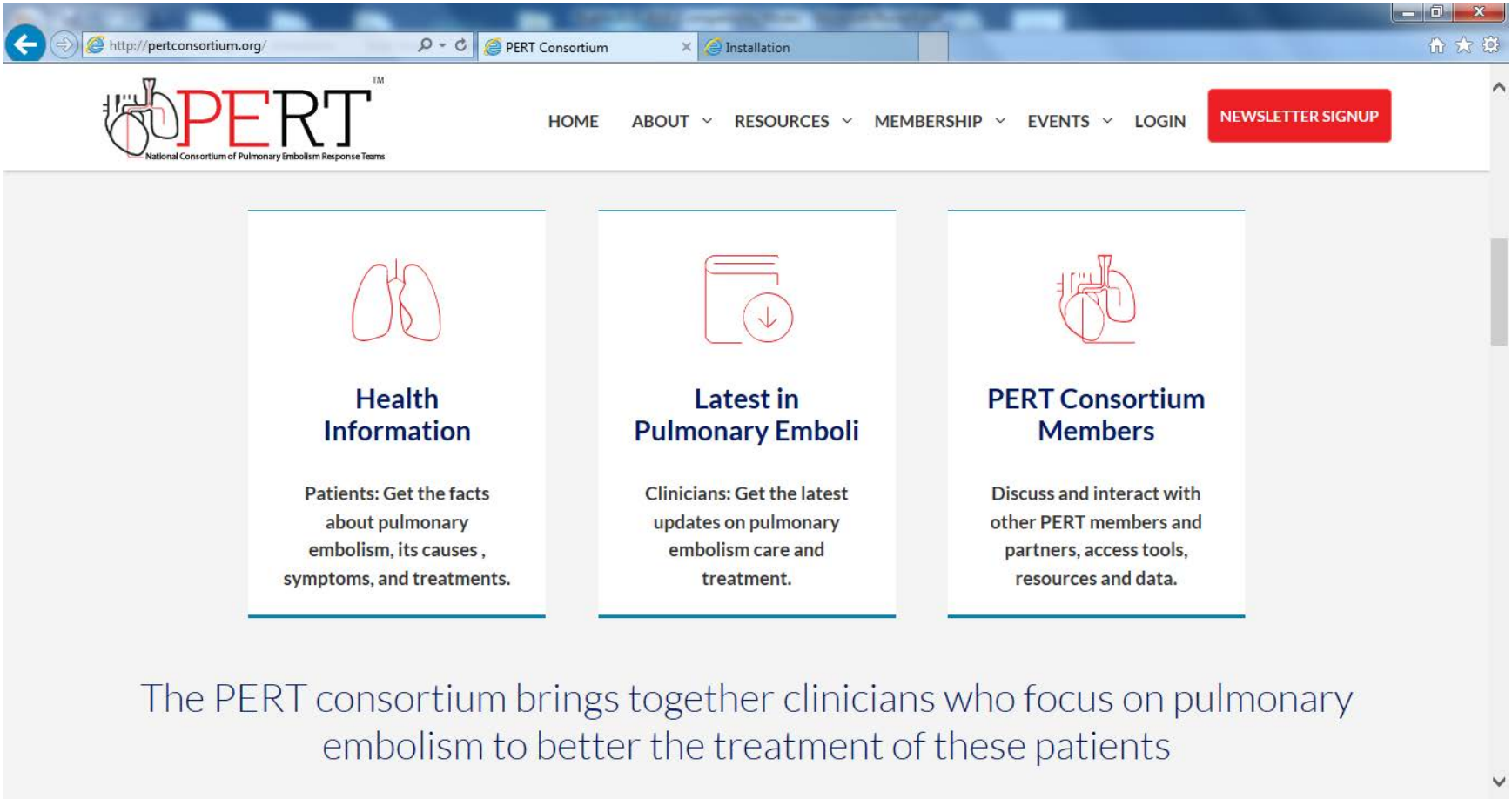
- Launched May 2015
  - 100 providers representing 30 PERT sites
  - Mission, goals, structure established
  - Created 5 committees
    - Governance
    - Education
    - Communication
    - Clinical practice and protocols
    - Research

PERT Consortium. 2016. Map of sites.

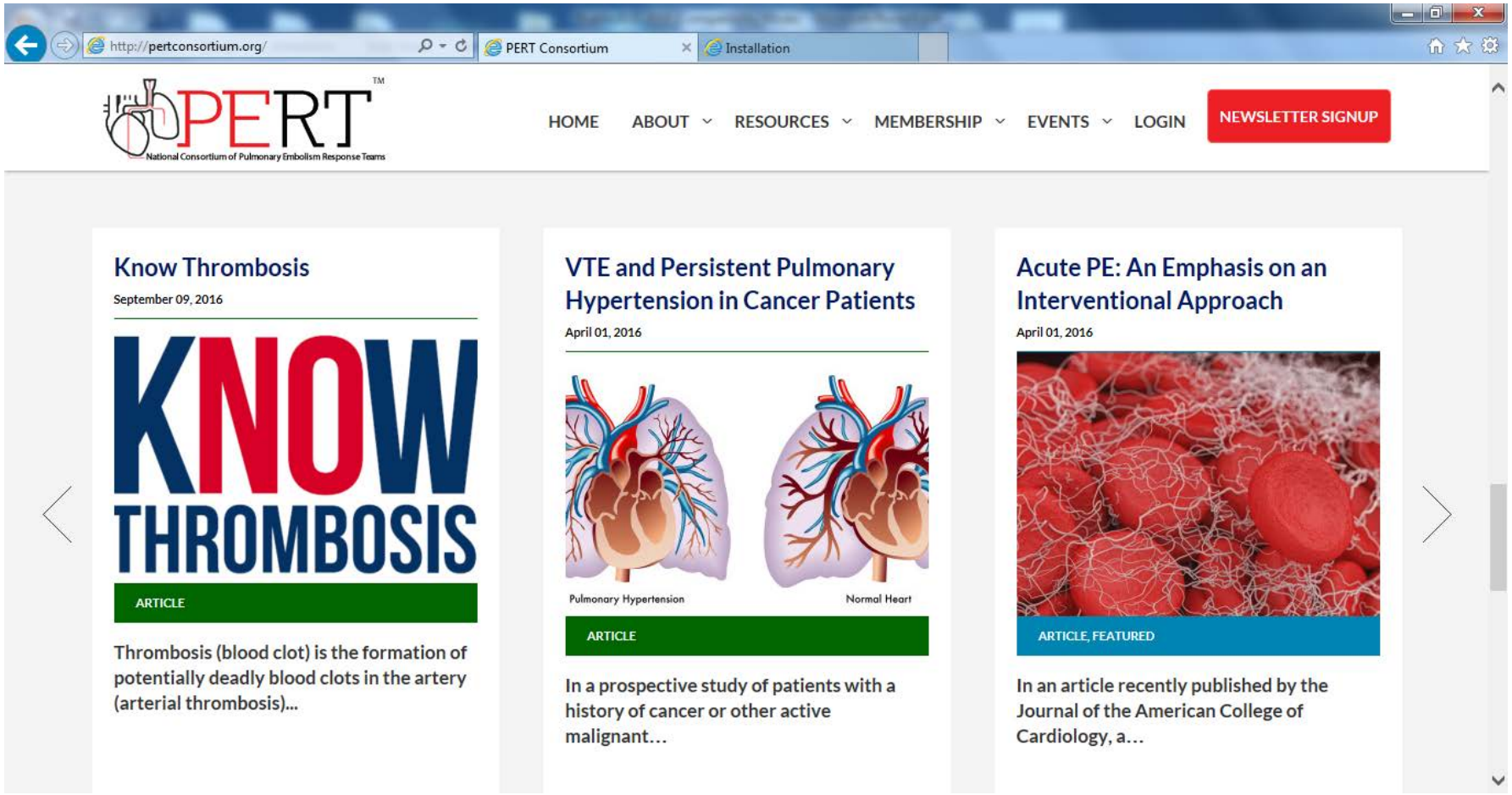
PERT ™ Consortium

- **2nd annual meeting June 2016**
  - 150 providers, over 90 PERT sites
  - Reviewed accomplishments from each committee
    - Governance: established 501c3
    - Education
      - mentorship program (rprosovsky@partners.org)
    - Communication
      - Website
    - Clinical practice and protocols
      - Algorithms
    - Research
      - Pilot study of database with 14 sites
    - Development

pertconsortium.org



pertconsortium.org



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National PERT ™ Consortium

We think PERT tidal wave in how treat PE in future: our vision moving forward.

We hope YOU are a part of that vision.

Next Consortium: **June 22, 2017. Boston, MA**

pertconsortium.org

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SAVE THE DATE

June 23-24, 2017

at the Royal Sonesta Boston in Cambridge, MA

Pulmonary Embolism

What is Known, and What We Need to Know

A Scientific Symposium Dedicated to PE

Immediately following the PERT Consortium Meeting
on June 22, 2017

Course Directors:

Christopher Kabrhel MD, MPH
Kenneth Rosenfield MD, MHCDS
Rachel Rosovsky MD, MPH
Samuel Goldhaber MD

Featured Speakers:

Phil Wells MD
Jeffrey Kline MD
Michael Jaff DO
Victor Tapson MD

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PERT: KEY Take Away Points

- PERT: New paradigm; wave of the future
  - In real time.
    - Infrastructure immediately and simultaneously engages multiple experts to determine best course of action for PE patients. Each consultant contributes relevant and vital information about each patient's clinical situation and perils.
  - Multidisciplinary
    - PERT members, outside hospital, other specialists
    - Patient and family members
  - Importance of follow up
- PERT National Consortium: education, clinical, research, communication
- Upcoming Events

ashp® MIDYEAR 2016
Clinical Meeting & Exhibition

Tesla:
Wave of the Future to treat PE patients

August 7, 2016

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Tesla car drives owner to hospital after he suffers pulmonary embolism

TECH | 13h

A US driver made it to hospital while suffering a pulmonary embolism after putting his car into autopilot.

Most Popular

Thank you

- Questions?

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Pulmonary Embolism Response Team:
The Potential Role of the Pharmacist

George A. Davis, PharmD, BCPS
December 2016

American Society of Health-System Pharmacists.

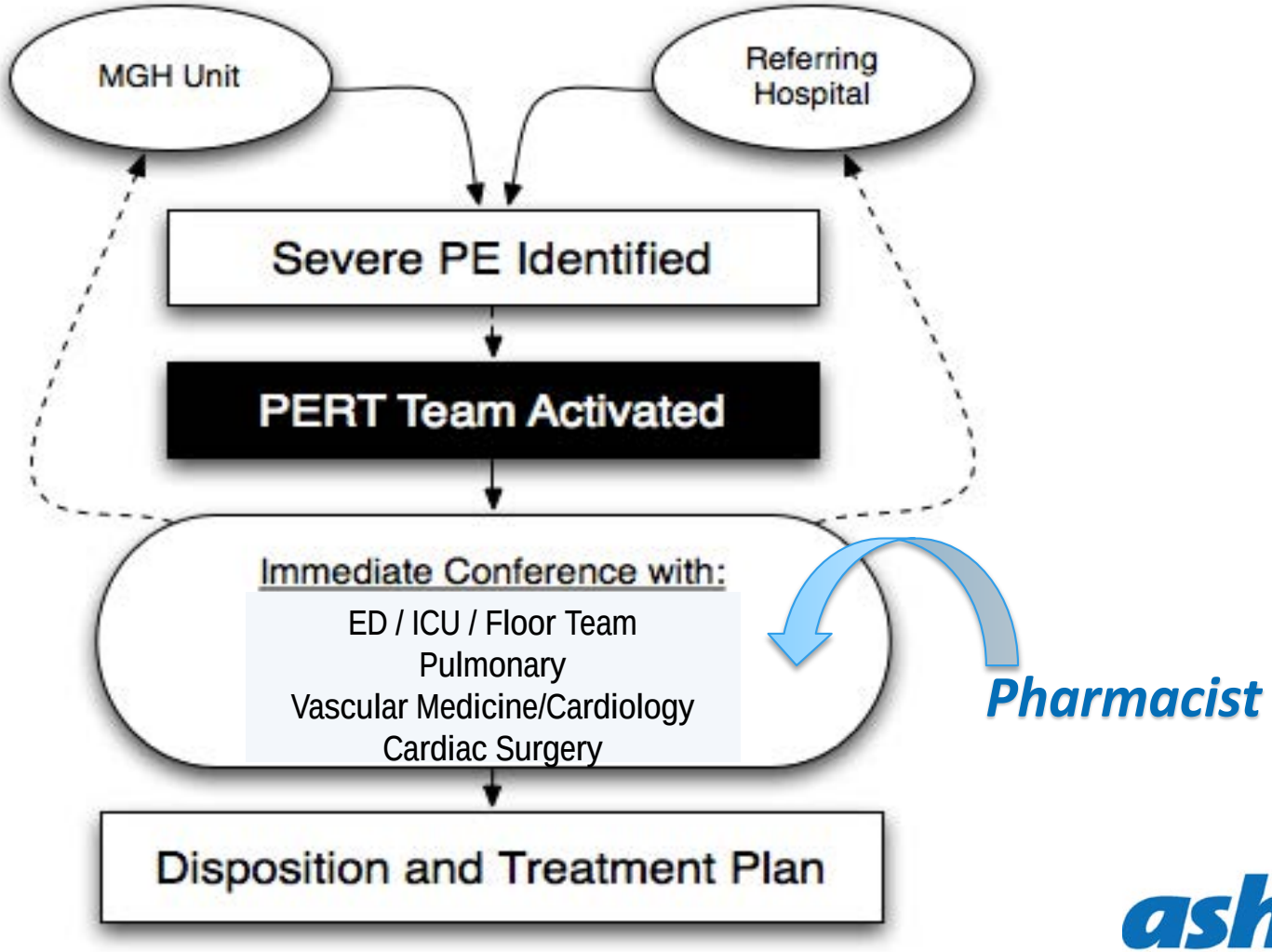
Learning Objectives

- Justify the rationale and background for developing a multidisciplinary Pulmonary Embolism Response Team (PERT)
- Describe the goals of the National PERT Consortium for advancing the care of patients with pulmonary embolism
- **Assess the potential role of a pharmacist on a PERT.**

PERT Case Review

- 65yo F presented to ED on with 4-day history of left calf pain and leg swelling and difficulty catching her breath
- HPI included recent hospitalization for appendicitis requiring surgery and diagnosed with pancreatitis
- In ED, venous ultrasound showed evidence of acute left femoral DVT extending to the popliteal vein
- Patient initially started on heparin drip by ED and PERT activated
- CT-PE revealed acute PE with right heart strain (RV:LV = 1.1), elevated troponin & proNTBNP, and HR > 110; Other labs: platelets = 75,000
- PMHx: HTN, Type II DM, HLD, DVT in 2000 and was on warfarin for 2 years but discontinued

Pulmonary Embolism Response Team (PERT)



Our Approach to Developing a PERT

- Recognized there was variation in care for patients diagnosed with pulmonary embolism
- **UK HealthCare Optimal Care™ – Pulmonary Embolism Multidisciplinary Task Force** was created in April 2015.
- *GOAL: Improvement to streamline work flow for diagnosis, risk stratification, and treatment management was recognized as area for optimization for UK HealthCare patients with PE.*
- Reported to Hospital Administration, Optimal Care Steering Committee
- Pharmacist involvement from the start

UK HealthCare Optimal Care™ - Pulmonary Embolism Team Members

Multidisciplinary Expertise Represented	***Invited Members***
*Physician, Cardiovascular Medicine, Anticoagulation Consult Service	Susan Smyth, MD, PhD
*Pharmacist, Anticoagulation Program Coordinator	George Davis, PharmD, BCPS
*Physician, Vascular and Endovascular Surgery	Eleftherios Xenos, MD
Physician, Cardiovascular Medicine	Paul Anaya, MD
Physician, Hospital Medicine	Paula Bailey, MD
Physician, Hospital Medicine	Adam Gray, MD
Physician, UK Emergency Medicine	Sam Ghali, MD
Physician, Cardiovascular Medicine	Khaled Ziada, MD
Physician, CT Surgery	Hassan Reda, MD
Physician, Interventional Cardiology	John Gurley, MD
Physician, Cardiology	Martin Rains, MD
Physician, Cardiology	Bennett George, MD
Physician, Pulmonary Medicine	Roland Berger, MD
Nurse, Quality Assurance	Amanda Green, DNP, RN
^Pharmacist, Emergence Medicine	Abby Bailey, PharmD, BCPS
^Physician, Hematology and Blood & Marrow Transplantation	Amit Goldberg-Ray, MD

***Co-Leader; ^Newest members**

Our Approach to Developing a PERT

- Committee assessed diagnosis, risk stratification, and when to appropriately use advanced therapy available at our institution for Submassive or Massive PE

Advanced Therapy	Considerations
Systemic thrombolysis	• Massive or submassive PE • Screen for contraindications • Associated with up to 3% risk of intracranial hemorrhage
Catheter-directed thrombolytic therapy	• Massive or submassive PE • Screen for contraindications • *May* be associated with a lower risk of intracranial hemorrhage because of lower doses of fibrinolytic therapy are employed • *May* be combined with ECMO in patients who need mechanical support
Surgical or percutaneous embolectomy	• Massive and high-risk submassive PE • May be preferred if contraindications to thrombolytics exist • Centrally-located PE (accessible surgically) • Clot-in-transit (right heart thrombus) • Can combine with ECMO in patients who need mechanical support

UK HealthCare Optimal Care™ - Pulmonary Embolism

Acute PE

Patient in shock?

Systolic SBP < 90 and/or use of vasopressors, cardiac arrest, or bradycardia

NO

Enoxaparin
(1mg/kg SQ X 1) if no contraindication (Table 1)

YES

MASSIVE PE

Call UKMDs and Activate PERT

Heparin IV bolus
(80 units/kg to max. 8000 units) if no contraindication (Table 1)

CT with RV/LV ratio ≥1 OR troponin T >0.1

NO

YES

LOW RISK PE

ANTICOAGULATION ALONE

Assess for home management

Anticoagulation options
- apixaban
- rivaroxaban
- enoxaparin + warfarin
- UFH + warfarin

SUBMASSIVE PE

Call UKMDs and Activate PERT

PERT: Risk Assessment Across Continuum

LOWER RISK

RV dysfunction
OR
troponin T >0.1

Anticoagulation, if no contraindication, and close observation

HIGHER RISK

RV dysfunction
AND
troponin T >0.1
HR >110

Contraindication to thrombolytics ? (Table 2)

YES

Consider embolectomy (catheter or surgical)

NO

Catheter-directed thrombolysis

PERT: Is patient a candidate for ECMO?

NO

YES

Contraindication to thrombolytics ? (Table 2)

ECMO and definitive therapy

NO

YES

Systemic tPA (Table 3)

Simplified PESI risk factors :
- HR>110;
- O2 sat <90%
- SBP <100;
- age >80;
- cancer;
- chronic cardiopulmonary disease

UK HealthCare Optimal Care™ - Pulmonary Embolism

Table 1.
Absolute contraindications to enoxaparin or heparin bolus as initial therapy for confirmed PE.

- Already received therapeutic enoxaparin within last 8 hours (e.g., outside hospital)
- Known or suspected active major bleeding
- Thrombocytopenia with confirmed history of heparin induced thrombocytopenia (HIT)
- Hypersensitive to enoxaparin or heparin products
- Neuraxial anesthesia or undergoing spinal puncture

Table 3.
Dosing strategies for systemic thrombolysis therapy using tissue plasminogen activator (also known as tPA; alteplase or Activase®) for confirmed pulmonary embolism:

- Standard dosing (FDA approved): 100mg IV infusion over 2 hours
- Accelerated dosing (non-FDA approved): 0.6 mg/kg with maximum dose of 50mg IV infusion over 10 minutes; may consider additional 50mg IV infusion over 1 hour for total dose of 100mg over 2 hours.

Table 2.
Absolute contraindications to thrombolysis therapy for confirmed PE.

- Active internal bleeding
- Bleeding diathesis
- History of recent stroke (within three months)
- Presence of intracranial conditions that may increase the risk of bleeding (e.g. some neoplasms, arteriovenous malformations, or aneurysms)
- Recent intracranial or intraspinal surgery or serious head trauma (within 3 months)
- Suspected aortic dissection

Relative contraindications to thrombolysis therapy for confirmed PE.

- History of chronic, severe, poorly controlled hypertension
- Current severe uncontrolled hypertension (SBP >180 mmHg or DBP >110 mmHg)
- History of ischemic stroke more than three months prior
- Traumatic or prolonged (>10 minute) CPR or major surgery less than three weeks
- Recent internal bleeding (within two to four weeks)
- Noncompressible vascular punctures
- Pregnancy
- Active peptic ulcer
- Pericarditis or pericardial fluid
- Current use of anticoagulant (eg, warfarin sodium) that has produced an elevated international normalized ratio (INR) >1.7 or prothrombin time (PT) >15 seconds
- Age >75 years

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PERT Activation Team Members at UK HealthCare

- Group text page from central paging
  - Cardiology Fellow – ED/New Admissions
    - Triages patient and involves other members of PE Committee based on protocol
  - Cardiology Attending – ED/New Admissions
  - Cardiology Attending – PE Committee Co-Lead / Anticoagulation Consult Team
  - Pharmacist, Anticoagulation Consult Team
  - Pharmacist, Pharmacy Resident on Call (“PDOC”)
  - Cardiology Nurse Practitioner
- Quality Assurance nurse receives email at time of PERT activation

Pharmacist Resources for PERT Involvement – Our Model

- Anticoagulation Program Coordinator – dedicated FTE
  - Leads protocol development for anticoagulation
  - Formulary management
  - Quality assurance
  - PERT member
- ED Pharmacist presence 16 hours per weekday and 12 hours on weekends
- Pharmacy resident on-call (“PDOC”) – 24/7/365 in house on-call program where pharmacist responds to emergency situations
  - PERT added to PDOC responsibilities starting November 2016

Pharmacist Role in PERT

- Work with multidisciplinary team to assist with risk stratification, treatment options, and optimizing pharmacologic management/advanced therapy
  - Anticoagulation protocols
  - Thrombolysis
    - Systemic
    - Catheter directed
  - Transition of Care planning for anticoagulation

Pharmacist Role in PERT

- Review EMR and any additional OSH records as needed to identify any potential issues in regard to use of anticoagulation or thrombolysis
  - If patient is potential candidate for systemic or catheter directed thrombolysis, are there any absolute or relative contraindications to thrombolysis with PERT members
  - Optimize anticoagulation choice (e.g., LMWH and UFH), facilitate appropriate dosing and monitoring per anticoagulation protocols.
  - Help facilitate timely order verification, delivery, and administration of anticoagulants and thrombolytic as warranted
  - Help facilitate appropriate oral anticoagulation plan for transition of care

Pharmacist Role in PERT

- Documentation
  - Documentation of assessment and recommendations (similar model at our institution: Stroke Alert)
  - Developed note template for pharmacists
  - Provide handoff to pharmacist on primary team (standard handoff process)

PERT Activations to Date

- N = 50 since initiation (November 2015 – October 2016)
  - Increasing with awareness - average 4-6 per month in last 6 months
  - Potential to continue to expand with average submassive (~10/mo) and massive (n=1-2/mo) PE patients at our institution

PERT Case Review

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PERT Case Review – Pharmacist Role

- PE Risk Stratification – High Risk Submassive PE
  - Initially assessed as candidate for catheter directed thrombolysis
  - Contraindications to thrombolysis included recent surgery and thrombocytopenia
  - Assessment for heparin induced thrombocytopenia
    - Alternative to unfractionated heparin pending HIT Antibody
    - HIT antibody and serotonin release assay were both positive confirming HIT diagnosis
  - Optimization of anticoagulation plan based on recurrent VTE, acute provoked submassive PE, and diagnosis of HIT

Becoming involved in PERT Consortium

- Approached hospital administration about applying for institution membership to National PERT Consortium
  - Participating in PERT Registry
  - Increasing local, regional awareness of VTE and PE
  - Resources
- PERT Consortium meeting beneficial to pharmacist education and involvement

National PERT Consortium – Membership Institution Benefits

- Recognition as member of the National PERT Consortium on website and other relevant publications and announcements
- Access to data
  - Participation in National PERT Consortium database and registry
- Access to protocols and algorithms
- Educational materials and programming
- Hospital recognition for achievement of benchmarked standards (to be determined)
- Competitive advantage to local and regional marketplace
  - Permission for institutional members to publicize their participation in the National PERT Consortium
- Advocacy
  - From endorsing societies (e.g. ACC, AHA, SVM, SCAI, SIR, etc.)
  - At local and national government agencies

Pharmacist Role in PERT: KEY Take Away Points

- HOPEFULLY WAVE OF THE FUTURE
  - Infrastructure which immediately and simultaneously engages multiple experts to determine best course of action for PE patients.
  - Each consultant contributes relevant and vital information about each patient's clinical situation and perils.
  - Multidisciplinary including a role for pharmacy
    - PERT members, outside hospital, other specialists
    - Patient and family members
  - Importance of follow up
- PERT National Consortium: education, clinical, research, communication – increasing pharmacist involvement and excellent professional opportunity for pharmacy profession

Thank you

- Questions?