Interhospital Vascular Conference

Emergency in Vascular Surgery

Management in Acute Pulmonary Embolism

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28th November 2020

Disclosure

- Speaker name: **Nutsiri Kittitirapong**
- I have the following potential conflicts of interest to report:
- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)
- ✓ I do not have any potential conflict of interest

Outline

How important?

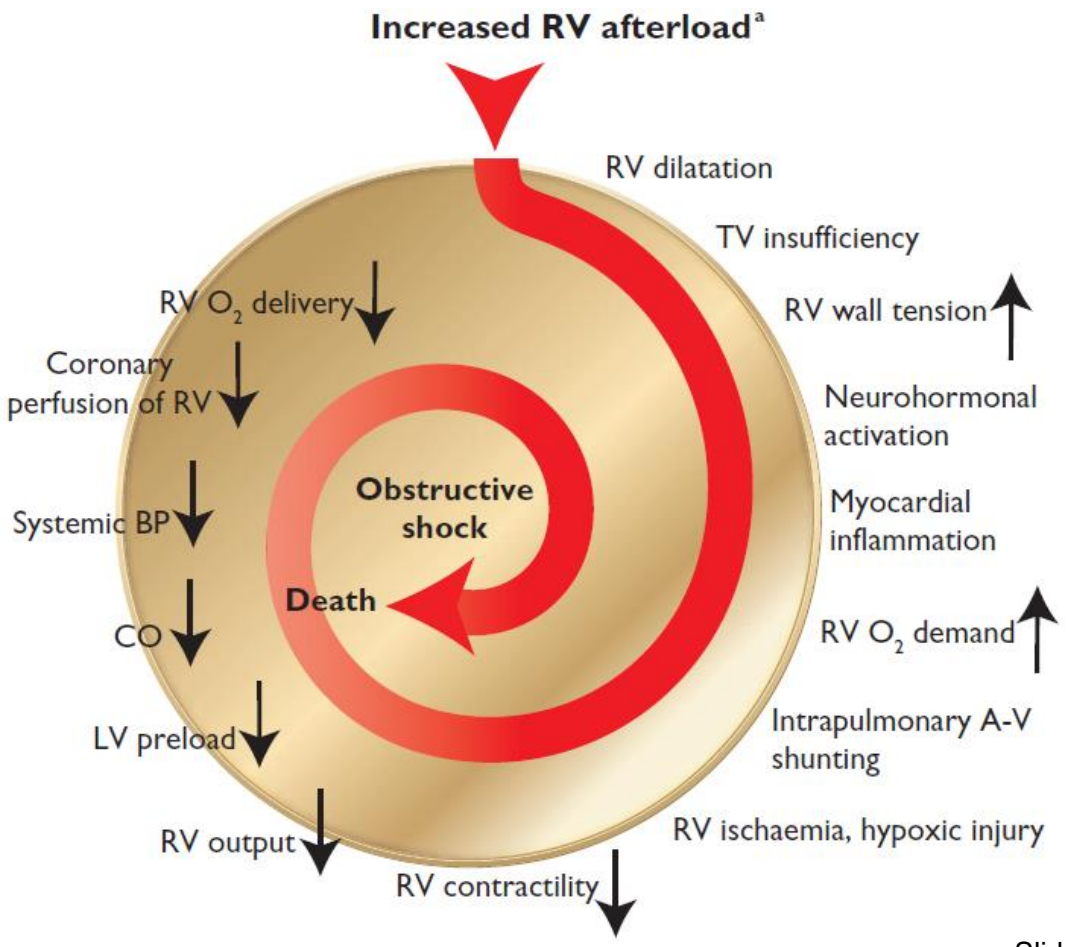
ESC guideline

Treatment modality

1. How important?

Pathophysiology

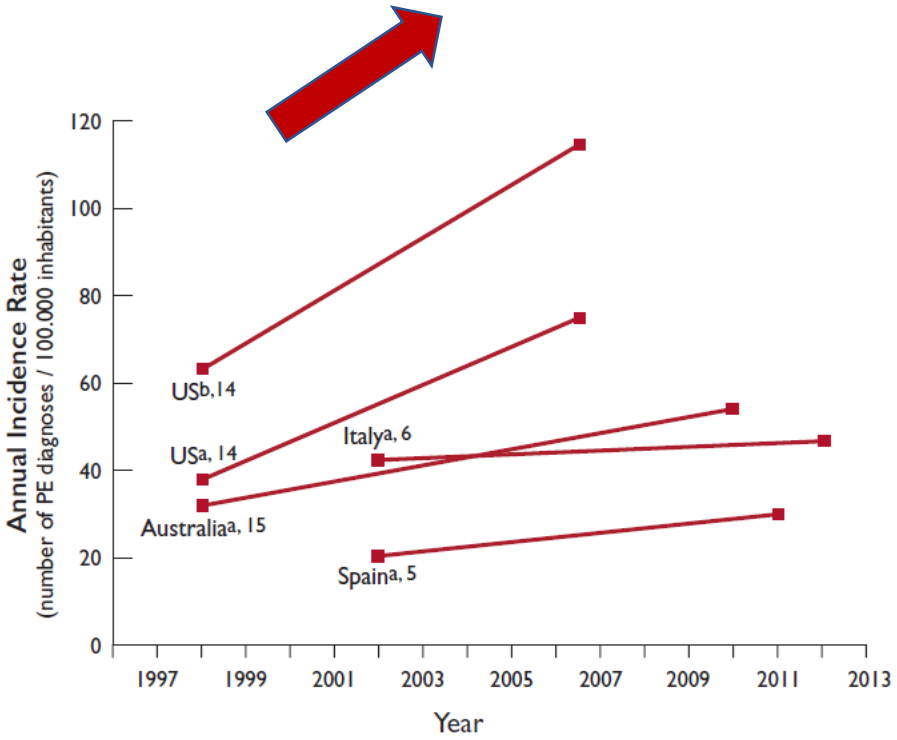
- Acute PE interferes with both **circulation** and **gas exchange**
- It is the **third most common cause of death** in hospitalized patients

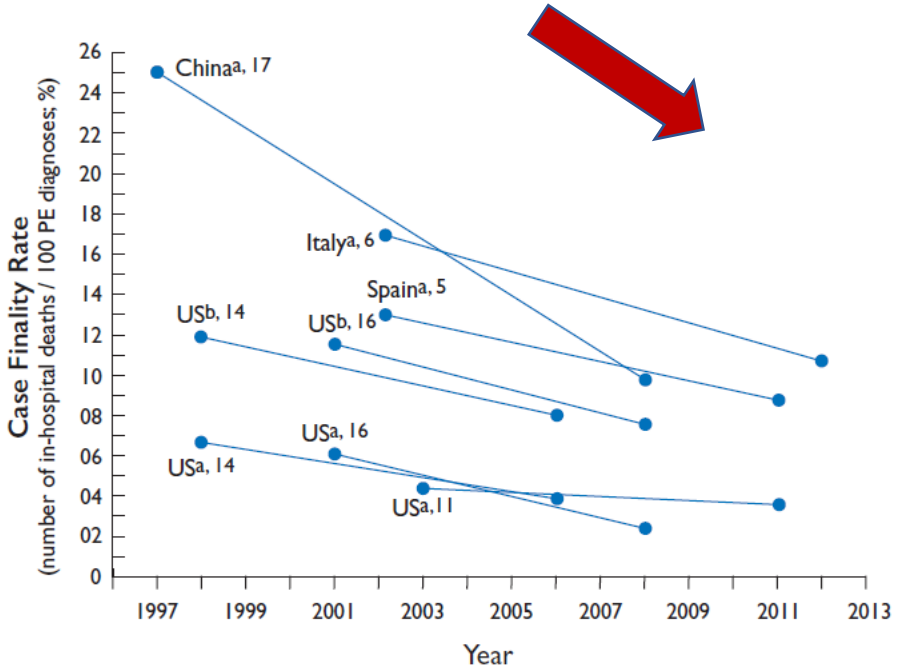


ESC guideline 2019. European Heart Journal (2020) 41, 543–603

Venous thromboembolism (VTE) is globally the third most frequent acute cardiovascular syndrome behind myocardial infarction and stroke

Increasing trends in annual incidence rates and decreasing in fatality rates of pulmonary embolism around the world





Raskob GE. Arterioscler Thromb Vasc Biol 2014;34:2363237l.
ESC guideline 2019. European Heart Journal (2020) 41, 543–603

Who need intervention for acute PE ?

2. ESC Guideline

ESC European Society of Cardiology
European Heart Journal (2020) **41**, 543–603
doi:10.1093/eurheartj/ehz405

ESC GUIDELINES

2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS)

The Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC)

ESC guideline 2019. European Heart Journal (2020) 41, 543-603

Prognostic assessment strategy

Table 8 **Classification of pulmonary embolism severity and the risk of early (in-hospital or 30 day) death**

Early mortality risk		Indicators of risk			
		Haemodynamic instability[a]	Clinical parameters of PE severity and/or comorbidity: PESI class III–V or sPESI ≥1	RV dysfunction on TTE or CTPA[b]	Elevated cardiac troponin levels[c]
High		+	(+)[d]	+	(+)
Intermediate	Intermediate–high	-	+[e]	+	+
	Intermediate–low	-	+[e]	One (or none) positive	
Low		-	-	-	Assesment optional; if assessed, negative

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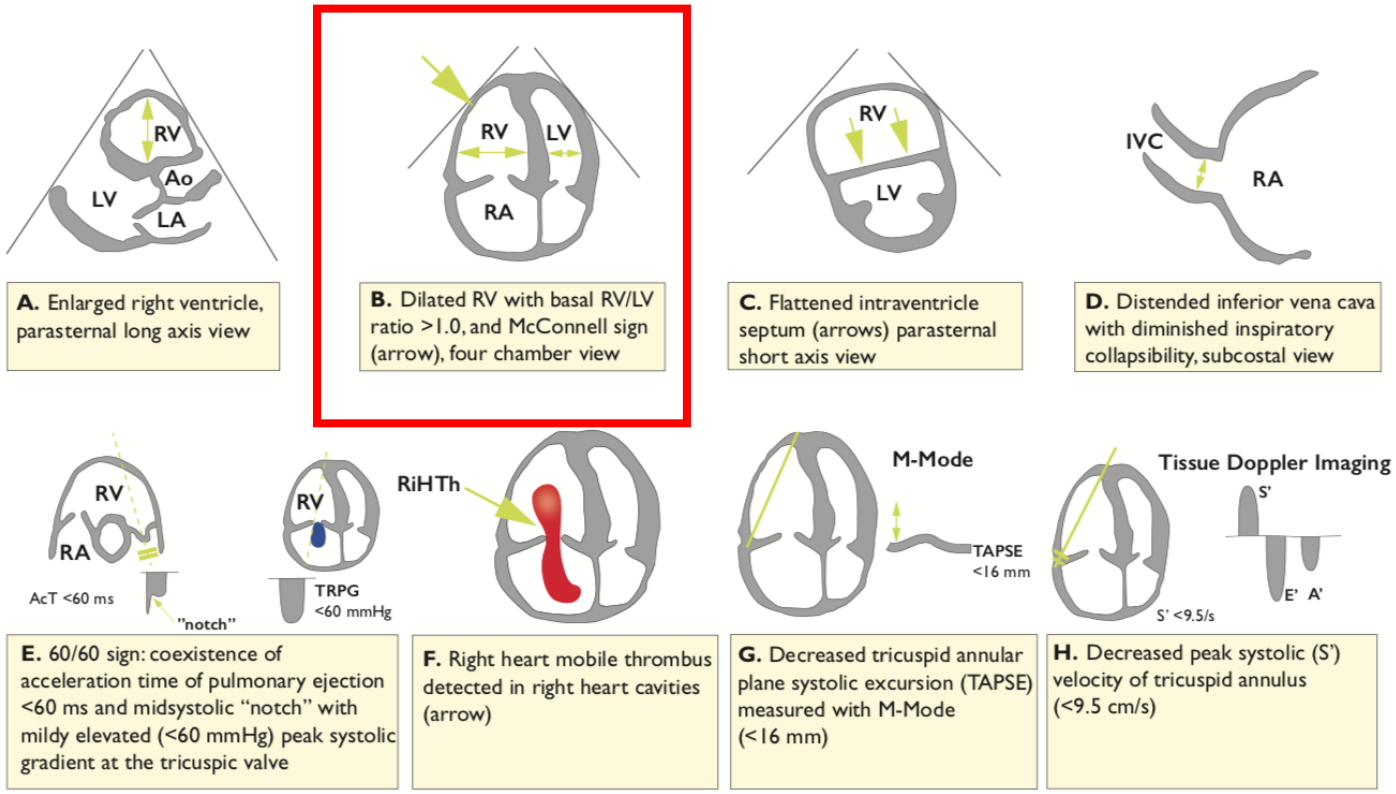
RV dysfunction on TTE or CTPA

Elevated cardiac troponin levels



A. Enlarged right ventricle, parasternal long axis view

B. Dilated RV with basal RV/LV ratio >1.0, and McConnell sign (arrow), four chamber view

C. Flattened intraventricle septum (arrows) parasternal short axis view

D. Distended inferior vena cava with diminished inspiratory collapsibility, subcostal view

E. 60/60 sign: coexistence of acceleration time of pulmonary ejection <60 ms and midsystolic "notch" with mildy elevated (<60 mmHg) peak systolic gradient at the tricuspic valve

F. Right heart mobile thrombus detected in right heart cavities (arrow)

G. Decreased tricuspid annular plane systolic excursion (TAPSE) measured with M-Mode (<16 mm)

H. Decreased peak systolic (S') velocity of tricuspid annulus (<9.5 cm/s)

- Elevation of further laboratory biomarkers
  - NT-proBNP $\geq$ 600 ng/L
  - H-FABP $\geq$ 6 ng/mL
  - copeptin $\geq$ 24 pmol/L

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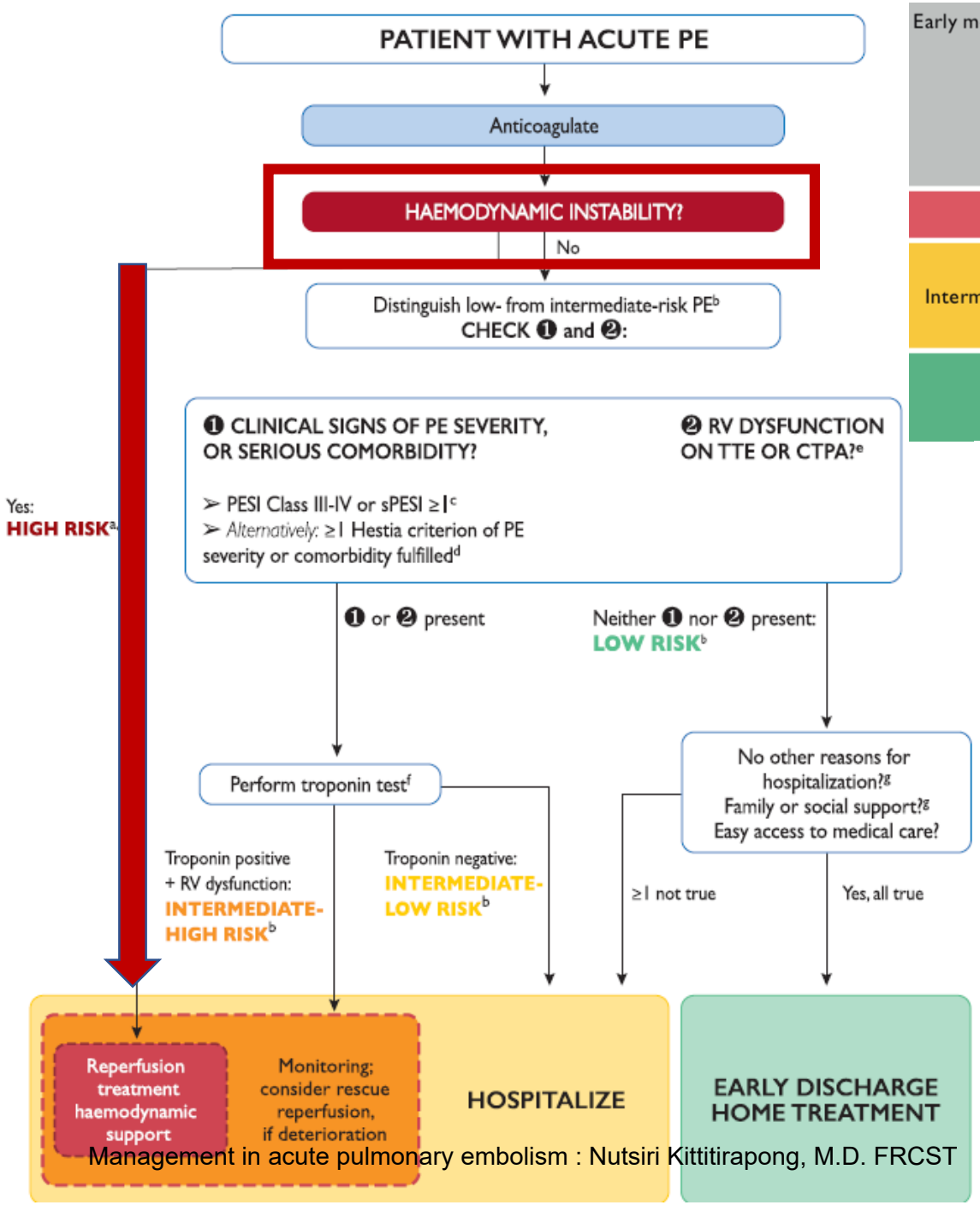

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Table 7 **Original and simplified Pulmonary Embolism Severity Index**

Parameter	Original version[226]	Simplified version[229]
Age	Age in years	1 point (if age >80 years)
Male sex	+10 points	–
Cancer	+30 points	1 point
Chronic heart failure	+10 points	1 point
Chronic pulmonary disease	+10 points	
Pulse rate ≥110 b.p.m.	+20 points	1 point
Systolic BP <100 mmHg	+30 points	1 point
Respiratory rate >30 breaths per min	+20 points	–
Temperature <36°C	+20 points	–
Altered mental status	+60 points	–
Arterial oxyhaemoglobin saturation <90%	+20 points	1 point

Parameter	Original version[226]	Simplified version[229]
Risk strata[a]		
	Class I: ≤65 points very low 30 day mortality risk (0–1.6%) **Class II: 66–85 points** low mortality risk (1.7–3.5%)	**0 points** = 30 day mortality risk 1.0% (95% CI 0.0–2.1%)
	Class III: 86–105 points moderate mortality risk (3.2–7.1%) **Class IV: 106–125 points** high mortality risk (4.0–11.4%) **Class V: >125 points** very high mortality risk (10.0–24.5%)	**≥1 point(s)** = 30 day mortality risk 10.9% (95% CI 8.5–13.2%)

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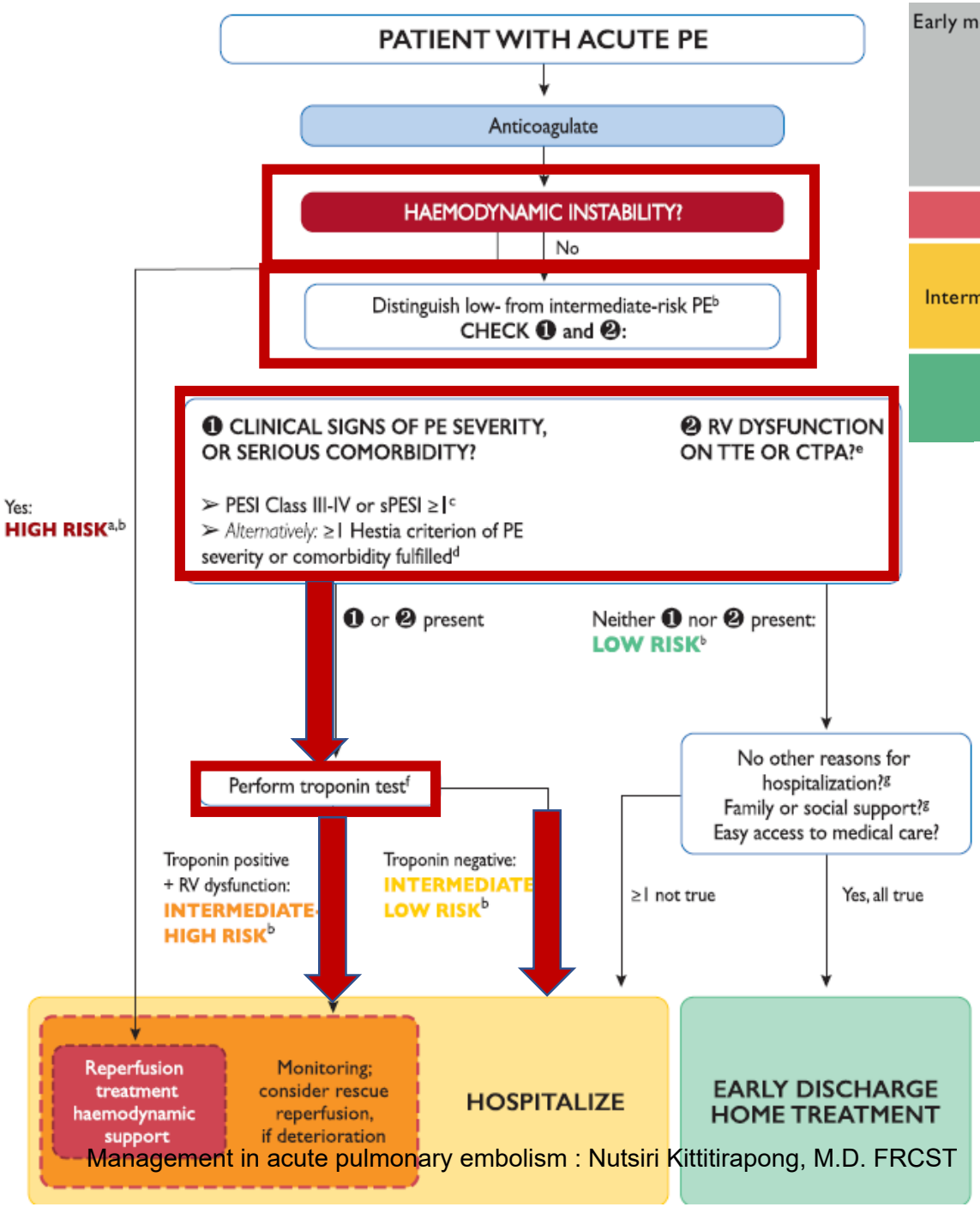

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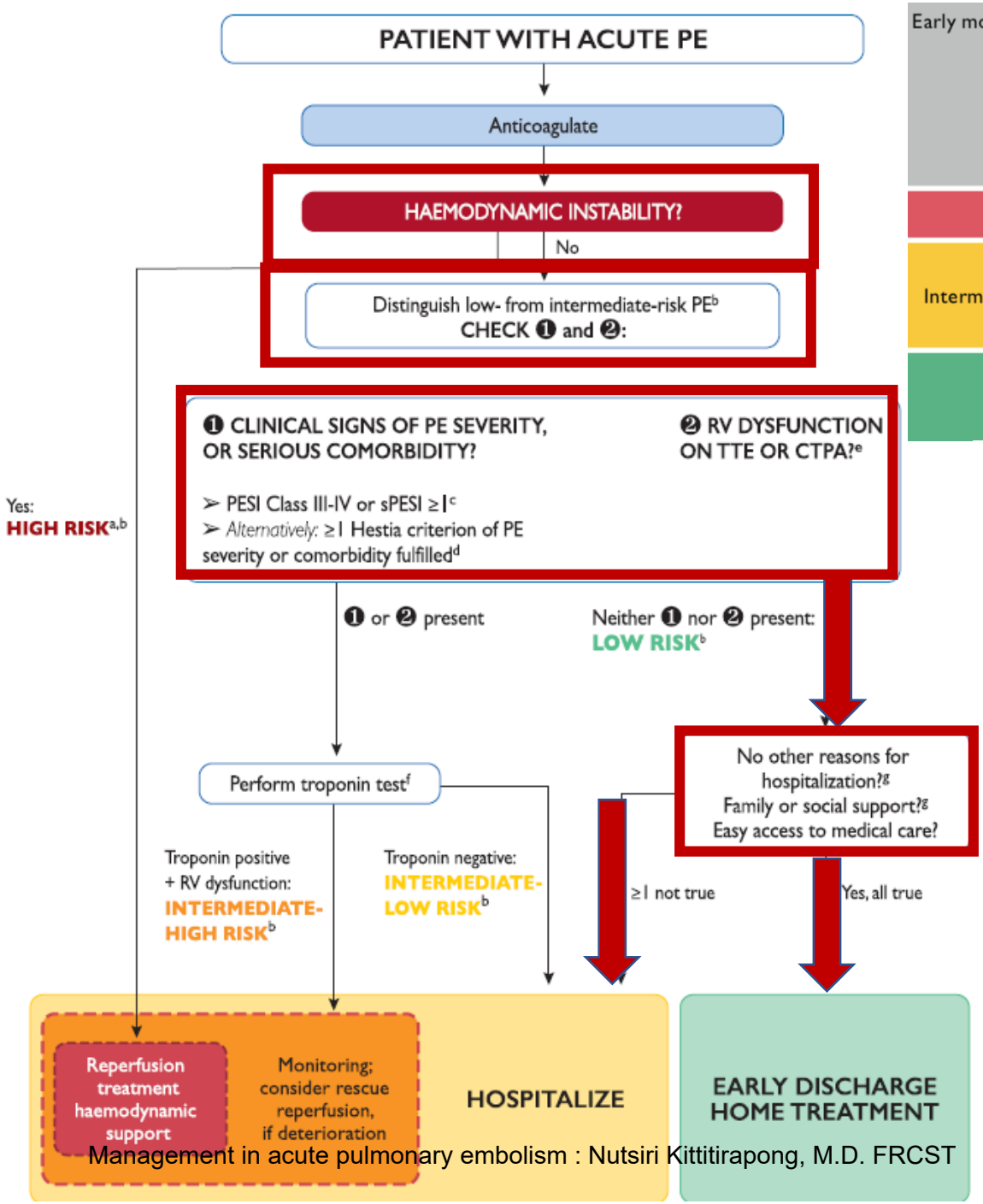

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6.6 Recommendations for acute-phase treatment of high-risk pulmonary embolism[a]

Recommendations	Class[b]	Level[c]
Systemic thrombolytic therapy is recommended for high-risk PE.[282]	I	B
Surgical pulmonary embolectomy is recommended for patients with high-risk PE, in whom thrombolysis is contraindicated or has failed.[d] [281]	I	C
Percutaneous catheter-directed treatment should be considered for patients with high-risk PE, in whom thrombolysis is contraindicated or has failed.[d]	IIa	C

6.7 Recommendations for acute-phase treatment of intermediate- or low-risk pulmonary embolism

Recommendations	Class[a]	Level[b]
Reperfusion treatment		
Rescue thrombolytic therapy is recommended for patients with haemodynamic deterioration on anticoagulation treatment.[282]	I	B
As an alternative to rescue thrombolytic therapy, surgical embolectomy[e] or percutaneous catheter-directed treatment[e] should be considered for patients with haemodynamic deterioration on anticoagulation treatment.	IIa	C
Routine use of primary systemic thrombolysis is not recommended in patients with intermediate- or low-risk PE.[c,f] [179]	III	B

Indication for catheter based treatment for High risk PE

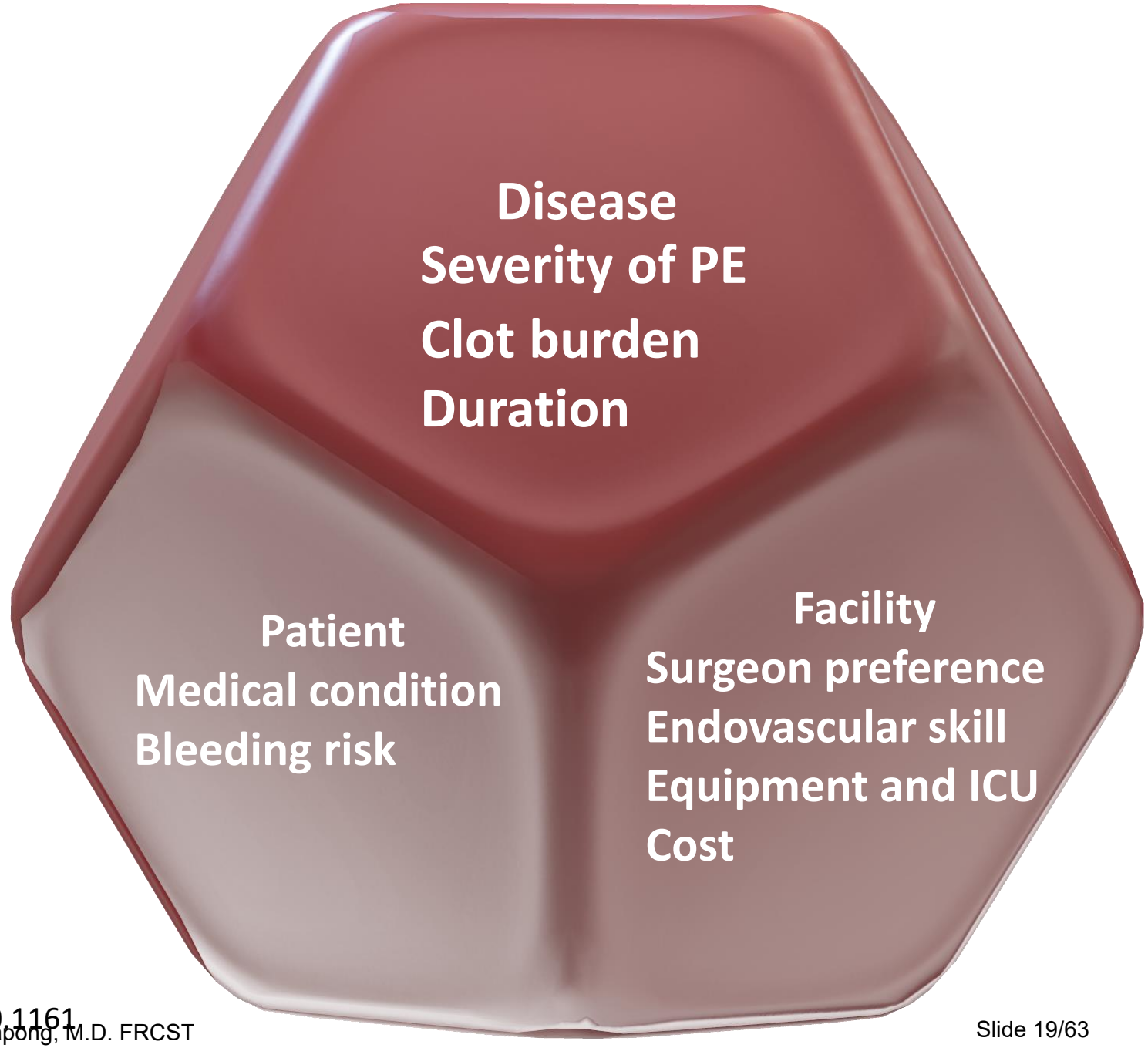
- **Contraindication/failed for systemic thrombolysis**

Indication for catheter based treatment for Low or intermediate risk PE

- **Hemodynamic deterioration**
- **intermediate high risk PE**

3. Treatment nodality

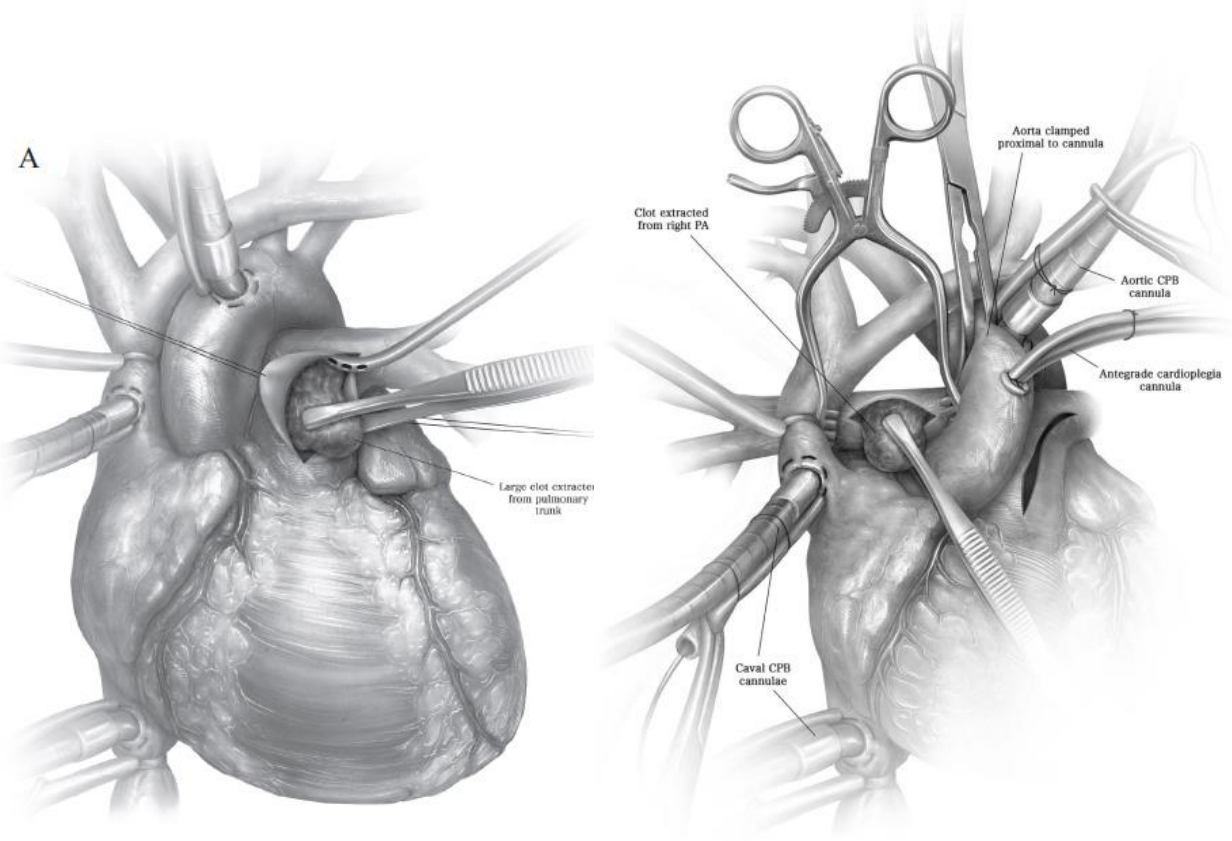
Factors Determine Treatment Options



Giri J. Circulation. 2019;140:e774–e801. DOI: 10.1161

Surgical thrombectomy

- Surgical embolectomy
  - Cardiopulmonary bypass
  - Without aortic cross-clamping
  - Cardioplegic cardiac arrest
  - Incision of the two main pulmonary arteries with the removal or suction of fresh clots.



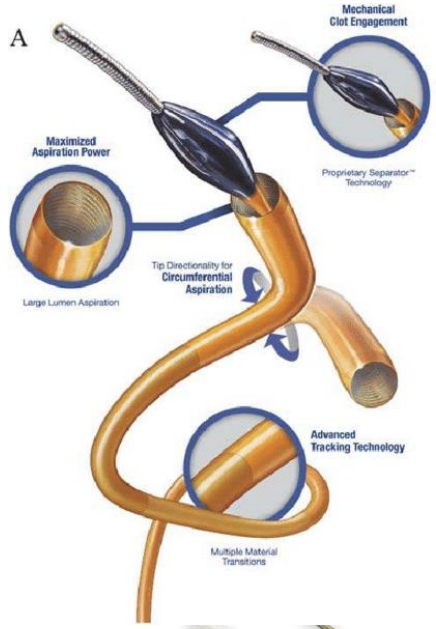
Lee T. J Thorac Cardiovasc Surg 2018;155:1084109.e12.

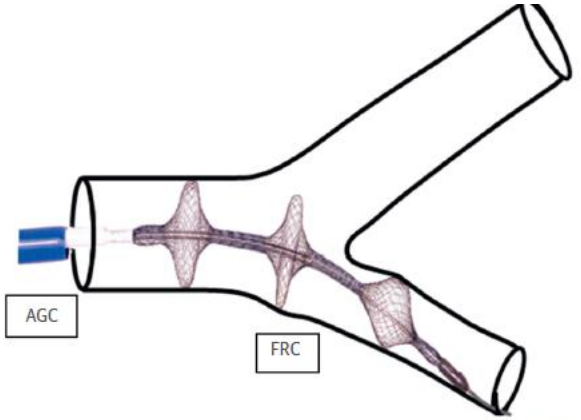
Surgical thrombectomy

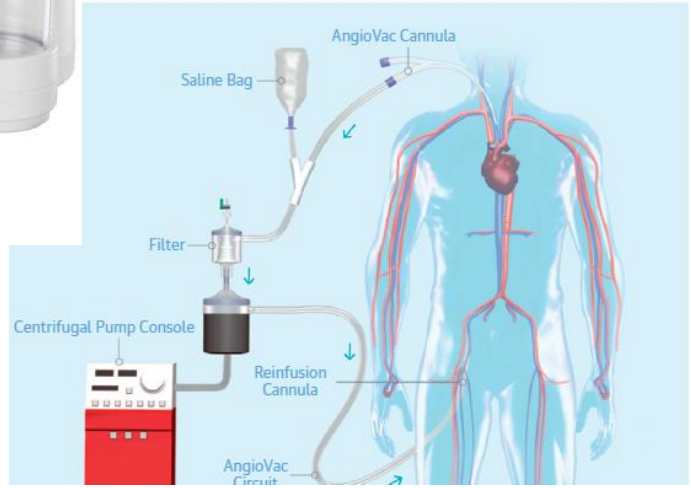
- Thrombolysis (n = 1854) or surgical embolectomy (n = 257)
  - No difference in
    - 5 year actuarial survival
    - 30 day mortality (15% and 13%)
  - Thrombolysis
    - higher risk of stroke and reintervention at 30 days
    - higher rate of recurrent PE requiring readmission compared with surgery (7.9 vs. 2.8)
  - Not randomly allocated in this observational retrospective study, and the patients referred for surgery may have been selected.

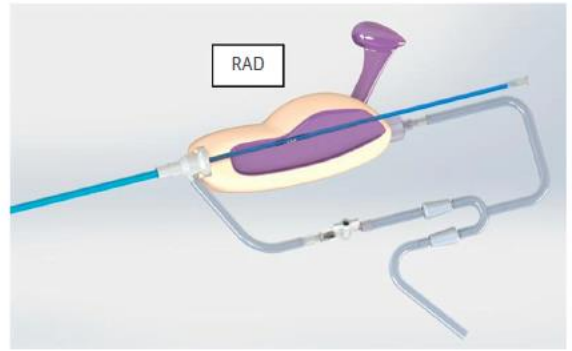
 Lee T. J Thorac Cardiovasc Surg 2018;155:1084109.e12.

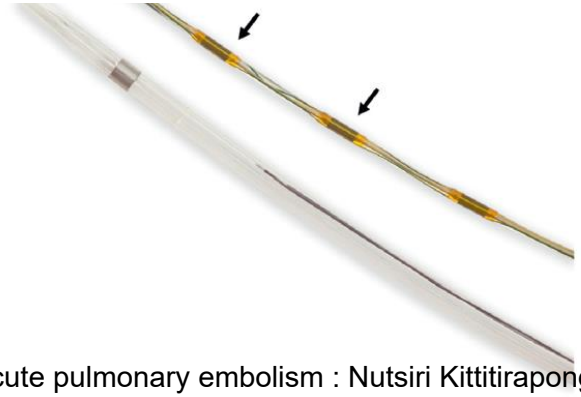
Technique for Percutaneous catheter-directed treatment











“รู้เขารู้เรา รบร้อยครั้งไม่แพ้ร้อยครั้ง
รู้เราไม่รู้เขา ชนะหนึ่งแพ้หนึ่ง
แต่ถ้าไม่รู้เขาไม่รู้เรา จะแพ้ทุกการรบ”

Known your patients

- Severity of PE
- Hemodynamic status
- Clot burden and duration
- Presence of DVT
- Cause of VTE
- C/I to thrombolysis
- C/I to anticoagulant
- C/I to PA catheterization

Known yourself

- Available facilities
- Available and suitable device including limitation
- Surgeon experience
- Team experience
  - PERT: pulmonary embolism response team
- Available ECMO
- ICU
- Cost

Absolute contraindications to pulmonary artery (PA) catheterization	• Tricuspid or pulmonary valve prosthesis or vegetation, • Recent myocardial infraction • Left bundle branch block
Relative contraindications	• Contrast allergy • History of ventricular irritability

Xi Xue. Tech Vasc Interventional Rad 21:78-84 C 2018

Characteristics of interventional pulmonary embolism devices

Device	Mechanism	Technical Considerations	Regulatory Status in United States
EKOSonic	USAT	5F catheter	510(k) Clearance for infusion for treatment of PE
Unifuse	CDL	4F–5F catheter	510(k) Clearance for treatment of peripheral vasculature
Cragg-McNamara	CDL	4F–5F catheter	510(k) Clearance for treatment of peripheral vasculature
Bashir Endovascular Catheter	Pharmacomechanical CDL	7F catheter with a nitinol-supported infusion basket that is expanded within the thrombus	510(k) Clearance for use in peripheral vasculature
AngioVac	Veno-veno bypass; funnel-shaped inflow tip to engage thrombi	26F access for inflow, 16F–20F access for outflow; requires perfusion team	510(k) Clearance for removal of undesirable intravascular material
FlowTreiver	Mechanical clot engagement with aspiration with adjunctive nitinol disks engage and mechanically retrieve clot	20F catheter; must manage blood loss associated with large-bore aspiration	510(k) Clearance for treatment of PE
Indigo System	Mechanical clot engagement with mechanized aspiration	8F catheter; large size of some proximal PE renders en bloc aspiration difficult with 8F device	510(k) Clearance for peripheral artery and venous systems
AngioJet	Rheolytic thrombectomy with option of thrombolytic vs saline spray	6F–8F catheters for venous thrombus; can cause hypotension and bradycardia	510(k) Clearance for peripheral thrombectomy; black-box warning against use in PAs
Aspire Max	Suction thrombectomy with specially designed handheld aspirator	5F–6F catheters	510(k) Clearance for removal of fresh, soft thrombi, and emboli from the peripheral and coronary vasculature

+ PE

CDL indicates catheter-directed thrombolysis; PA, pulmonary artery; PE, pulmonary embolism; and USAT, ultrasound-assisted thrombolysis.

Catheter-based thrombolysis

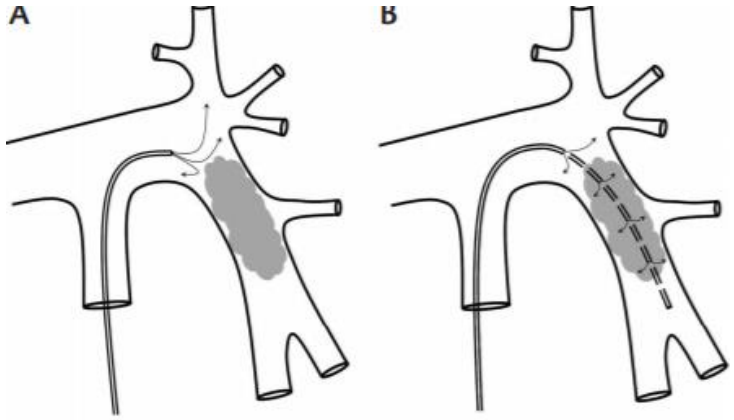
Catheter-based thrombolysis

Catheter-directed thrombolysis (CDL/CDT)	Infusion catheter
Uni-Fuse (AngioDynamics Inc, Latham, NY) catheters	
Cragg-McNamara (ev3 Inc, Plymouth, MN) catheters	
Ultrasound-assisted thrombolysis (USAT) with the EKOSonic endovascular system (EKOS Corp, Bothell, WA)	

Giri J. Circulation. 2019;140:e774–e801. DOI: 10.1161

Catheter-directed thrombolysis (CDL/CDT)

- The goals
  - Decrease the rate of major and intracranial bleeding



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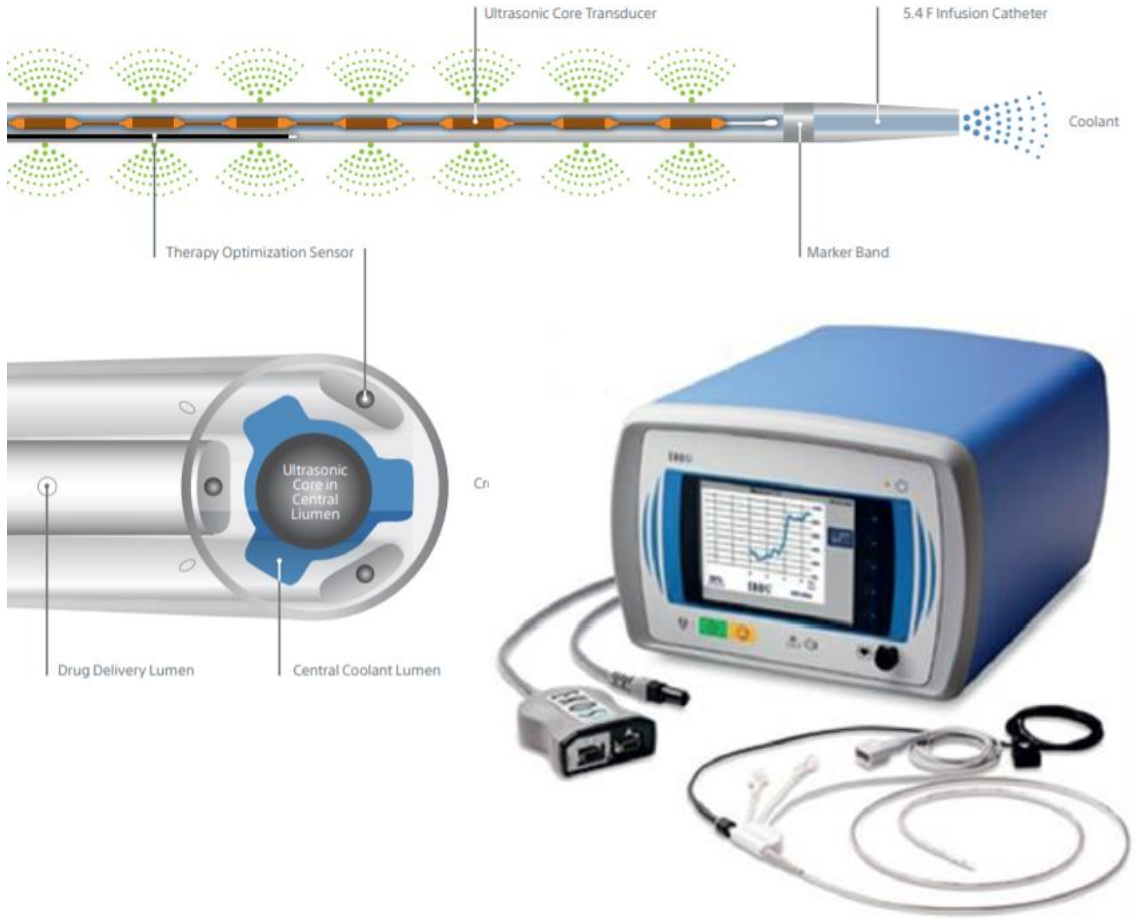
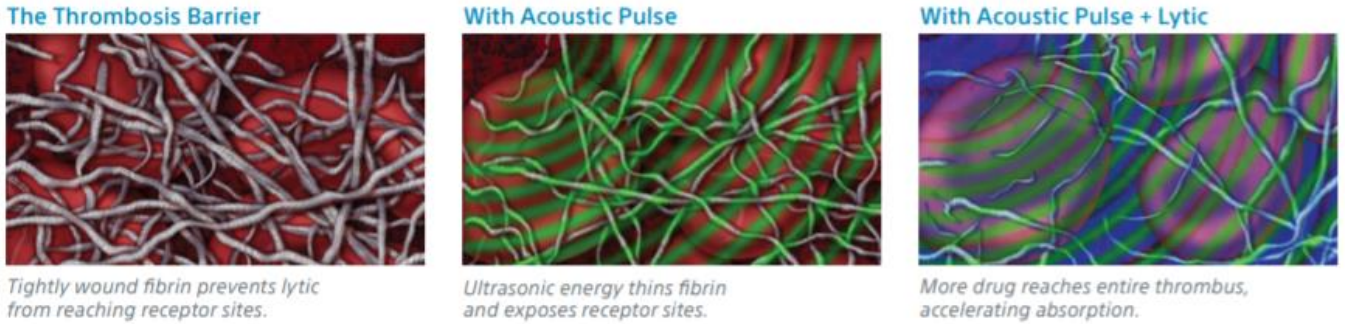
EKOS : EKOSonic endovascular system (EKOS Corp, Bothell, WA)

The EkoSonic™ Endovascular System includes an ultrasonic core within an infusion catheter, and control unit.



The EKOS System's targeted ultrasound waves accelerate thrombus dissolution by unwinding the fibrin matrix.[1]



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Catheter-based thrombolysis

CONCLUSION

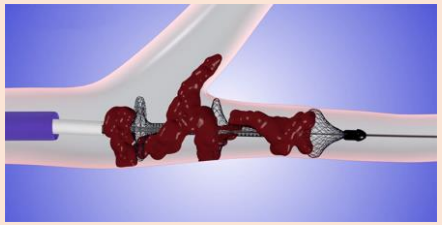
- Hemodynamically unstable PE (high-risk acute PE)
- Intermediate-high risk PE/ Hemodynamic deterioration

- Decrease bleeding risk compared to systemic thrombolysis

But still remain increased bleeding risk

Catheter-based embolectomy

Catheter-based embolectomy

Catheter-Based Thrombus Maceration	Catheter & guidewire	
Rheolytic Thrombectomy	AngioJet catheter (Boston Scientific, Marlborough, MA)	
Large-Bore Embolectomy	The Flow-Triever system (Inari Medical, Irvine, CA	
Small-Bore Embolectomy	The Indigo Thrombectomy System (Penumbra, Inc, Alameda, CA)	

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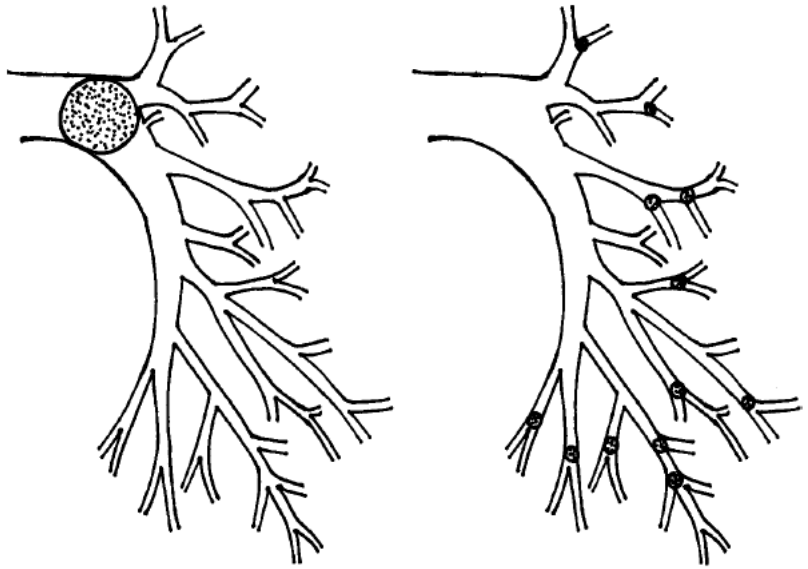
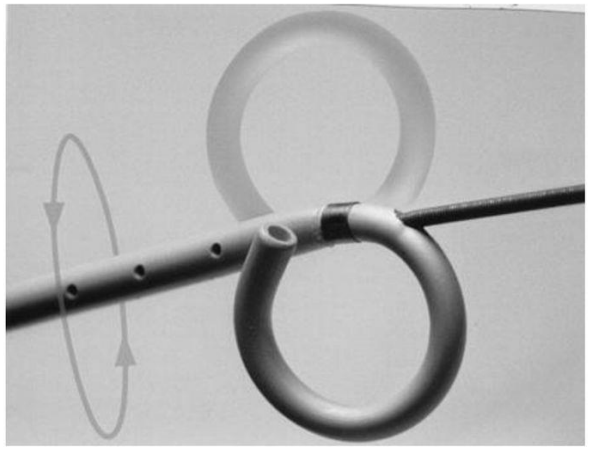
Catheter-Based Thrombus Maceration



Effect of mechanical fragmentation of a
total occlusive central thrombus in the pulmonary artery

- Reduce pulmonary artery pressure
- Increase total pulmonary perfusion

The fragmentation approach: Pigtail Rotational Catheter



case reports and series

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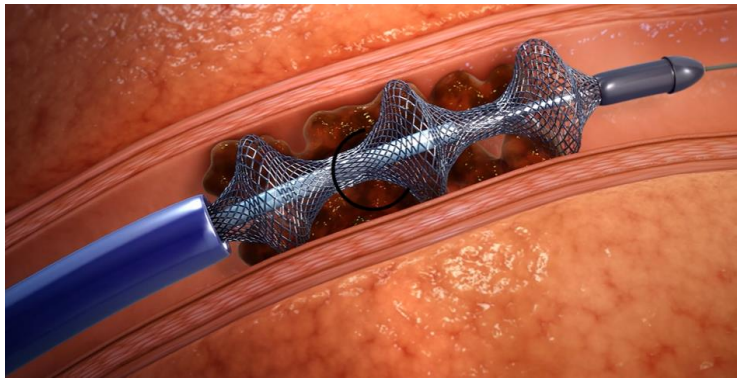
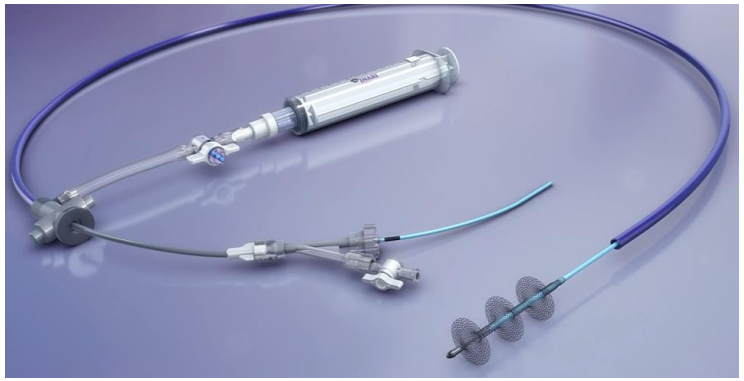
Large-Bore Embolectomy
The Flow-Triever system (Inari Medical, Irvine, CA)

20 F device with three self-expanding nitinol discs entrapping the thrombus with simultaneous aspiration





The FlowTriever is an over-the-wire system designed to:

- Capture and Remove large clot burden from big vessels
- Eliminate the need for thrombolytics
- Remove clot through both mechanical and aspiration mechanisms of action
- Treat in a single session
- Eliminate ICU Stay

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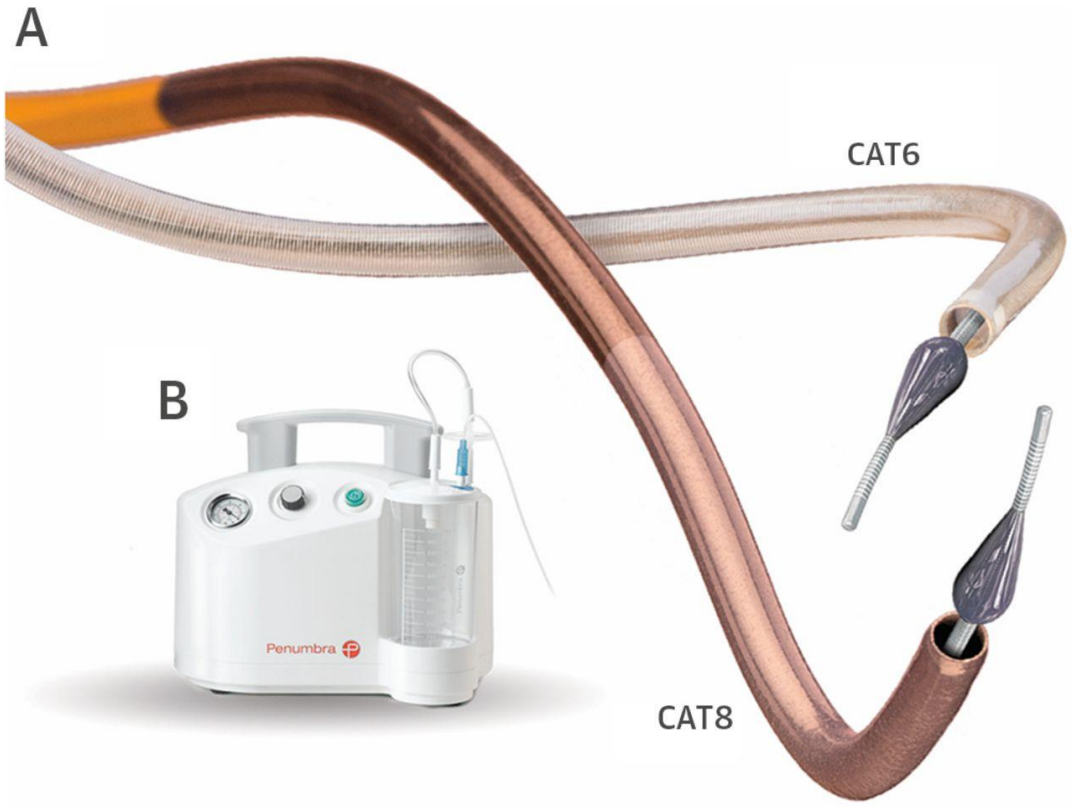
Small-Bore Embolectomy

The Indigo Thrombectomy System (Penumbra, Inc, Alameda, CA)



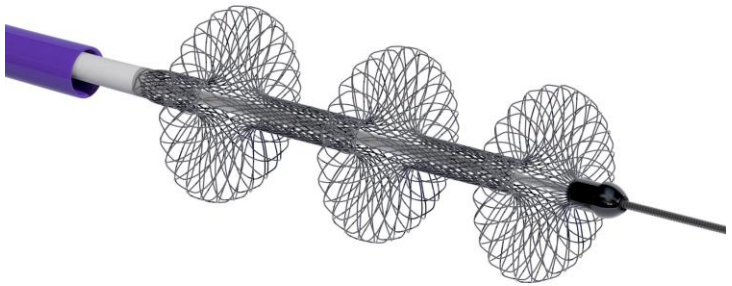
8 F vacuum assisted aspiration with mechanical clot engagement

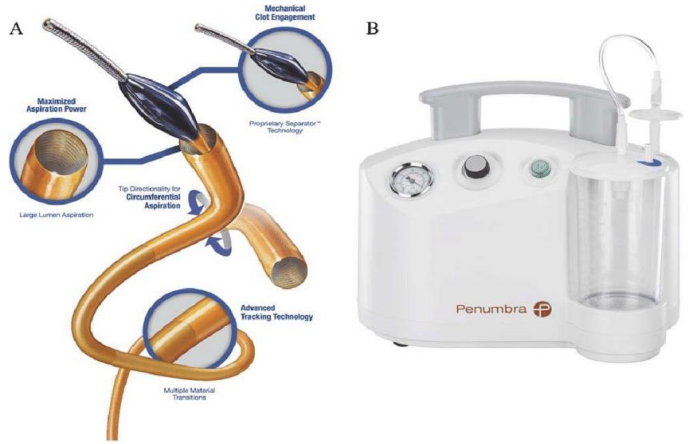
Management in acute pulmonary embolism : Nutsiri Kittitirapong, M.D. FRCST

Giri J. Circulation. 2019;140:e774–e801. DOI: 10.1161

The devices have been cleared by FDA for use in acute PE

- The EKOSonic endovascular system (SEATTLE II, 2014)
- The FlowTriever embolectomy device (FLARE, 2018)
- The Indigo Thrombectomy System (EXTRACT-PE, 2020)





Giri J. Circulation. 2019;140:e774–e801. DOI: 10.1161

Comparison trials

	Extract PE (N 119), 2019	SEATTLE II[1] (N 150), 2015	FLARE[2] (N 106), 2019	PEITHO[3] Tenecteplase arm (N 506), 2014
Device, study design	Penumbra (single arm)	EKOS (single arm)	Flow Triever (single arm)	Systemic thrombolysis VS Anticoagulant (RCT)
PE risk	Intermediate risk	Intermediate+ high risk	Intermediate risk	Intermediate risk
Primary efficacy (Change in RV/LV ratio at 48 hr)	0.43; p<0.0001	0.42; p<0.0001	0.38; p<0.0001	N/A
Primary safety	Major Adverse Events within 48 hrs 1.7%	Major bleeding within 72 hrs 10%	Major Adverse Events within 48 hrs 3.8%	Death or hemodynamic decompensation within 7 d 2.6%
Major bleeding	Within 48 hrs, 1.7%	Within 72 hrs, 10%	Within 48 hrs, 1.0%	Within 7 d, 11.5%
All cause mortality (30 d)	2.5%	2.7%	1.0%	2.4%
Device time	37 min	12-24 hrs	57 min	NA

1. Piazza et al. JACC Cardiovasc Interv,2015. 8(10): 1382-922;2
2. Tu et al. JACC Cardiovasc Interv, 2019 May 13;12(9):859-869
3. Meyer et al. N Engl J med. 2014 Apr 10:370(15):1402-11

Adapted from AKHILESH SISTA PRESENTED ON NOVEMBER 6, 2019 AT VIVA 2019

Conclusion

Understanding of pathophysiology of PE is the key to success.

Catheter-based intervention should be considered in pts with high risk or intermediate-high risk PE who are at risk for thrombolysis.

Determining the factors for the optimal treatment; patient, disease and utility, is important.

Patient Profile

73 year-old Thai female

Chief complaint : เวียนศีรษะ 2 วัน

History

- Chief complaint : เวียนศีรษะ 2 วัน
- Present illness:
  - 2 วัน เวียนศีรษะ คลื่นไส้อาเจียน
  - MRI brain: Heterogenous enhancing mass at cerebellar hemisphere associated with leptomeningeal enhancement
- Status เดิม: ช่วยเหลือตัวเองได้ เดินได้

History

- U/D:
  - Asthma, DM c DR, HT, DLP
  - HFpEF last echo : LVEF> 60%, mild concentric LVH
  - RLL AVM S/p lobectomy yr 46
  - Staghorn calculi S/p Rt nephrectomy yr 47
  - Granulomatosis with polyaniitis (GPA : sinusitis, asthma,antiPR3+)

Physical examination

- V/S : T 36 P 90/min RR 18/min BP 170/75 mmHg
- GA: Good consciousness, not pale, no jaundice, no dyspnea
- CVS : Normal S1, S2, no murmur
- RS: lung clear
- Abd: Soft, not tender

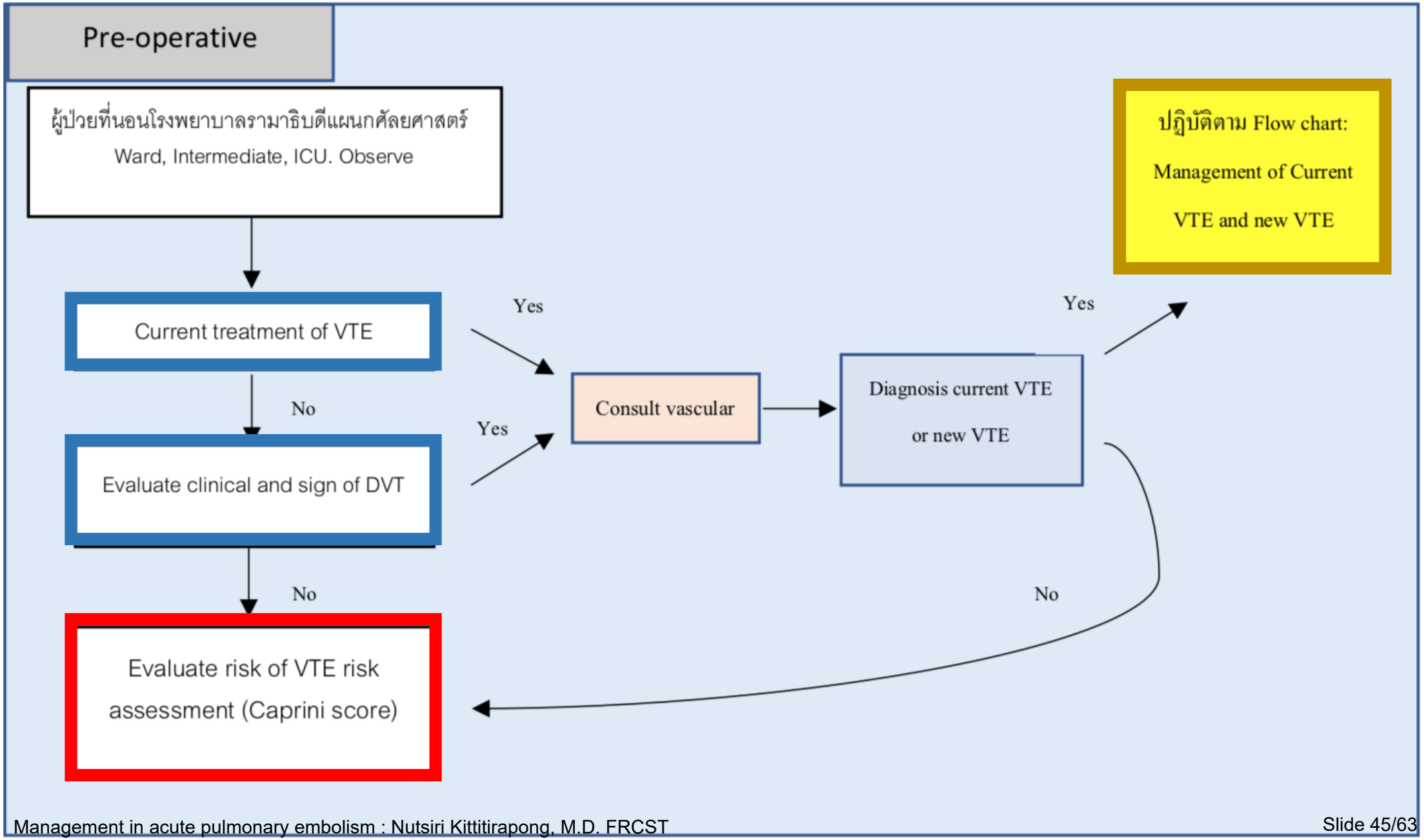
Physical examination

- Neurological examination:
  - E4V5M6, pupil 3mm RTL Rt/ Lt fixed with irregular shape (S/p cataract Sx), No nystagmus
  - Motor power: grade V all
  - CN V: normal facial sensation
  - CN VII: No facial palsy
  - CN IX: No uvular deviation, tongue in midline
  - Reflex 2+, BBK plantar response
  - **Cerebellar : Impaired FTNT and dysdiadochokinesia Lt , truncal ataxia with wide-base gait**

Problem list

- Cerebellar mass
  - R/o metastasis , unknown primary or primary brain tumor
  - **Plan: Rectosigmoid craniotomy with tumor removal**

- Risk for VTE : identified high risk patient


Pre-operative
ผู้ป่วยที่นอนโรงพยาบาลรามาธิบดีแผนกศัลยศาสตร์
Ward, Intermediate, ICU. Observe
ปฏิบัติตาม Flow chart:
Management of Current
VTE and new VTE
Current treatment of VTE
Yes
No
Evaluate clinical and sign of DVT
Yes
Consult vascular
Diagnosis current VTE
or new VTE
Yes
No
No
Evaluate risk of VTE risk
assessment (Caprini score)

RAMATHIBODI HOSPITAL

Department	Division	Ward
Attending Staff	Resident	

ชื่อ .....

H.N. .....

อายุ ..... ปี แผ่นที่ .....

VTE risk assessment in Department of Surgery Ramathibodi Hospital

Caprini VTE Risk Assessment

Diagnosis _____วันที่ประเมิน_____เวลา_____

Current VTE ☐ มี ส่ง consult หน่วย Vascular ☐ ไม่มี ทำการประเมินต่อด้านล่าง

Add 1 point for each of the following statements that apply now or within the past month:

- ☐ Age 41– 60 years
- ☐ Minor surgery (less than 45 minutes) is planned
- ☐ Past major surgery (more than 45 minutes) within the last month
- ☐ Visible varicose veins
- ☐ A history of Inflammatory Bowel Disease (IBD) (for example, Crohn's disease or ulcerative colitis)
- ☐ Swollen legs (current)
- ☐ Overweight or obese (Body Mass Index above 25)
- ☐ Heart attack
- ☐ Congestive heart failure
- ☐ Serious infection (for example, pneumonia)
- ☐ Lung disease (for example, emphysema or COPD)
- ☐ On bed rest or restricted mobility, including a removable leg brace for less than 72 hours
- ☐ Current use of birth control or Hormone Replacement Therapy (HRT)
- ☐ Pregnant or had a baby within the last month
- ☐ History of unexplained stillborn infant, recurrent spontaneous abortion (more than 3), premature birth with toxemia or growth restricted infant.

Add 2 points for each of the following statements that apply:

- ☐ Age 61–74 years
- ☐ Current or past malignancies (excluding skin cancer, but not melanoma)
- ☐ Planned major surgery lasting longer than 45 minutes (including laparoscopic and arthroscopic)
- ☐ Non-removable plaster cast or mold that has kept you from moving your leg within the last month
- ☐ Tube in blood vessel in neck or chest that delivers blood or medicine directly to heart within the last month (also called central venous access, PICC line, or port)
- ☐ Confined to a bed for 72 hours or more

Add 3 points for each of the following statements that apply:

- ☐ Age 75 or over
- ☐ History of blood clots, either Deep Vein Thrombosis (DVT) or Pulmonary Embolism (PE)
- ☐ Family history of blood clots (thrombosis)
- ☐ Personal or family history of positive blood test indicating an increased risk of blood clotting

Add 5 points for each of the following statements that apply now or within the past month:

- ☐ Elective hip or knee joint replacement surgery
- ☐ Broken hip, pelvis or leg
- ☐ Serious trauma (for example, multiple broken bones due to a fall or car accident)
- ☐ Spinal cord injury resulting in paralysis
- ☐ Experienced a stroke

Patient score	Total Risk Factor score	Risk of VTE	Risk level	Prophylaxis regimen			Duration
				Pharmaco prophylaxis • Enoxaparin 40mg SC daily (CrCl ≥ 30mL/min) • Heparin 5000 units SC TID (CrCl < 30mL/min)	Mechanical prophylaxis (IPC > GCS)	Early ambulation	
	0	< 0.5 %	VERY LOW			+	Hospitalization
	1-2	1.5 %	LOW		+	+	Hospitalization
	3-4	3 %	MODERATE	+	+ / -	+	Hospitalization
	≥ 5	6 %	HIGH or Previous VTE	+	+	+	1-10 d (non cancer) 28 days (cancer)

Please circle on the prophylaxis regimen that you choose

☐ มีข้อห้ามในการให้ Pharmaco prophylaxis

☐ มีข้อห้ามในการให้ Mechanical prophylaxis

☐ VTE prophylaxis regimen ☐ Early ambulation ☐ IPC ☐ GCS ☐ Pharmaco (โปรดระบุในคำสั่งการรักษา)

☐ VTE accepted Date _____ (Fellow รับ consult ระบุ)

Signature _____ CODE _____

Add 1 point for each of the following statements that apply now or within the past month:

- ☐ Age 41– 60 years
- ☐ Minor surgery (less than 45 minutes) is planned
- ☐ Past major surgery (more than 45 minutes) within the last month
- ☐ Visible varicose veins
- ☐ A history of Inflammatory Bowel Disease (IBD) (for example, Crohn's disease or ulcerative colitis)
- ☐ Swollen legs (current)
- ☐ Overweight or obese (Body Mass Index above 25)
- ☐ Heart attack
- ☐ Congestive heart failure
- ☐ Serious infection (for example, pneumonia)
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- ☐ Spinal cord injury resulting in paralysis

Caprini score

6

Patient score	Total Risk Factor score	Risk of VTE	Risk level	Prophylaxis regimen			Duration
				Pharmaco prophylaxis • Enoxaparin 40mg SC daily (CrCl ≥ 30mL/min) • Heparin 5000 units SC TID (CrCl < 30mL/min)	Mechanical prophylaxis (IPC > GCS)	Early ambulation	
	0	< 0.5 %	VERY LOW			+	Hospitalization
	1-2	1.5 %	LOW		+	+	Hospitalization
	3-4	3 %	MODERATE	+	+ / -	+	Hospitalization
6	≥ 5	6 %	HIGH or Previous VTE	+	+	+	1-10 d (non cancer) 28 days (cancer)

Please circle on the prophylaxis regimen that you choose

☐ มีข้อห้ามในการให้ Pharmaco prophylaxis

☐ มีข้อห้ามในการให้ Mechanical prophylaxis

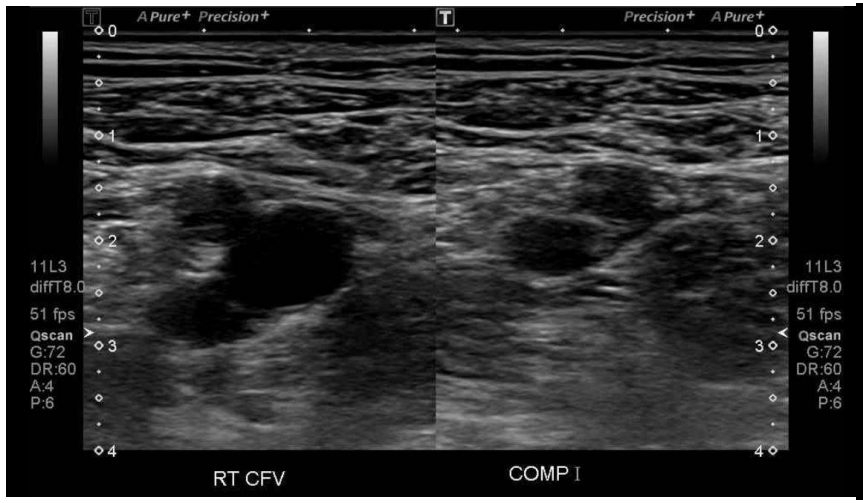
☐ VTE prophylaxis regimen ☐ Early ambulation ☑ IPC ☐ GCS ☐ Pharmaco (โปรดระบุในคำสั่งการรักษา)

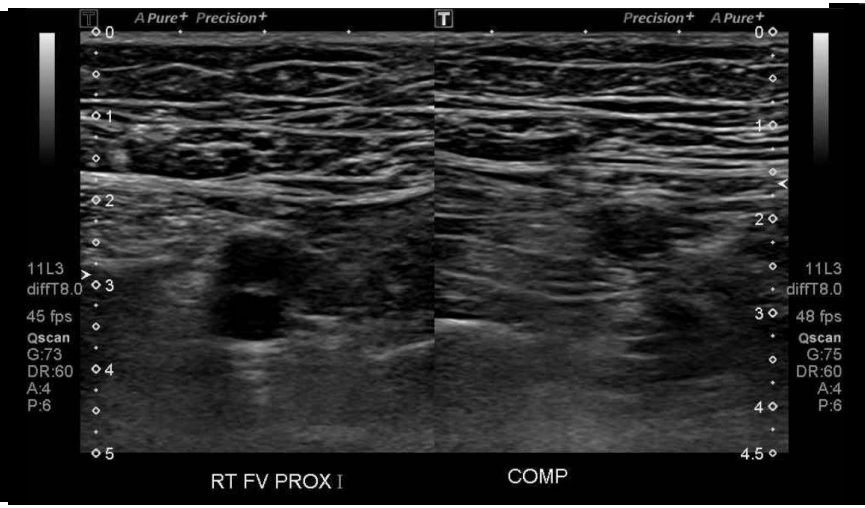
☐ VTE occurred Date _____ [Fellow รับ consult ระบุ]

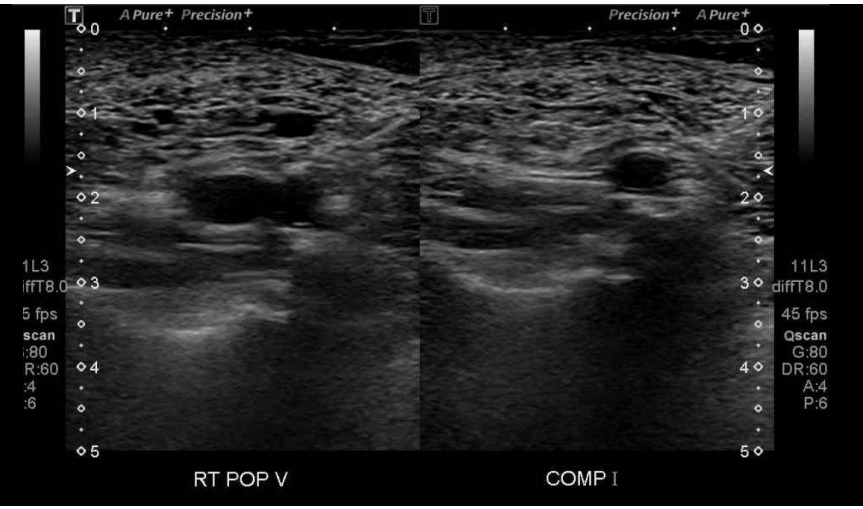
Signature _____ CODE _____

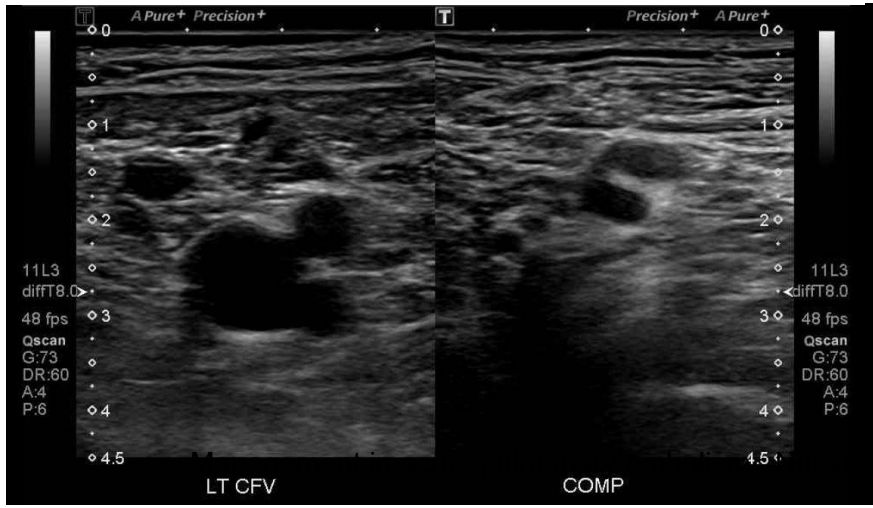
DUS (30/12/62):

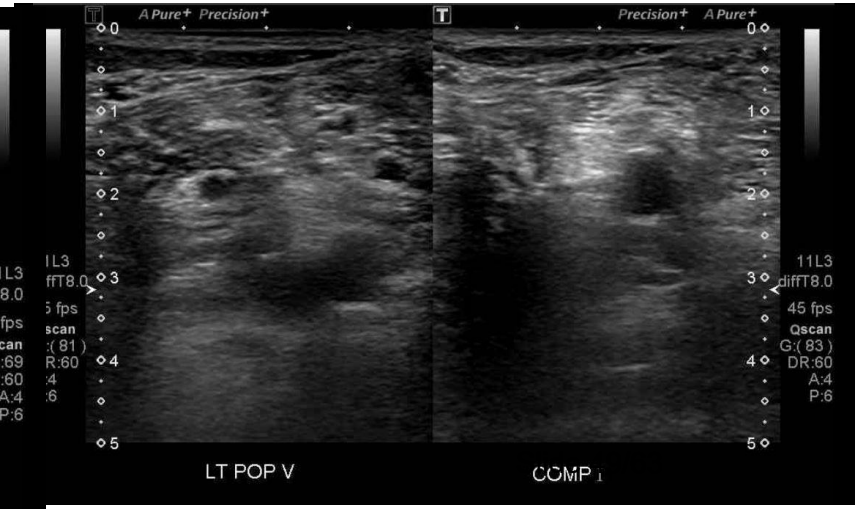
No evidence of deep vein thrombosis











Operation : Craniotomy with tumor removal

2/1/63

Cerebellar mass

Rectosigmoid craniotomy with tumor removal

Admit 26/12/62

DUS 30/12/62

OR 2/1/63

PO D 2 4/1/63

O2 sat drop หลังกลับจากห้องน้ำ

เดิม on O2 canula 3 LPM --> O2 sat 97-98%

หลังกลับจากห้องน้ำ O2 sat 80% → Mask c bag 10 LPM → **O2 sat 90% HR 114/min BP 120/80** → On ET tube

Prophylaxis VTE : IPC intraoperatively and postop

No pharmacological prophylaxis

- CTA PE protocol
- DUS both legs
- Echocardiogram
- Cardiac enz

Acute pulmonary embolism at LPA and RPA with pulmonary artery hypertension and RV strain (RV:LV= 1.82)

DUS both legs (4/1/63)

- No evidence of DVT

Echocardiogram (4/1/63)

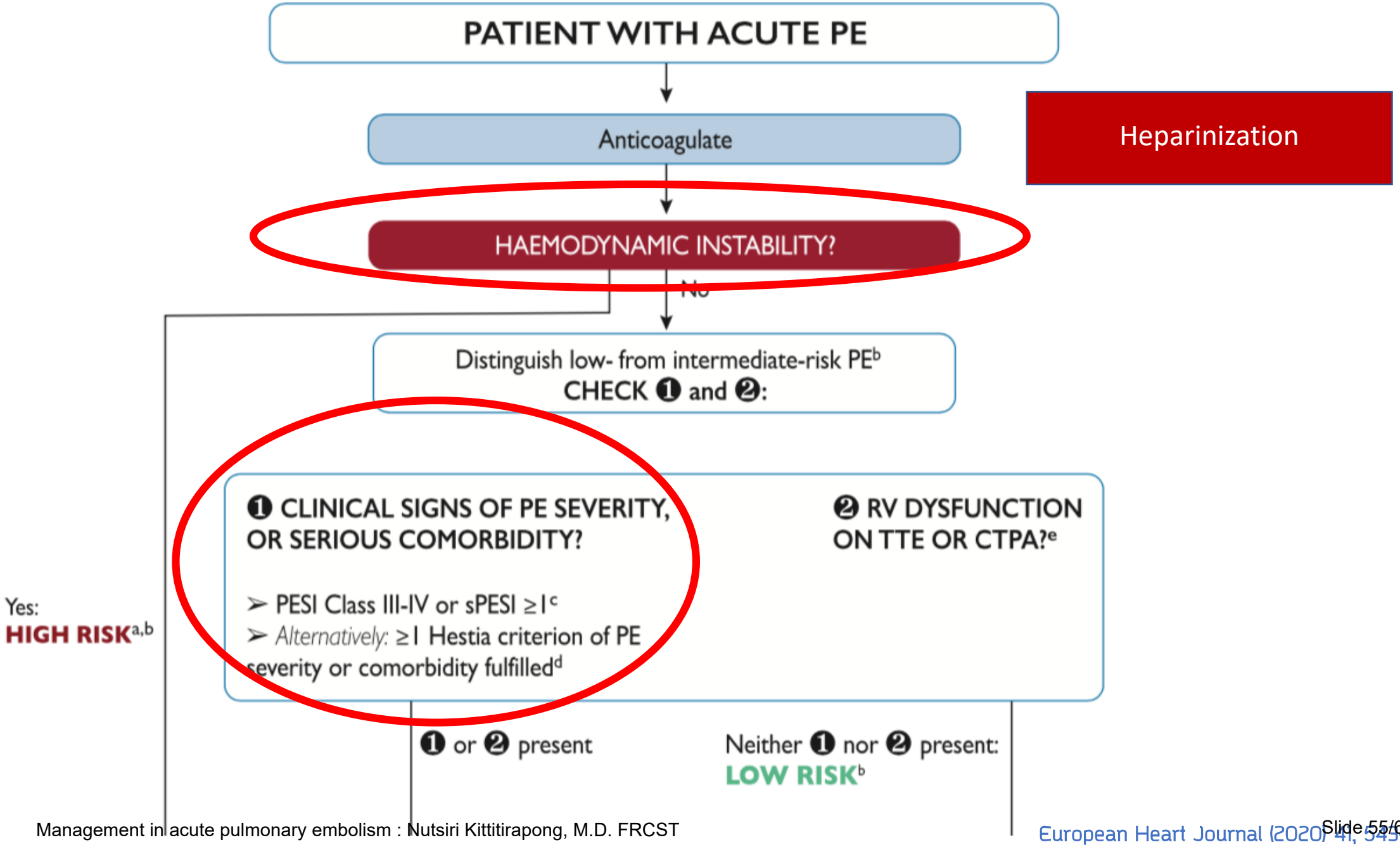
- Dilate RV with impaired RV free wall contraction, Mc cornell's sign positive

Cardiac enzyme (4/1/63)

- Trop T +, Pro BNP +

What is your management?

Acute submassive PE, high risk



Heparinization

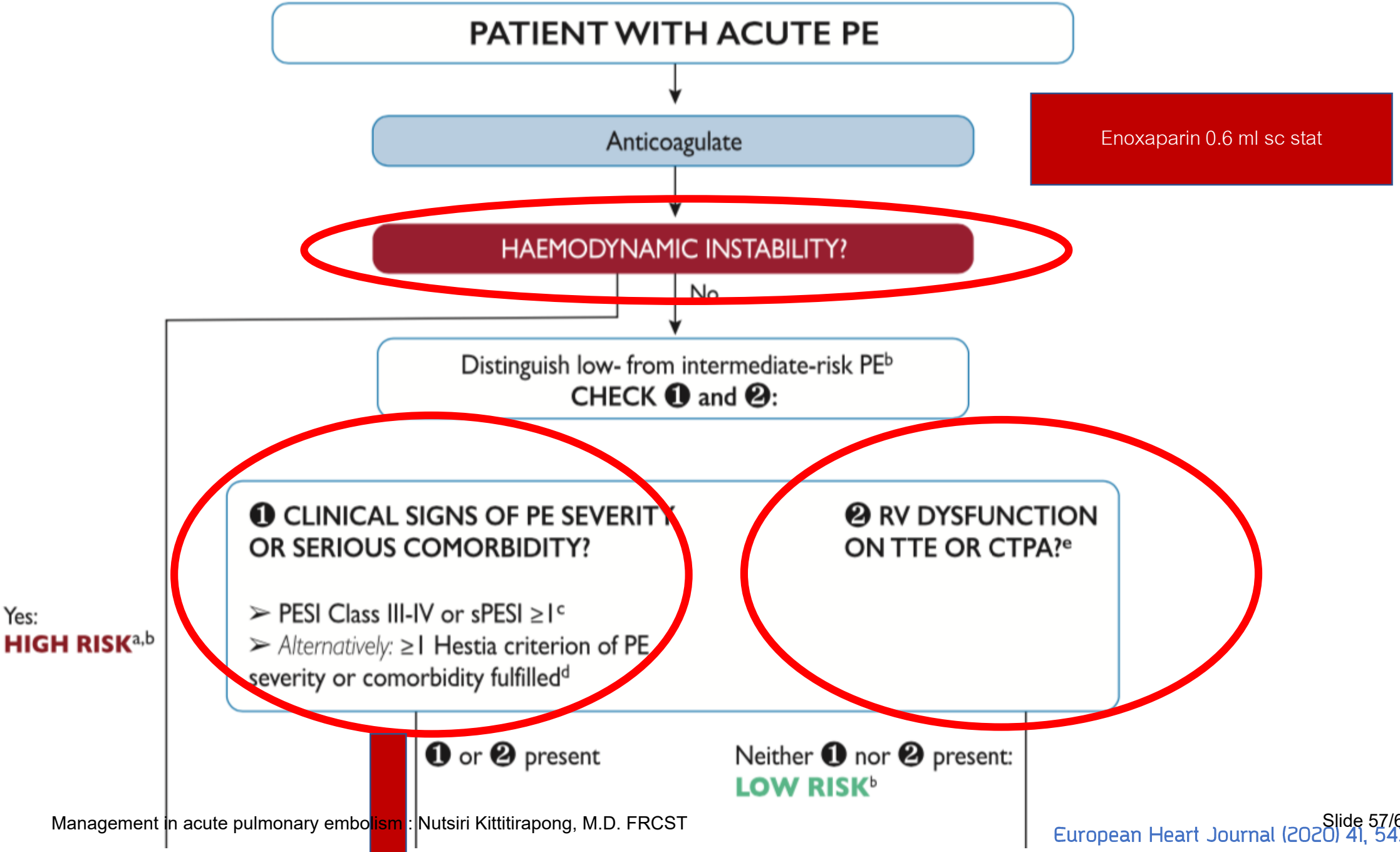
European Heart Journal (2020) 41, 543–603

Table 7 Original and simplified Pulmonary Embolism Severity Index

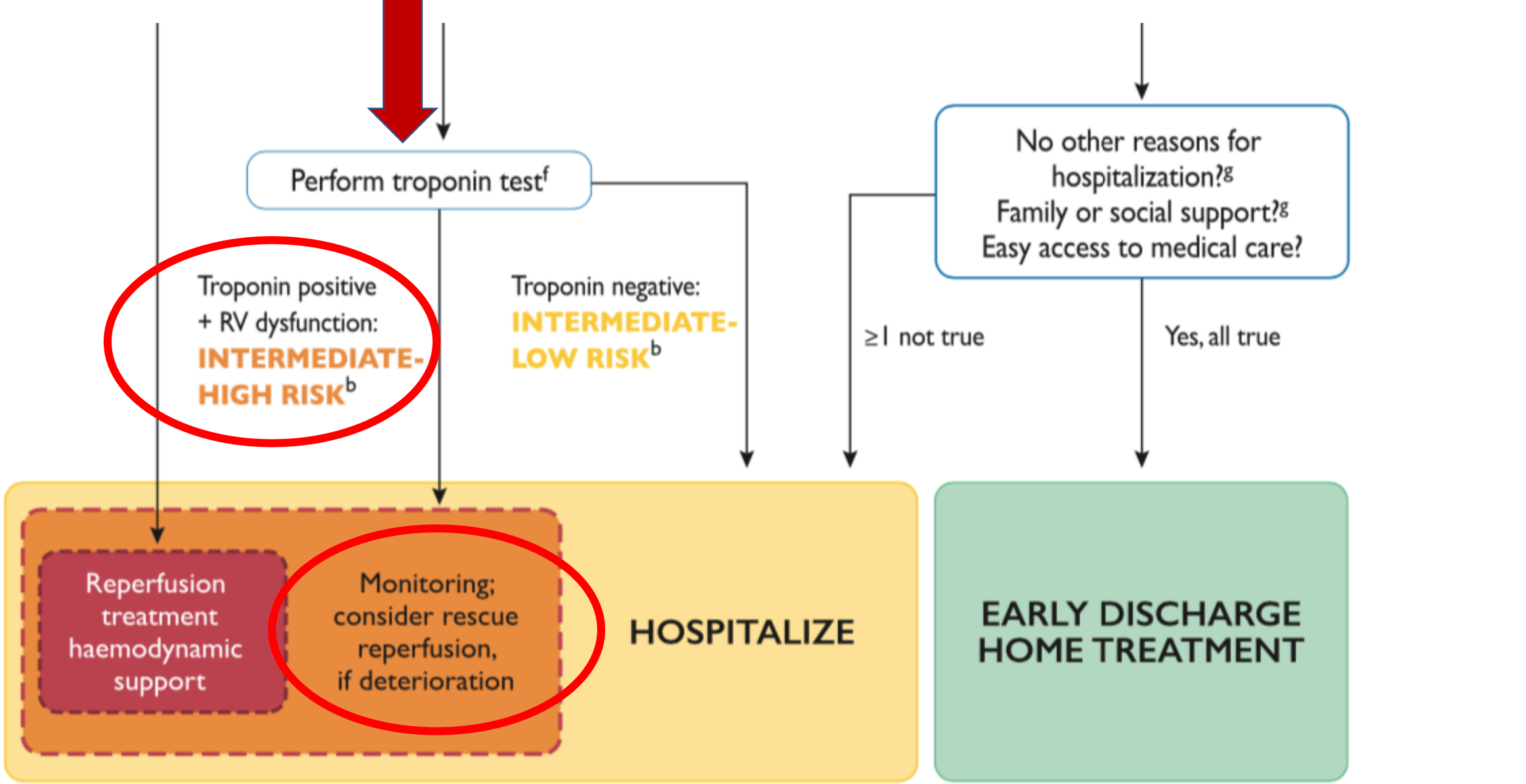
Parameter	Original version[226]		Simplified version[229]
Age	Age in years	73	1 point (if age >80 years)
Male sex	+10 points		–
Cancer	+30 points	30	1 point
Chronic heart failure	+10 points	10	1 point
Chronic pulmonary disease	+10 points	10	
Pulse rate ≥110 b.p.m.	+20 points	20	1 point
Systolic BP <100 mmHg	+30 points		1 point
Respiratory rate >30 breaths per min	+20 points	20	–
Temperature <36°C	+20 points		–
Altered mental status	+60 points		–
Arterial oxyhaemoglobin saturation <90%	+20 points	20	1 point
Risk strata[a]			
	Class I: ≤65 points very low 30 day mortality risk (0–1.6%) **Class II: 66–85 points** low mortality risk (1.7–3.5%)		**0 points** = 30 day mortality risk 1.0% (95% CI 0.0–2.1%)
183	**Class III: 86–105 points** moderate mortality risk (3.2–7.1%) **Class IV: 106–125 points** high mortality risk (4.0–11.4%) **Class V: >125 points** very high mortality risk (10.0–24.5%)		**≥1 point(s)** = 30 day mortality risk 10.9% (95% CI 8.5–13.2%)

BP = blood pressure; b.p.m. = beats per minute; CI = confidence interval.
[a]Based on the sum of points.

European Heart Journal (2020) 41, 543–603



European Heart Journal (2020) 41, 543–603



European Heart Journal (2020) 41, 543–603

Problem

- 1. Intermediate high risk acute pulmonary embolism
- 2. Recent Craniotomy with tumor removal

Discuss กับแพทย์เจ้าของไข้

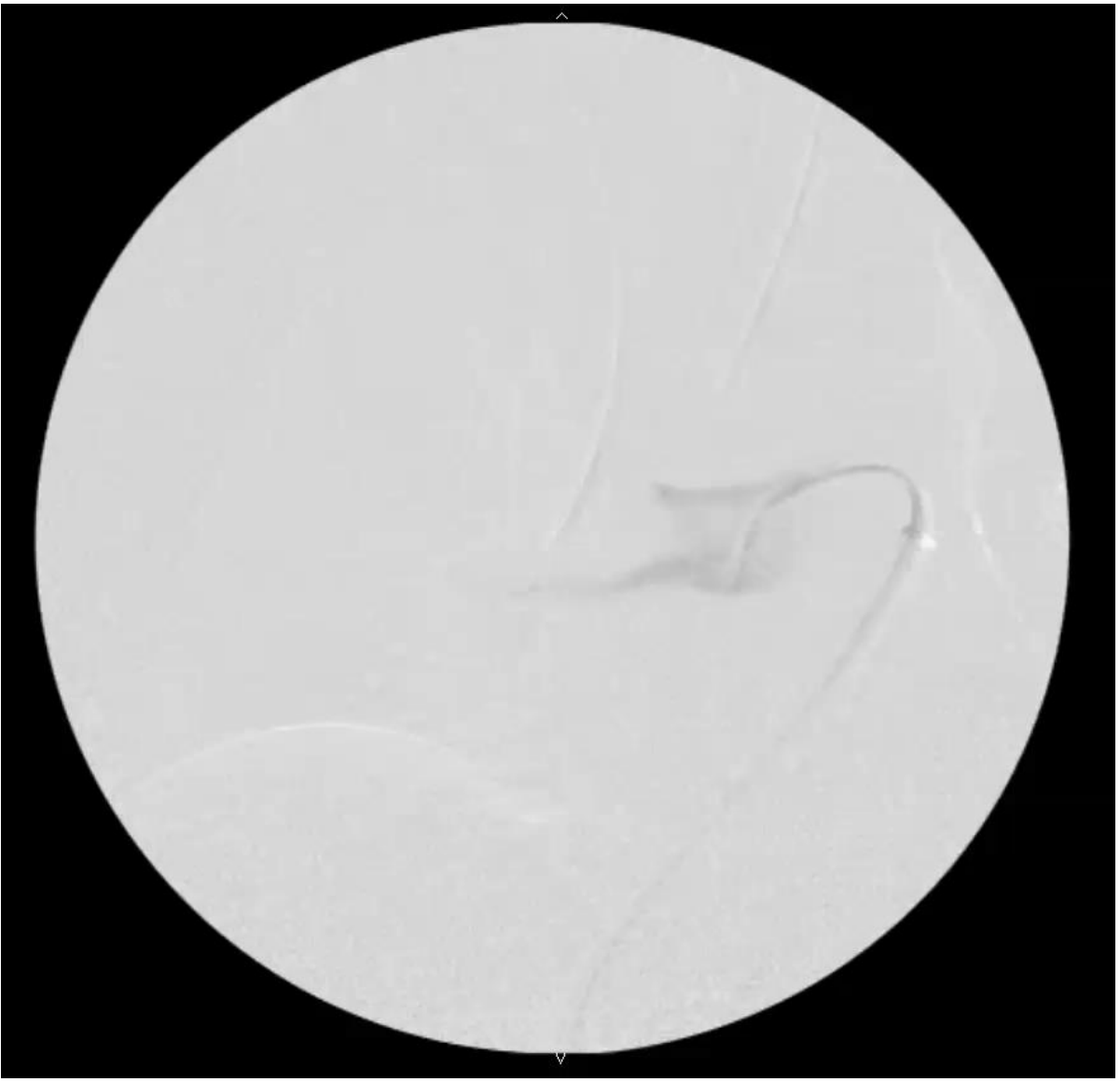
☑ **Anticoagulation**

☐ **Thrombolysis**

☑ **Thrombectomy**

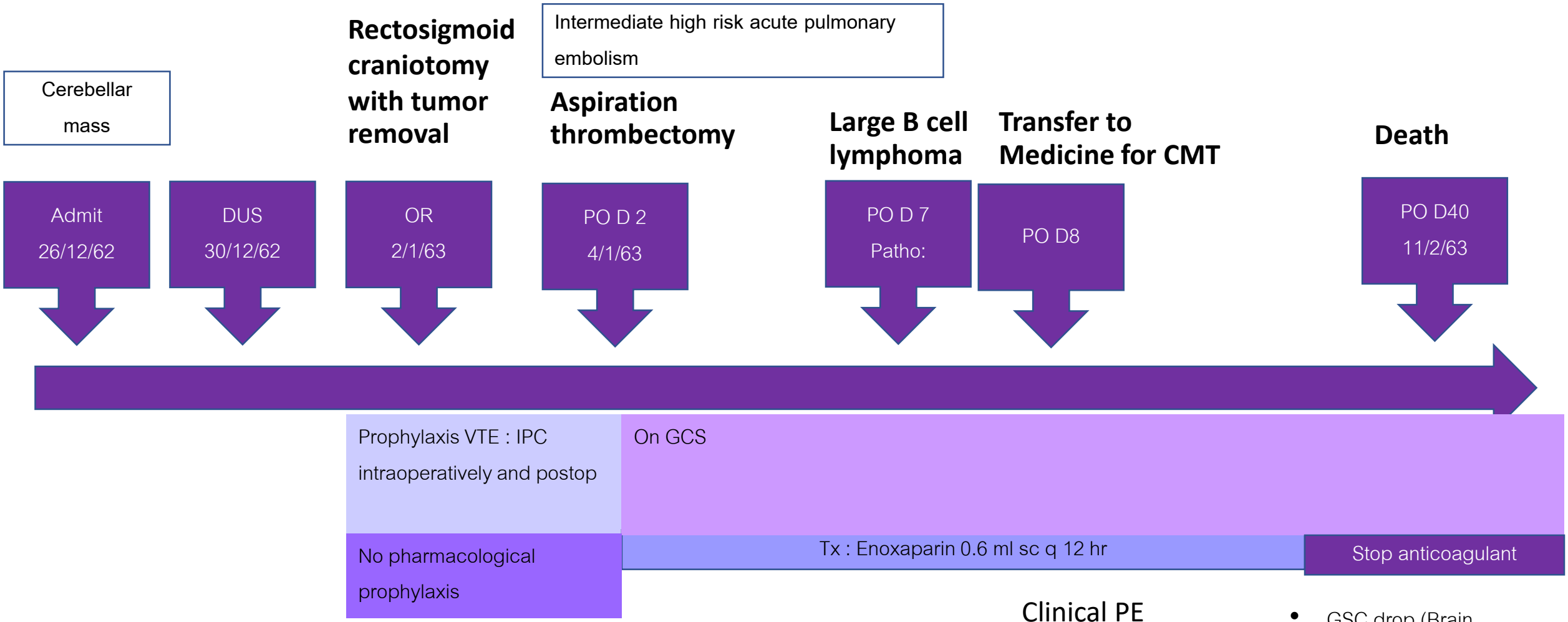
Set OR for Penumbra aspiration thrombectomy

Pre



Post

Indigo system SEP 8


Cerebellar mass
Admit 26/12/62
DUS 30/12/62
Rectosigmoid craniotomy with tumor removal
OR 2/1/63
Intermediate high risk acute pulmonary embolism
Aspiration thrombectomy
PO D 2 4/1/63
Large B cell lymphoma
PO D 7 Patho:
Transfer to Medicine for CMT
PO D8
Death
PO D40 11/2/63
Prophylaxis VTE : IPC intraoperatively and postop
On GCS
No pharmacological prophylaxis
Tx : Enoxaparin 0.6 ml sc q 12 hr
Stop anticoagulant
Clinical PE improve
On O2 sat 99% (canula 3 LPM)
GSC drop (Brain edema)
Pancytopenia + Intracerebral bleeding(CMT)

มหาวิทยาลัยมหิดล
คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี

ภาควิชาศัลยศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี
สาขาวิชาศัลยศาสตร์หลอดเลือดและปลูกถ่ายอวัยวะ

รับสมัครแพทย์ประจำบ้านต่อยอด สาขาศัลยศาสตร์หลอดเลือด

Vascular Surgery Fellowship

ประจำปีการศึกษา 2563 จำนวน 3 อัตรา

(กำหนดการสัมภาษณ์จะแจ้งให้ทราบภายหลัง)
สมัครได้ที่ http://med.mahidol.ac.th/graded/

สอบถามข้อมูลเพิ่มเติม : การศึกษาหลังปริญญา สาขาศัลยศาสตร์ โทร 02-201-1315 ต่อ 314

ภาควิชาศัลยศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล อาคาร 1 ชั้น 3
270 ถนนพระรามที่ 6 แขวงทุ่งพญาไท เขตราชเทวี กรุงเทพมหานคร 10400 โทรศัพท์ : 02-201-1315 โทรสาร 02-201-1316
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E-mail : sura@mahidol.ac.th : surgeryrama@gmail.com : ramasurgery@Hotmail.com / LINE ID : @mjp3370h/ Facebook :
www.facebook.com/Surgery.rama

Interhospital Vascular Conference

Emergency in Vascular Surgery

Management in Acute Pulmonary Embolism

Nutsiri Kittitirapong, MD FRCST
Division of vascular and transplantation surgery, Department of surgery, Faculty of medicine,
Ramathibodi hospital, Mahidol university
28th November 2020