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National Centre of Excellence in Cardiovascular Healthcare

# Acute Pulmonary Embolism

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## 9th Abuja Cardiovascular Symposium

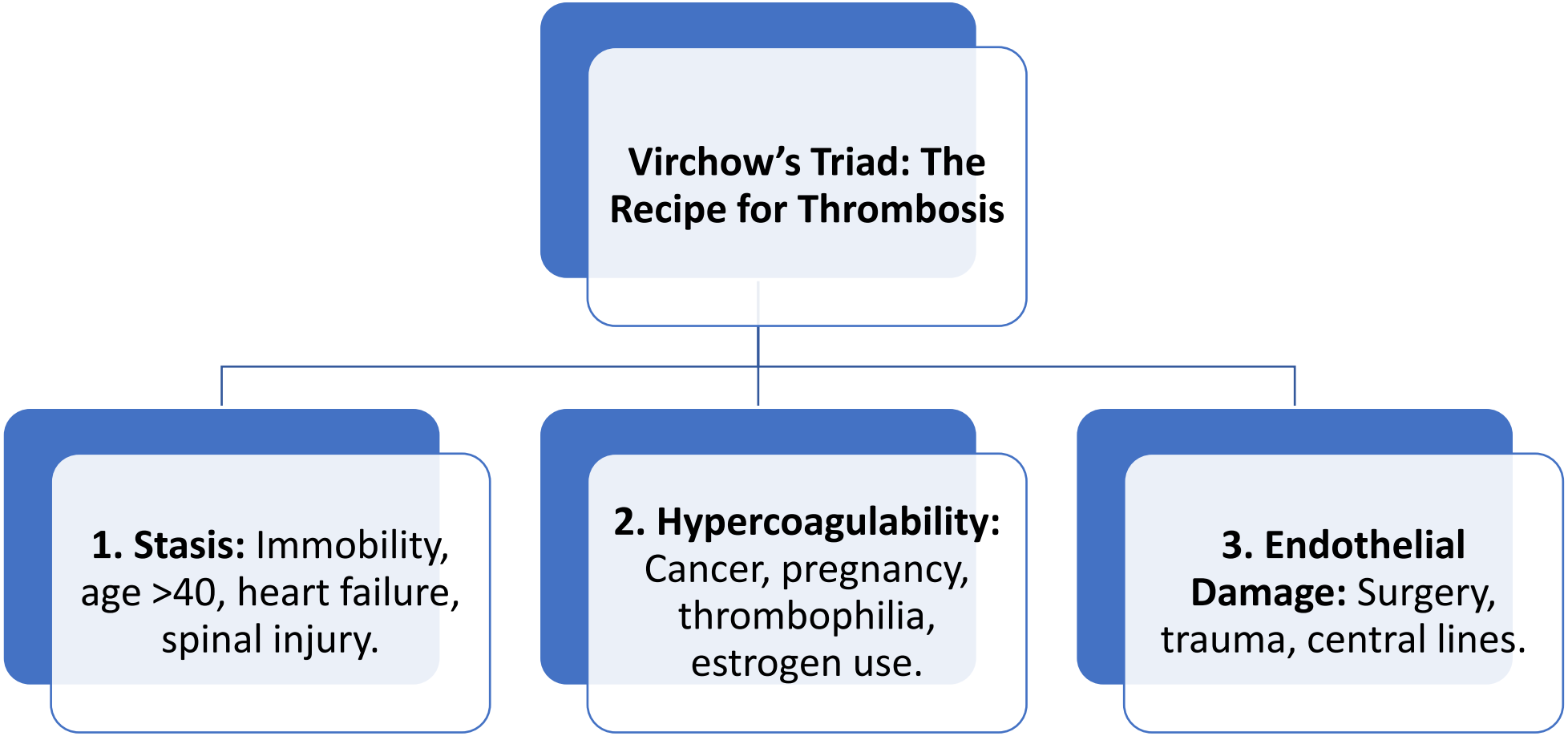
# Introduction & Epidemiology



- Pulmonary embolism is the 3rd leading cause of cardiovascular death, after MI and stroke.
- A silent killer- non specific nature of the symptoms, often leading to missed diagnosis.
- It has a strong causal link with Deep Vein Thrombosis (DVT). ~50-70% of symptomatic PE patients have co-existing DVT.
- Estimated annual incidence of 1-2 per 1,000.
- Higher rates in older adults and medically ill-patient.

# Pathophysiology (The "Why")



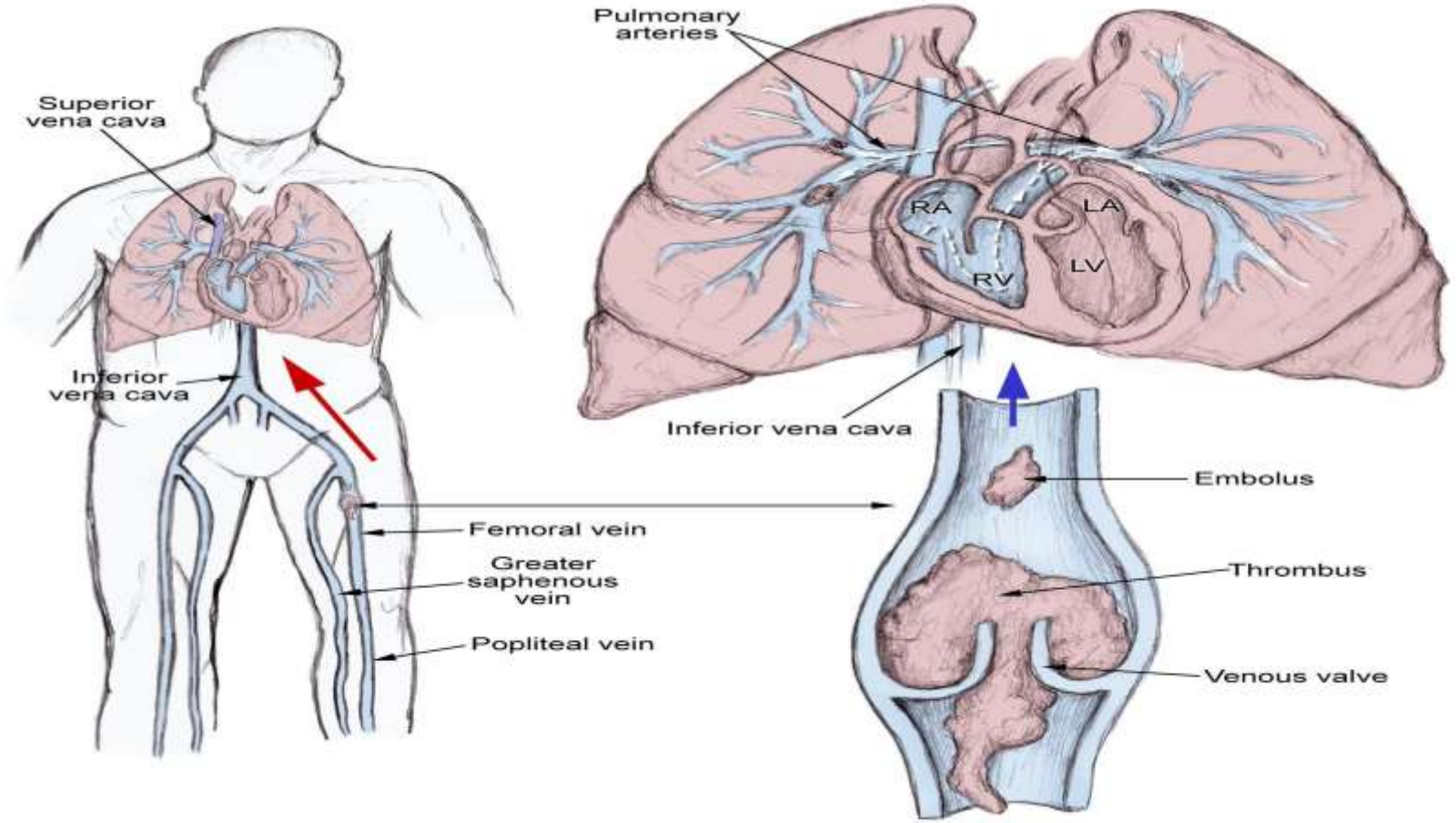


FOUNDED
SINCE 1982

***TO SUPPORT & SERVE***

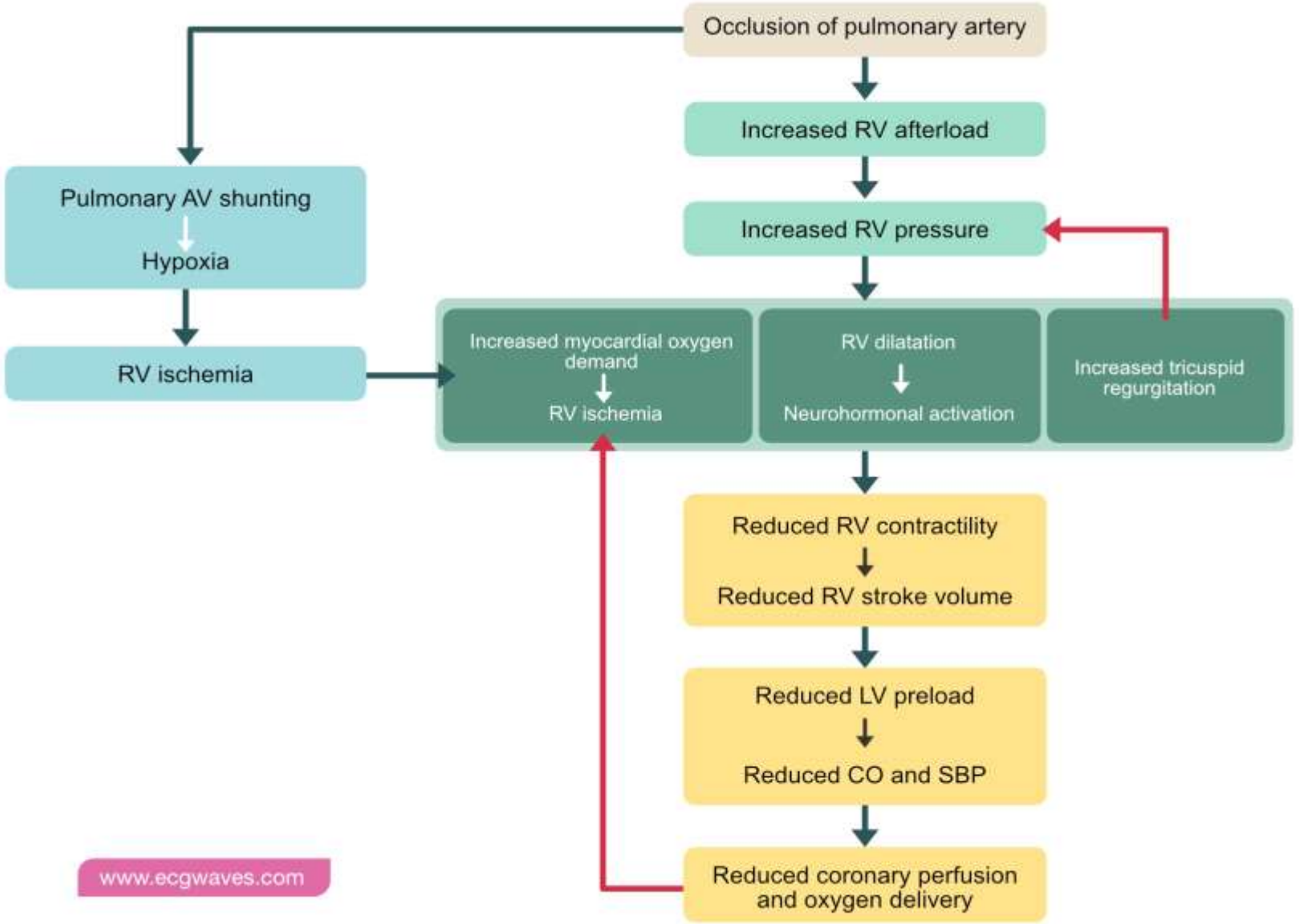
# Pathophysiology (The "Why")





# Pathophysiology (The "Why")- cardiopulmonary effects.





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# 6-Steps to Diagnosing or Excluding Pulmonary Embolism

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**1. Clinical Presentation**
- Dyspnea
- Hypoxemia
- Chest Pain/Pleurisy &
- Hemodynamic status.

**2. Risk & Probability**
- Wells Score
- DVT

**3. Biomarkers**
- D-Dimers
- +/- BNP
- +/- Troponin

**4. ECG**
- RV strain
- Tachycardia

**5. ECHO**
- RV/LV Ratio
- RV Dysfunction

**6. CT Pul Angio**
- Diagnostic Gold Standard

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# Step-1: Clinical Presentation



**A "Chameleon" Diagnosis**

**Symptoms are often non-specific.** High index of suspicion is required.

**Classic Symptoms:**

- Unexplained Dyspnea: Most common.
- Chest Pain: Pleuritic (distal emboli) or Angina-like (central emboli/RV ischemia)
- Syncope/Presyncope: Suggests massive PE with hemodynamic collapse.

**Hemoptysis**

# Step-2: Wells score for P.E



| Clinical Feature | Points |
|---|---|
| Clinical signs of **DVT** (leg swelling, pain on palpation) | **+3.0** |
| PE is the **most likely diagnosis** | **+3.0** |
| **Heart rate >100 bpm** | **+1.5** |
| **Immobilization ≥3 days** or **surgery within 4 weeks** | **+1.5** |
| **Previous DVT or PE** | **+1.5** |
| **Hemoptysis** | **+1.0** |
| **Malignancy** (on treatment, treated in last 6 months, or palliative) | **+1.0** |

| Score | Meaning |
|---|---|
| ≤ 4 | PE Unlikely |
| > 4 | PE Likely |

◆ **If Wells ≤ 4 (PE Unlikely)**
→ Do **D-dimer**
- **Negative D-dimer → Exclude PE**
- **Positive D-dimer → CTPA**

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◆ **If Wells > 4 (PE Likely)**
→ **Skip D-dimer**
→ Go **straight to CTPA**

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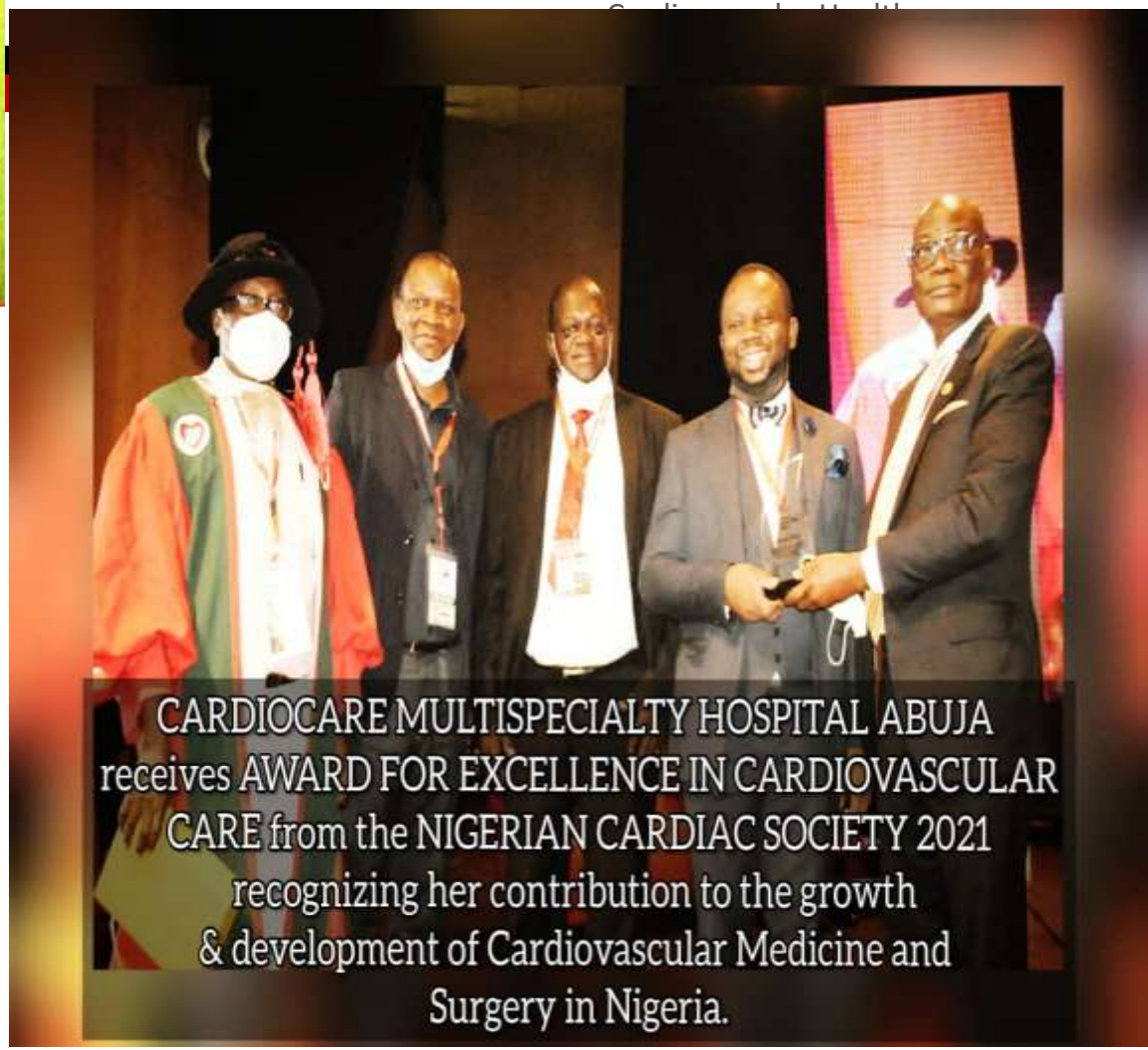
# Who is Cardiocare Multispecialty Hospital?_

Northern Nigeria's **pioneer standalone Institution** wholly dedicated to comprehensive **Cardiovascular and Internal Medicine**.

Received Multiple **Awards for Excellence in Service.**

We are a **Support Hospital** for your practice in Nigeria through our **specialized services, training, and research in collaboration with you.**

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# CASE 1

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| Referred from a peripheral hospital | | O/E In obvious respiratory distress, T-36.6C |
|---|---|---|
| 41-year-old-female with | | PR **102** beats/min, regular, good volume |
| Sudden onset difficulty in breathing & chest discomfort X 12hrs duration, | | BP 136/76 mmHg |
| **Associated sweating and cough, no hemoptysis, no fever** | | No raised JVP |
| | | Heart sounds, Normal S1 S2 only + loud P2 |
| **The chest discomfort does not radiate** to the left arm and necks | | |
| Not a known hypertensive or diabetic, no previous history of P.E | | Resp rate **30 cycles/min** |
| **Does not smoke nor take alcohol** | | **O2 Sat 86% in room air** |
| She had **myomectomy about 4days ago for** symptomatic huge uterine fibroids. Not on oral contraceptive pills | | Fine crepitations heard right lower lung laterally |
| | | |

# Q1. What is the likely wells score for this patient?



a. 3

b. 4.5

c. 6

d. 5.5

# Q2.What is the next approach in evaluating this patient?

a. D-dimer

b. CTPA

# Answer to case 1: Assessing Wells score.



| Clinical Feature | Points |
|---|---|
| Clinical signs of **DVT** (leg swelling, pain on palpation) | **0** |
| PE is the **most likely diagnosis** | **+3.0** |
| **Heart rate >100 bpm** | **+1.5** |
| **Immobilization ≥3 days** or **surgery within 4 weeks** | **+1.5** |
| **Previous DVT or PE** | **0** |
| **Hemoptysis** | **0** |
| **Malignancy** (on treatment, treated in last 6 months, or palliative) | **0** |

| Score | Meaning |
|---|---|
| | |
| 6 | PE Likely |

- **If Wells ≤ 4 (PE Unlikely)**

→ Do **D-dimer**

- **Negative D-dimer → Exclude PE**
- **Positive D-dimer → CTPA**

---

- **If Wells > 4 (PE Likely)**

→ **Skip D-dimer**

→ Go **straight to CTPA**

# What are the Cardiocare Multispecialty Hospital's services?

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We provide **24/7 world-class healthcare solutions** for patients, hospitals, and their doctors in:

- ✓ Interventional Cardiology (Cathlab)
- ✓ Endocrinology, Diabetology & Metabolic Medicine
- ✓ Cardiology
- ✓ Nephrology, Transplant & Dialysis
- ✓ Neurology
- ✓ Rheumatology
- ✓ Pulmonology
- ✓ Critical Care
- ✓ Cardiothoracic Surgery
- ✓ General Internal Medicine
- ✓ Comprehensive Medical Checkups

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# Step 3 &4: Diagnostic Workup (Key Investigations)



## Biomarkers

- **D-Dimer:**
  - ❖High sensitivity, low specificity. Useful to **rule out** PE in low/intermediate risk patients.
  - ❖(Negative test = No PE).
- **Troponin & BNP:**
  - ❖**Prognostic** markers.
  - ❖Elevated levels indicate RV dysfunction and higher mortality risk.

## Electrocardiography (ECG)

- **Common:** Sinus Tachycardia (most frequent).
- **Classic (but rare):** S1Q3T3 pattern.
- **RV Strain:** T-wave inversions (V1-V4), RBBB, RAD.

# P.E & hemodynamic instability- Definition



- .

**1. CARDIAC ARREST NEEDING CPR**

**2. OBSTRUCTIVE SHOCK i.e**

- **SBP <90mmHg or required vasopressor to achieve a SBP >90mmHg despite adequate filling status and**
- **End-organ hypoperfusion**

**3. TRANSIENT OR PERSISTENT HYPOTENSION**

# Step 5 & 6: Imaging

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**Echocardiography (Bedside)**

Critical in **unstable** patients to assess RV function

Findings include enlarged RV, RV/LV >1, McConnell's sign, 60/60 sign

**Computed Tomography Pulmonary Angiography (CTPA)- (The Gold Standard)**

Preferred initial imaging for stable patients.

Filling defects seen in pulmonary arteries.

Contraindicated in renal failure, severe contrast allergy, pregnancy (relative).

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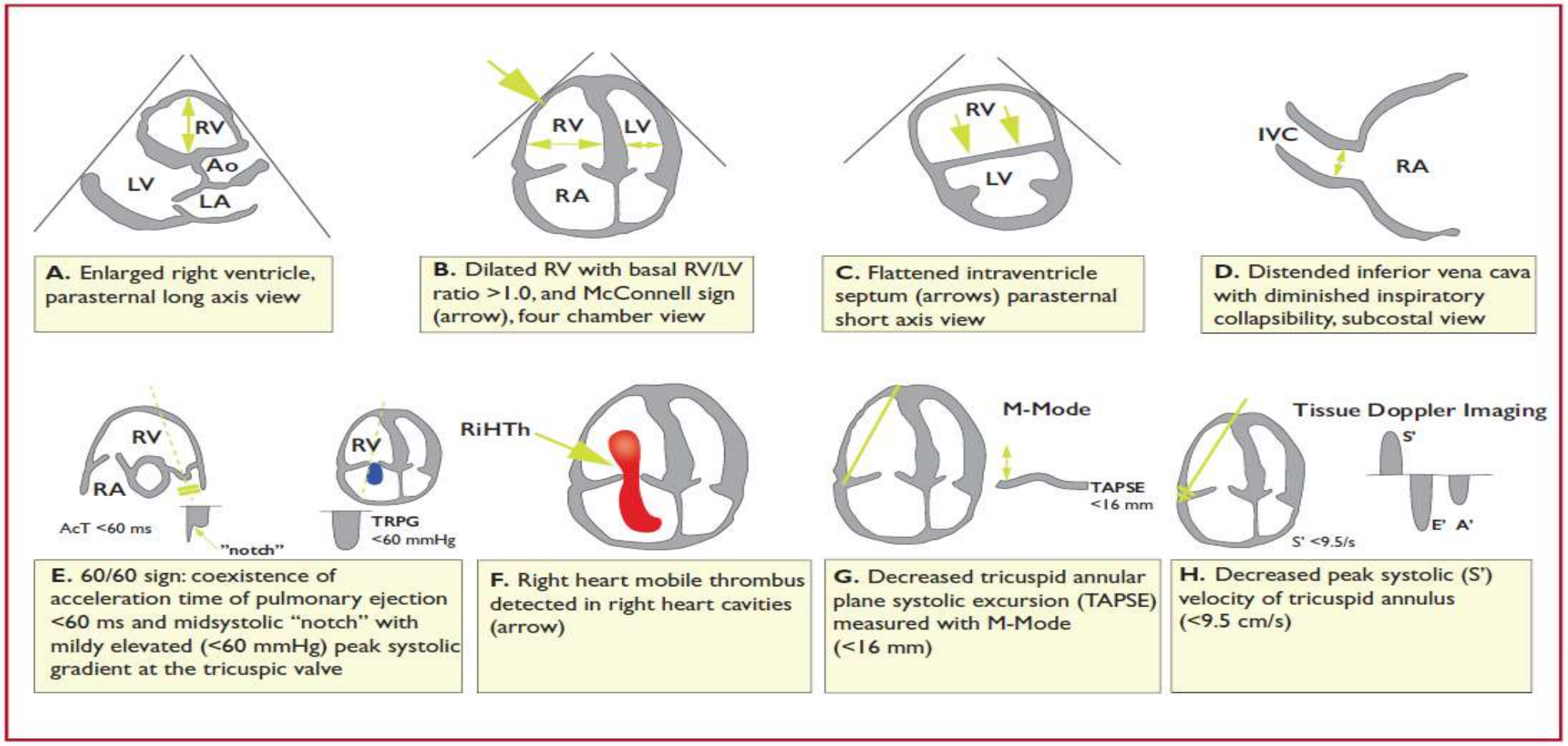
•Clinical & Interventional Cardiology •Endocrinology & Diabetology •Neurology •Nephrology and Dialysis •Hepatology •Critical and Intensive Care •Internal Medicine

5 Giza Close, Area 11 Garki, Abuja-Nigeria.
0817 444 0888, 0817 444 5544, 0908 331 7777
frontdesk@cardiocare.ng

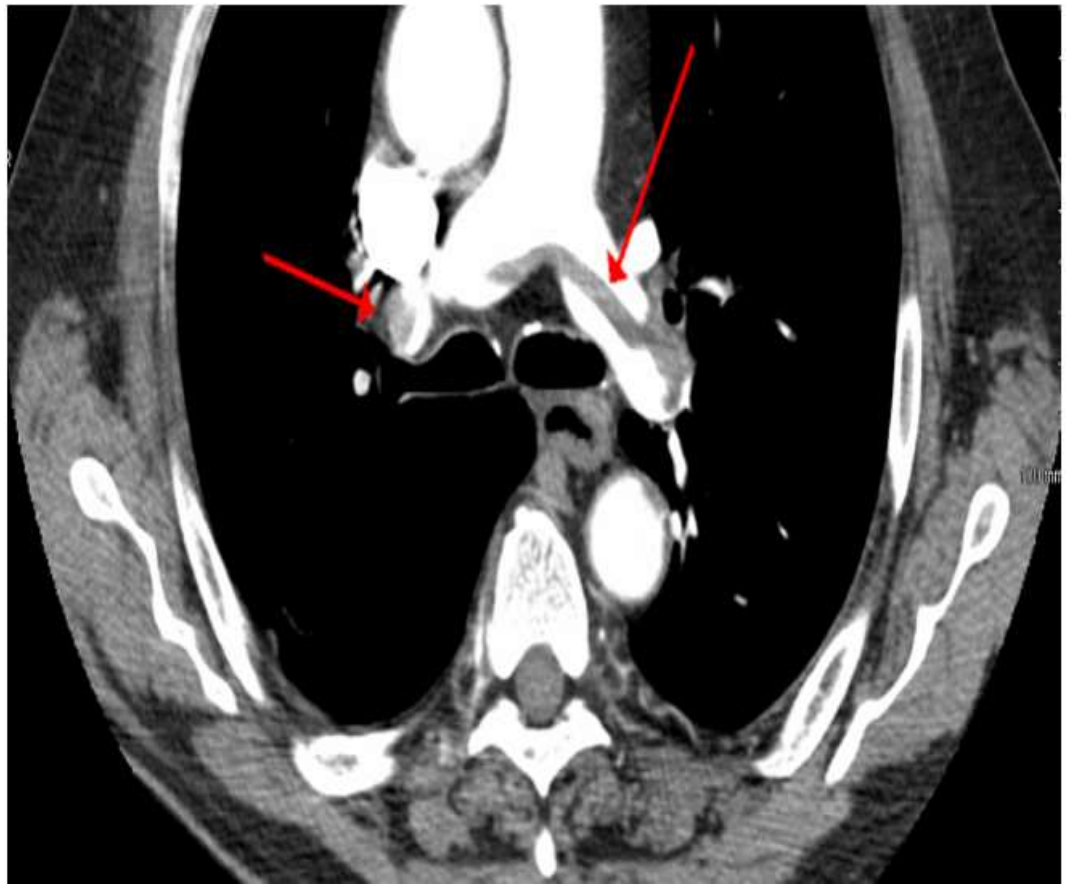
# Echocardiography findings in acute pulmonary embolism.

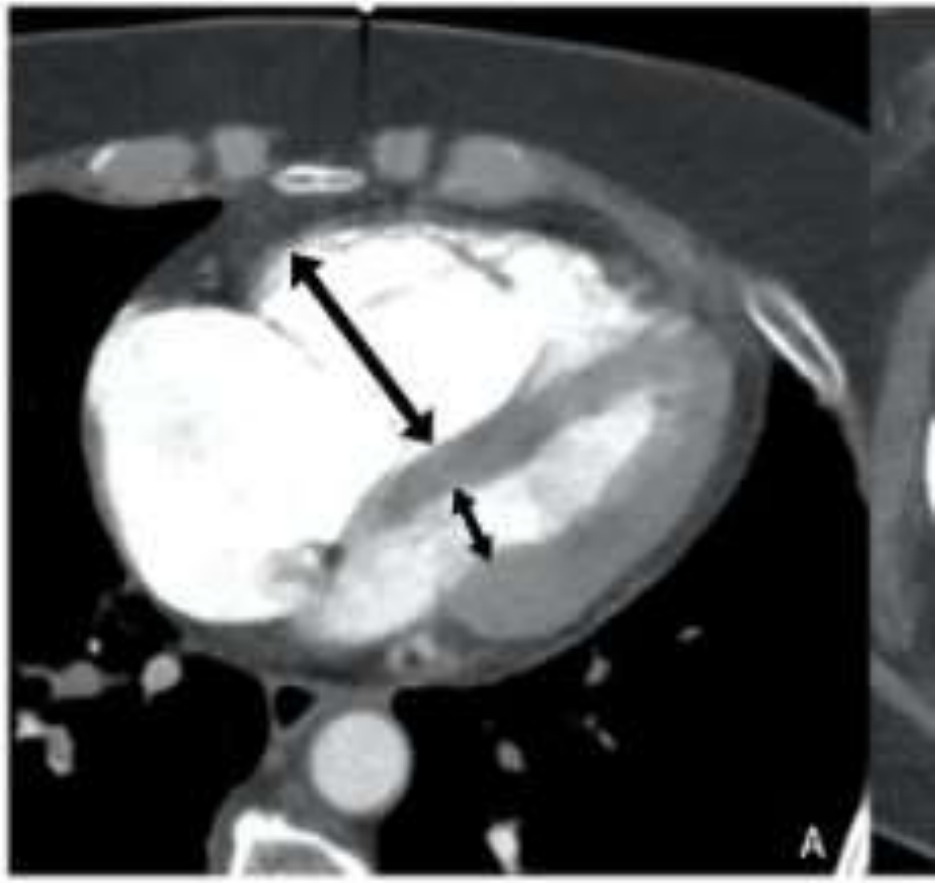




# CT Pulmonary Angiography - contrast enhanced CT scan.







# 6-Steps to Diagnosing or Excluding Pulmonary Embolism

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- Dyspnea
- Hypoxemia
- Chest Pain/Pleurisy
- Hemodynamics

**2. Risk & Probability**
- Wells Score
- DVT

**3. Biomarkers**
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- +/- Troponin

**4. ECG**
- RV strain
- Tachycardia

**5. ECHO**
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**6. CT Pul Angio**
- Diagnostic Gold Standard

**EXCLUDE DIFFERENTIALS WHICH COULD MIMIC OR HAPPEN CONCURRENTLY:**
- Acute Coronary Syndrome
- Acute Heart Failure
- Severe Sepsis
- Pneumonia

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# OUR FOCUS

❖ We aim to provide the best possible care with respect to

- ❑ **SAFETY**
- ❑ **EFFECTIVENESS**
- ❑ **PATIENT CENTEREDNESS**
- ❑ **INTERNATIONAL STANDARDS**

# Diagnostic Algorithm (Hemodynamic Stability)

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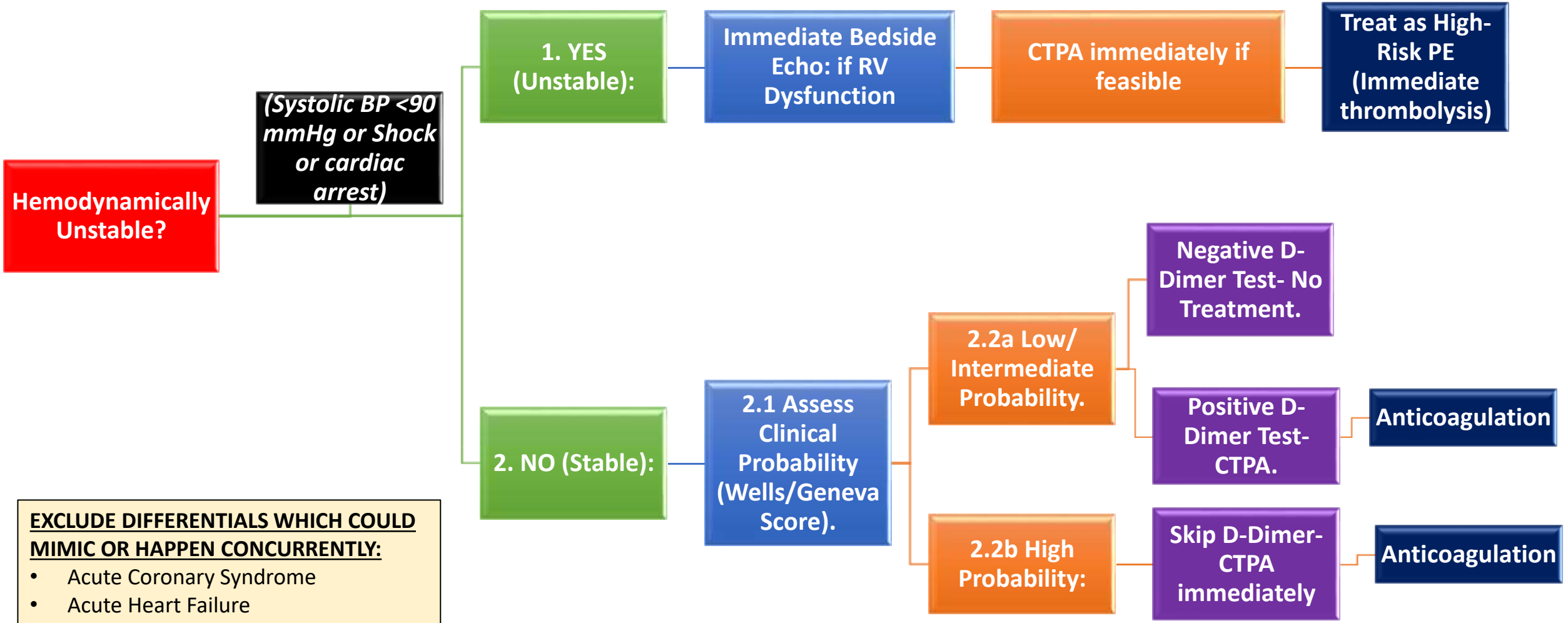
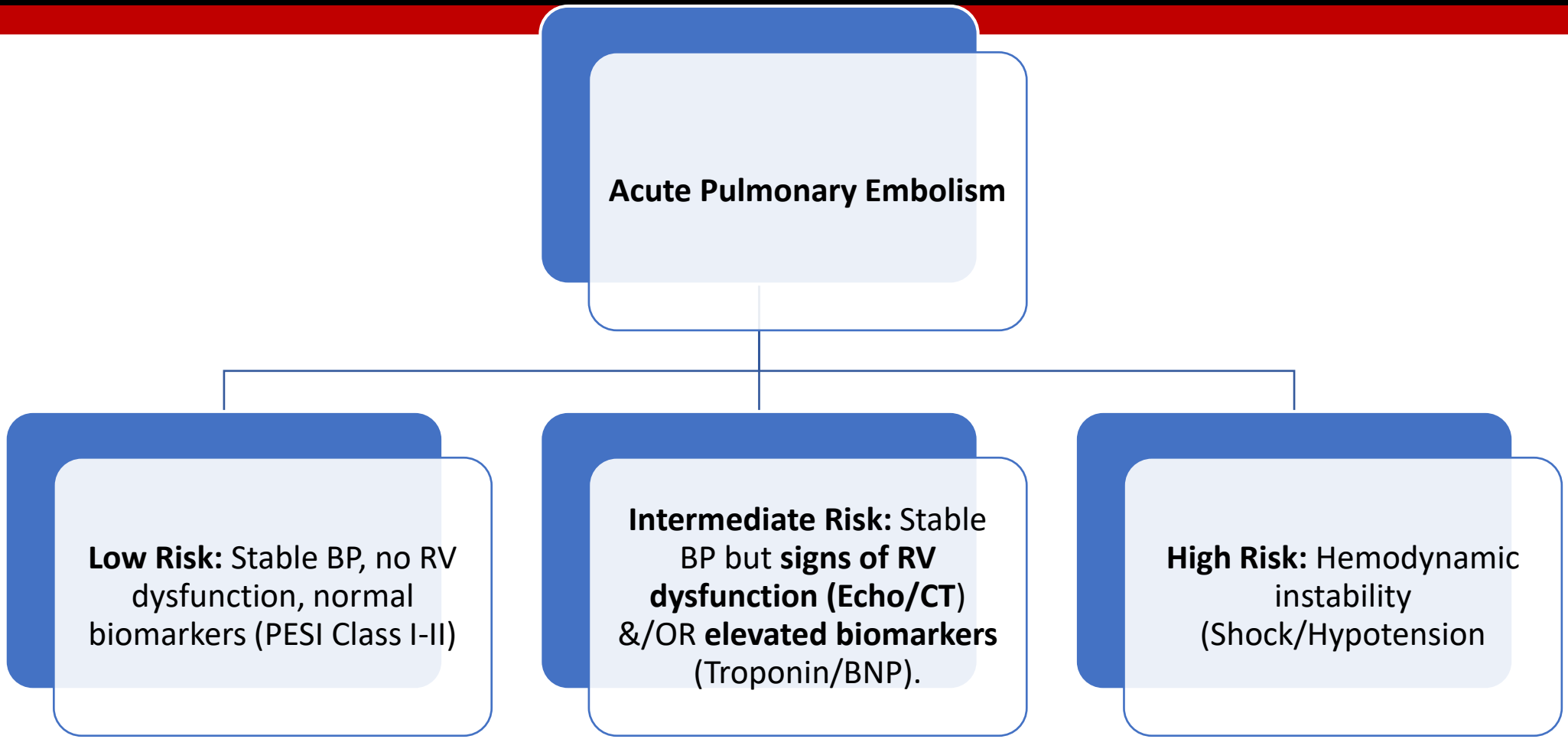



**EXCLUDE DIFFERENTIALS WHICH COULD MIMIC OR HAPPEN CONCURRENTLY:**

- Acute Coronary Syndrome
- Acute Heart Failure
- Severe Sepsis
- Pneumonia

# Pulmonary embolism & severity





# HOW DO WE TREAT



- GOAL 1:
  - Rapid Reperfusion if high risk
- GOAL 2:
  - Treat and Prevent Recurrence
- GOAL 3:
  - Treat Complications especially if late presentation

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# Our Offered Services

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We provide advanced solution to all aspect of Cardiovascular Medicine and Surgeries.

- ✓ **Cardiology**
- ✓ **Interventional Cardiology (Cathlab)**
- ✓ **Endocrinology, Diabetology &**
- ✓ **Nephrology, Transplant & Dialysis**
- ✓ **Neurology**
- ✓ **Rheumatology**
- ✓ **Pulmonology**
- ✓ **Critical Care**
- ✓ **Cardiothoracic Surgery**
- ✓ **General Internal Medicine**
- ✓ **Comprehensive Medical Checkups**

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# Treatment - High Risk (Unstable)



**Goal 1: Rapid Reperfusion**

**1. Supportive Care:** Oxygen, fluids (<500ml), Vasopressors (Norepinephrine).

**2. Primary Reperfusion:**

- **Systemic Thrombolysis:** (e.g., rTPA/Alteplase) is the treatment of choice.
- **Catheter-Directed Thrombolysis:** If high bleeding risk.

**3. Surgical or Endovascular Embolectomy:** If early enough or thrombolysis fails or is contraindicated.

# Treatment - Intermediate & Low Risk (Stable)



**Goal 2: Treat & Prevent Recurrence**

**Anticoagulation:** Commence immediately.

**First Line: NOACs** (Apixaban, Rivaroxaban) are preferred over Vitamin K Antagonists (Warfarin).

**Exceptions (Use LMWH/VKA):** Severe renal impairment, Pregnancy, Antiphospholipid syndrome.

**IVC Filters:** Not routinely used. Only for absolute contraindications to anticoagulation or recurrent VTE despite treatment.

**LIFE TREATMENT** for Thrombophilia's.

# Long Term Complications



**Chronic Thromboembolic Pulmonary Hypertension (CTEPH)**

**Definition:** High pulmonary pressure (>20mmHg) persisting >6 months after PE.

**Symptoms:** Persistent dyspnea, right heart failure.

**Treatment:**

- Lifelong anticoagulation.
- **Pulmonary Endarterectomy (PEA):** Choice for operable disease.
- Balloon Pulmonary Angioplasty (BPA) for inoperable cases.

# ADVANCED CARE

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1 **CORONARY ANGIOGRAPHY & INTERVENTIONS-** For patients presenting with chest pains, acute coronary syndrome

2 **PERIPHERAL ANGIOGRAPHY & INTERVENTIONS-** For patients presenting with Peripheral vascular diseases causing tissue loss or gangrene

3 **CARDIAC DEVICE IMPLANTATION & PROGRAMMING** such as Pacemakers, ICDs,CRTs for patients presenting with heart failure & Cardiac rhythm abnormalities

4 **STRUCTURAL HEART INTERVENTIONS –** for patients presenting with ASD, VSD, PDA etc..

5 **THROMBOEMBOLIC THERAPIES such as IVC Filters,** for VTE (Venous Thrombo-embolic) treatment and management

6 **CARDIAC SURGERY –** Open Heart Surgery

7 **KIDNEY TRANSPLANT & DIALYSIS**

8 **CRITICAL CARE**

9 **ADVANCED CARDIAC INVESTIGATIONS**

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# CASE 2

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| Referred from a peripheral hospital | | O/E In obvious respiratory distress |
|---|---|---|
| 41-year-old-female | | PR **102** beats/min, regular, good volume |
| Sudden onset difficulty in breathing & chest discomfort X 12hrs duration, | | BP 136/76 mmHg |
| **Associated sweating and cough** | | No raised JVP |
| | | Heart sounds, Normal S1 S2 only + loud P2 |
| **The chest discomfort does not radiate** to the left arm and necks | | |
| Not a known hypertensive or diabetic. | | Resp rate **30 cycles/min** |
| **Does not smoke nor take alcohol** | | **O2 Sat 86% in room air** |
| She had myomectomy about 4days ago for symptomatic huge uterine fibroids. Not on oral contraceptive pills | | Fine crepitations heard right lower lung laterally |
| | | |

# CASE 2……



| Laboratory test | | Imaging |
|---|---|---|
| D-dimer- 10mg/L. | | ECG- sinus tachycardia, RAD, Incomplete RBBB |
| FBC- WBC- 14,000 (Neutrophils- 80.2%) | | ECHO-RV dysfunction |
| Electrolyte Urea and Creatinine- Unremarkable | | |
| NT-pro-BNP: 1558.pg/mL | | |
| Troponin: 1.2ng/mL | | |
| INR: 1.08 | | |
| Doppler ultra-sound of the lower limbs- Negative of deep vein thrombosis | | |
| CTPA- filling defect at the bifurcation of the right main pulmonary artery. | | |
| | | |

# Case presentation….ECG

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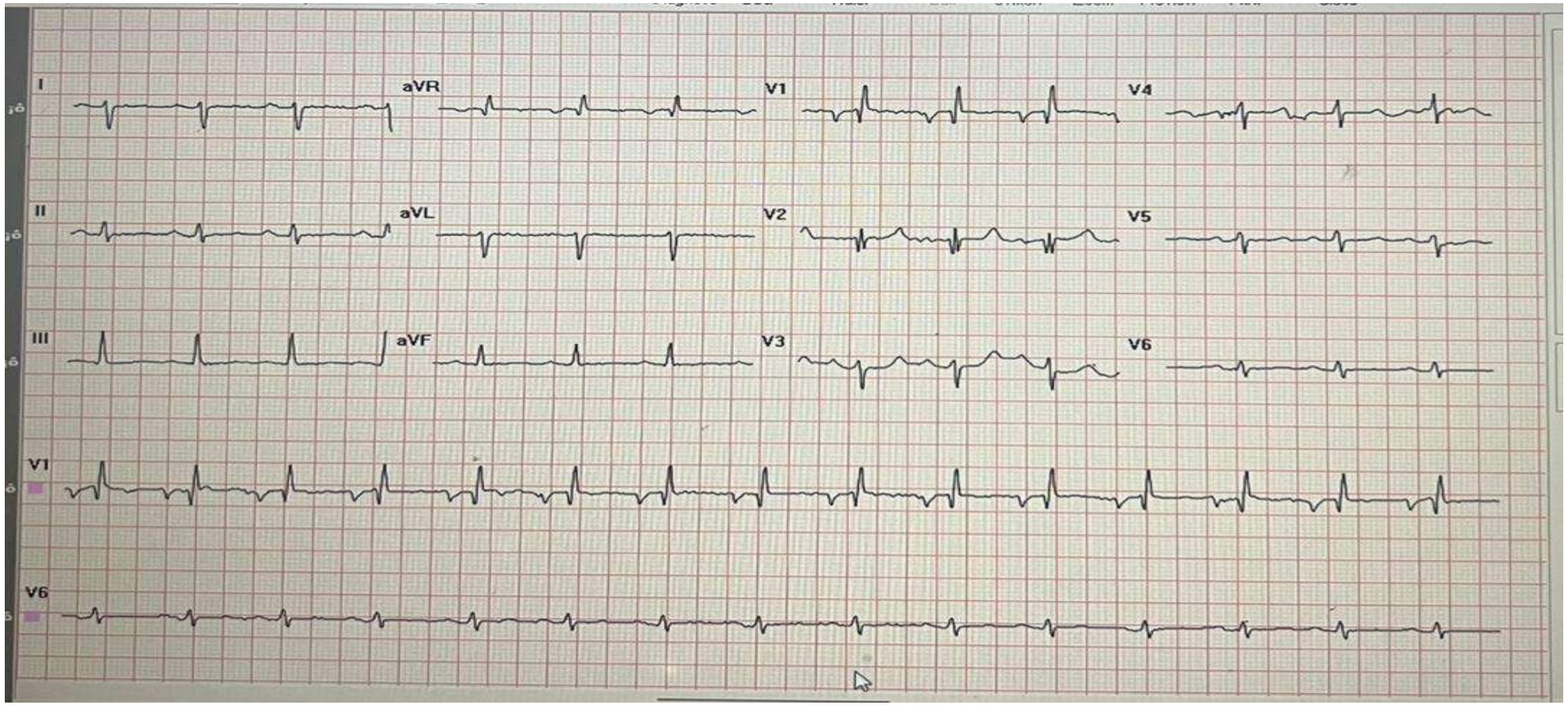

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# Our Non-Invasive Assessment services

- ❑ HOTLERS
- ❑ SPIROMETRY
- ❑ STRESS
- ❑ EEG
- ❑ ECG

# Case presentation….Echo

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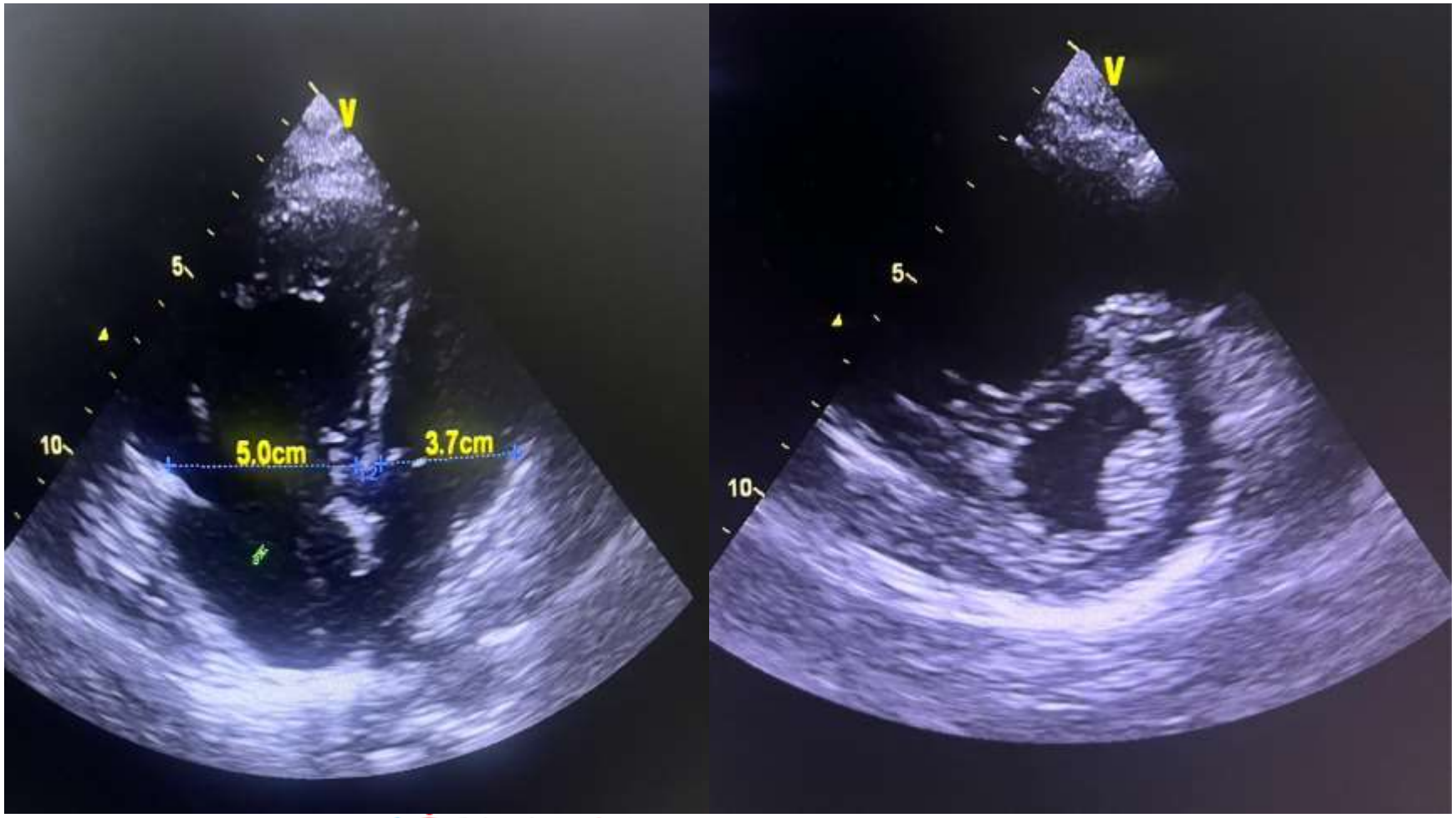

# Q3. What is the likely risk-stage of the patient as at the time of presentation



- A. low risk
- B. Intermediate risk
- C. High risk
- D. Very high risk

# Answer to Q3
# Pulmonary embolism severity index

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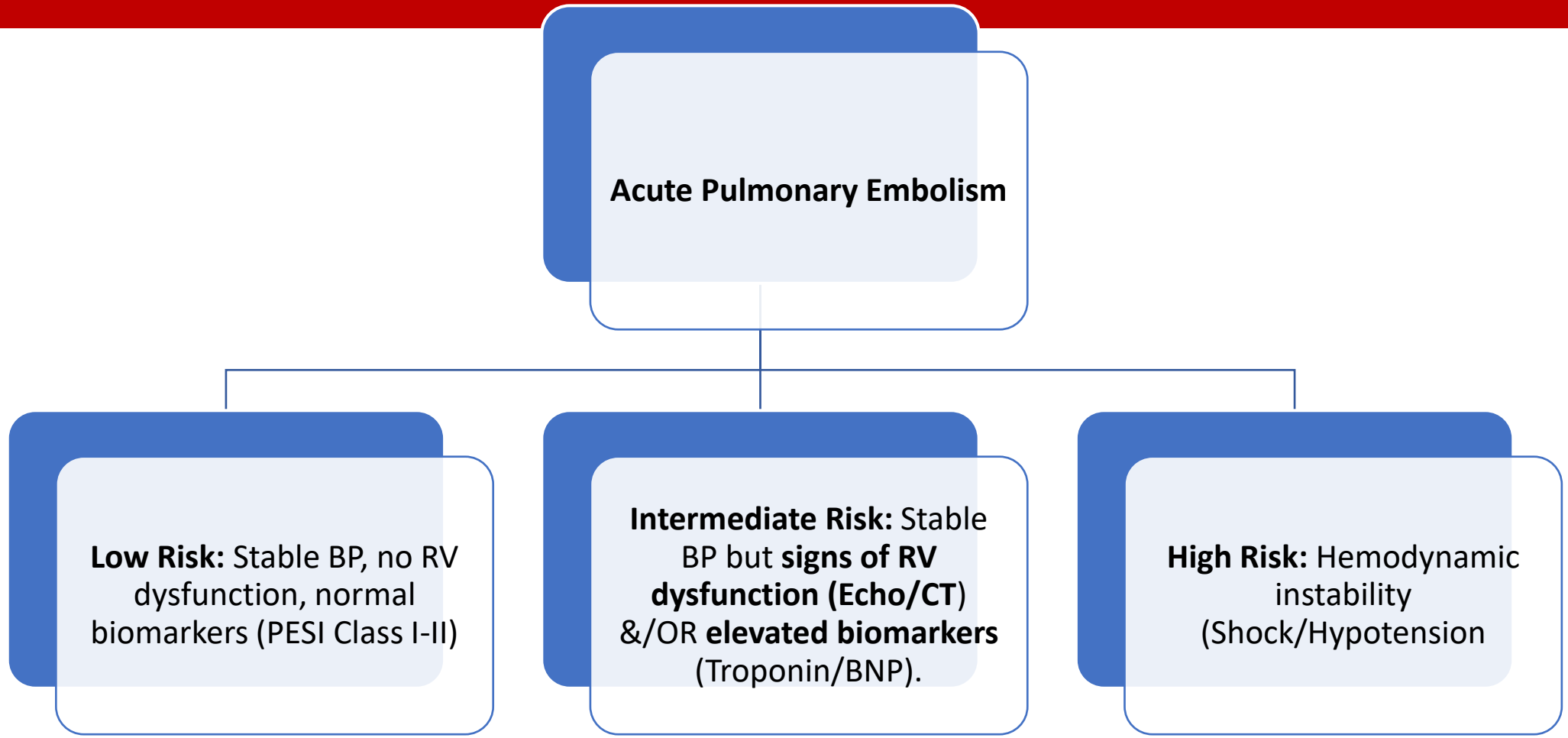

# OUR FACILITIES

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**24**

## BED SPACE

VIP SUITES,

PRIVATE SUITES,

GENERAL SUITES etc

**2**

## INTENSIVE CARE UNIT

HDU&ICU

**3**

## THEATERS

ULTRAMORDEN CATHLAB, CARDIAC OPERATION THEATER

**1**

## DIALYSIS SUITE

## PHYSIOLOGY LAB

## RADIOLOGY SIUTE

# Q4. About the ECG and Echo of this patient, Which is not correct ?



- A. ECG is in keeping with right axis and right bundle block
- B. The is D-septum on the echo
- C. Right ventricle is dilated
- D. No feature of right ventricular overload

# Case presentation….



| Treatment | Progress report |
|---|---|
| Commenced Oxygen Therapy via Non re-breather Face mask @15L/min | **48hours into admission, patient still desaturating with SPO2-88%, tachypnoic RR-30cpm and blood pressure dropped to 100/60mmHg**. |
| Commenced Sc Enoxaparin 80mg 12 hourly. | |
| | |

# Q5: what will be your approach to treatment at this stage ?



- A. Systemic thrombolysis
- B. Catheter Directed thrombolysis
- C. Continue SC enoxaparin
- D. Surgical embolectomy

# OUR EDUCATIONAL SYMPOSIA

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| | |
|---|---|
| 1 | 1st – 9th Annual Abuja Cardiovascular Symposia |
| 2 | 1st National Interventional Cardiology Symposium |
| 3 | Peripheral Vascular Disease Seminar |
| 4 | Monthly Webinars since March 2020. |
| 5 | Hospital Presentations at Govt healthcare Facilities |
| 6 | Inhouse 1Weekly CPD's and Routine BLS Training |

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# Treatment - High Risk (Unstable)



**Goal 1: Rapid Reperfusion**

**1. Supportive Care:** Oxygen, fluids (<500ml), Vasopressors (Norepinephrine).

**2. Primary Reperfusion:**

- **Systemic Thrombolysis:** (e.g., rTPA/Alteplase) is the treatment of choice.
- **Catheter-Directed Thrombolysis:** If high bleeding risk.

**3. Surgical or Endovascular Embolectomy:** If early enough or thrombolysis fails or is contraindicated.

# Case presentation….



- She had **catheter-directed thrombolysis @ day 3 of admission.**
- Post-CDT, She required less oxygen supplementation and saturating at 94%.
- she was transited to Oral anticoagulants (Tab Rivaroxaban 15mg b.d, then 20mg daily), counselled on the expected duration of anticoagulation of 3-6months.
- She was discharged home on day 7 of hospital admission and has been regular on her clinic visits.

# Case presentation- Initial on admission & Repeat echo 72hours post-CDT

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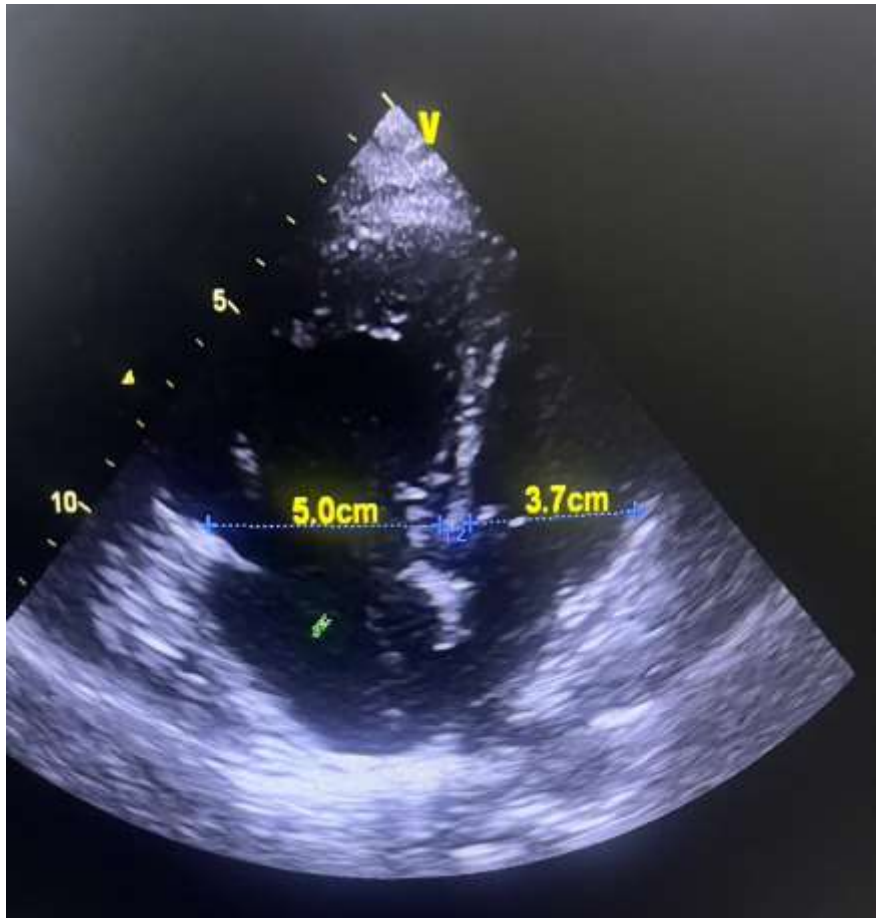


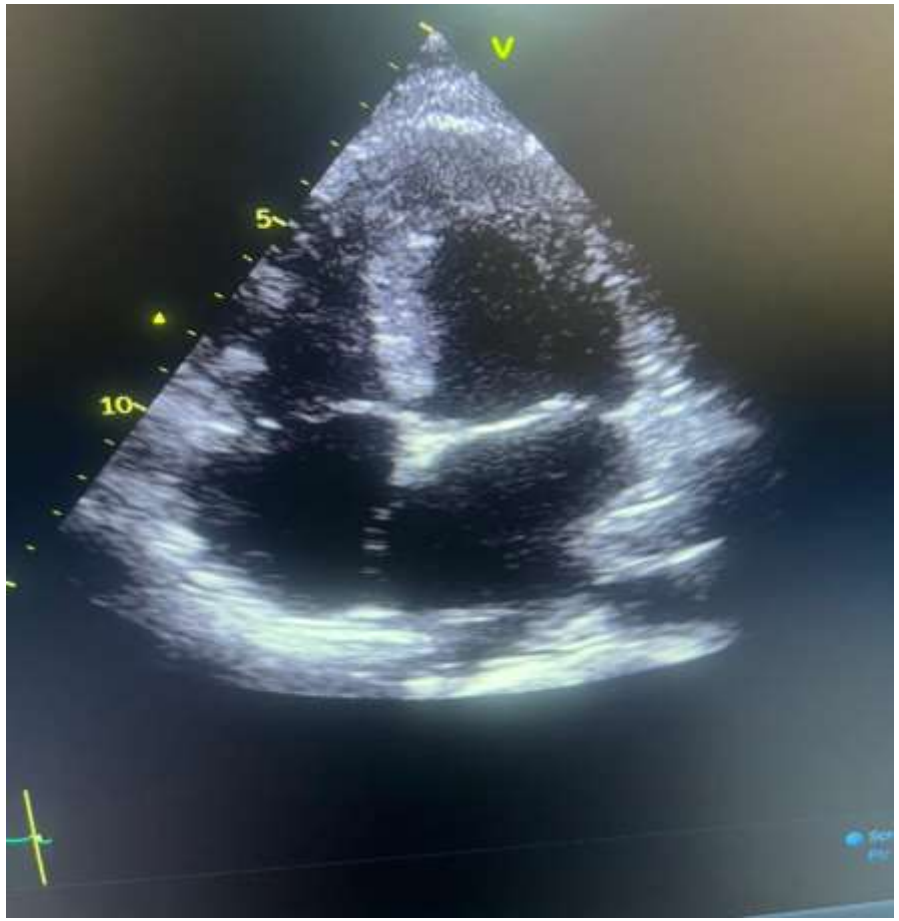

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# Our Milestones

## OVER 600 CATHLAB PROCEDURES

CARDIOCARE HAS PERFORMED OVER 500 CARDIAC PROCEDURES FOR NIGERIANS AND FOREIGN NATIONALS SUCCESSFULLY AND RELIABLY OVER THE YEARS

## AWARDS & RECORGNITION

WE ARE HAPPY TO HAVE RECEIVED AWARD OF EXCELLENCE IN CARDIOVASCULAR CARE FROM THE NIGERIAN CARDIAC SOCIETY

## RESEARCH & COLLABOTRATIONS

CARDIOCARE HAS PROVIDED AVENUES FOR LOCAL RESEARCH & TRAINING.
COLLABORATED WITH FOREGN AND LOCAL ORGANIZATIONS TO HOST CARDIAC OUTREACHES THAT OFFERED LIFE SAVING INTERVENTIONAL PROCEDURES TO INDIGENT NIGERIANS

## TRAINING & SYMPOSIUM

TRAINING OVER 600 HEALTHCARE PROFESSIONALS VIA MONTHLY WEBINARS AND ANNUAL CARDIOVASCULAR SYMPOSIUM NOW IN ITS 8TH EDITION.
PG RESIDENCY ROTATION TRAINING MOUS WITH (UPTH, OAUTH)

# CASE 3

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| Presented @ the hospital ER | | O/E In obvious respiratory distress |
|---|---|---|
| 69-year-old-retired male professor | | PR **108** beats/min, regular, good volume |
| shortness of breath that got worse while on admission in a peripheral facility | | BP 140/78 mmHg |
| **Productive cough** | | No raised JVP |
| | | Heart sounds, Normal S1 S2 only + loud P2 |
| **The chest discomfort does not radiate** to the left arm and necks | | |
| Not a known hypertensive or diabetic. | | Resp rate **36 cycles/min** |
| **Does not smoke nor take alcohol** | | **O2 Sat 89% in room air** |
| Initially being managed for community acquired pneumonia the referring centre. Urgent CTPA showed consolidation in the right lobe with a filling defect in the right pulmonary artery | | Bronchial breath sound with coarse crepitation on the right lower lung zone laterally. |
| | | |

# CASE 3

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| Laboratory test | | Imaging |
|---|---|---|
| D-dimer- 4.5mg/L. | | ECG |
| FBC- WBC- 11.8 ,000 (Neutrophils- 76.2%) | | ECHO |
| Electrolyte Urea and Creatinine- Unremarkable | | |
| NT-pro-BNP: 544pg/mL | | |
| Troponin: Normal | | |
| INR: 1.0 | | |
| **HBA1C-5.7%** | | |
| CTPA- filling defect at the bifurcation of the right main pulmonary artery. | | |
| | | |

# ECG

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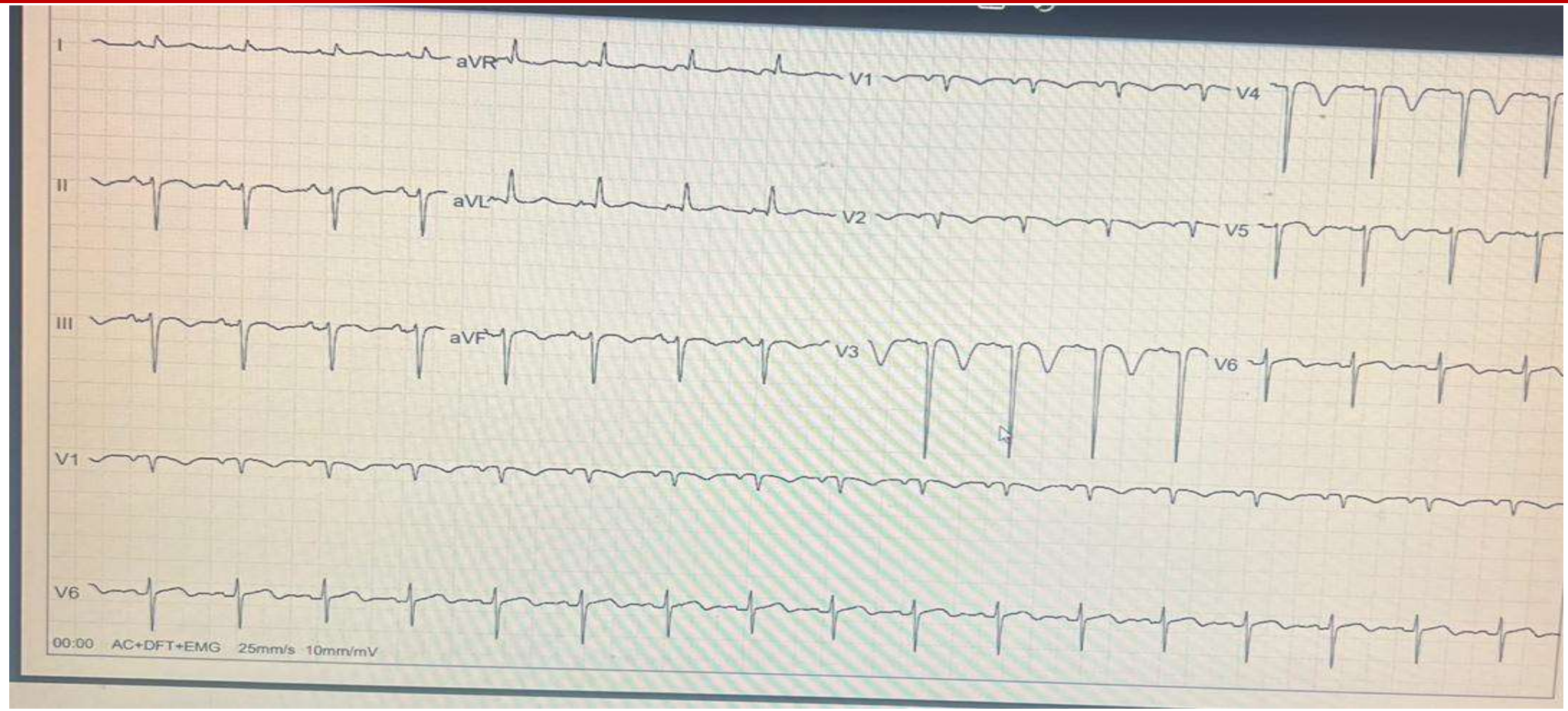

# WHY DOCTORS CHOOSE CARDIOCARE

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| | |
|---|---|
| 1 | **DETAILED FEEDBACK-REFERRAL:** Timely updates in form of feedback reports on referred cases to referring doctors |
| 2 | **TEAM WORK:** Opportunity to discuss & collaborate with diverse and multidisciplinary team of specialists on referred cases |
| 3 | **IMMEDIATE INTERVENTION:** in all aspect of cardiovascular medicine, 24/7 emergencies and same-day appointments for referred patients |
| 4 | **STATE OF ART FACILITY:** Ultramodern world-class equipment & fully computerized systems |
| 5 | **EXPERTISE & EXPERIENCE:** with the success rate of over 600 interventional cardiology procedures, ranging from cardiac device implantations to advanced heart failure treaments |
| 6 | **RESEARCH & COLLABORATIONS:** Data sharing & Research collaboartons with teaching hospitals & Public institutions for partnerships and residency trainings |

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# Echo

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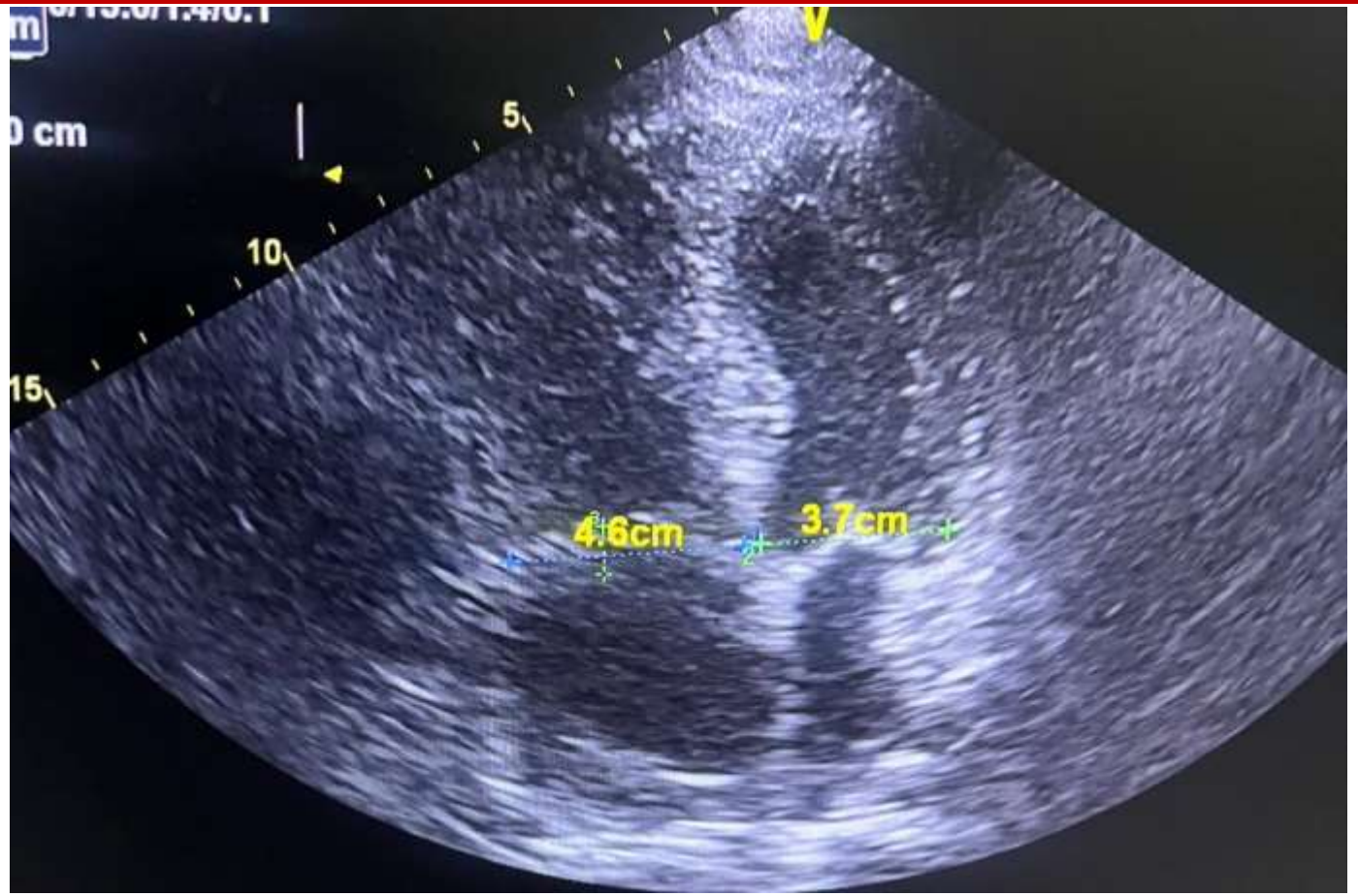


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# Q6. What is the likely P.E severity index of the patient as at the time of presentation



- A. low risk
- B. Intermediate risk
- C. High risk
- D. Very high risk

# Q7: what will be your approach to treatment at presentation ?



- A. High flow oxygen & Systemic thrombolysis
- B. Catheter Directed thrombolysis
- C. High flow oxygen & SC enoxaparin @1mg/kg 12hourly
- D. Surgical embolectomy

# HOW TO REFER TO CARDIOCARE

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| | |
|---|---|
| 1 | **REFERRAL LETTER:** Give a standard referral letter & preferably attach any available results of previous investigations |
| 2 | **ON-SITE REFERRAL:** Visit no 5 Giza Close, Area 11 Garki off Dunukofia Str- near FCDA) Abuja-FCT. |
| 3 | **EMAIL:** Send an email to frontdesk@cardiocare.ng or o.solomon@limihospital.org or e.james@limihospital.org |
| 4 | **WHATSAPP:** Send a Whatsapp message to 0908-331-7777 0806-530-1797 |
| 5 | **CALL:** 0908-331-7777, 0817 444 0888 |
| 6 | **IDENTIFICATION:** Kindly indicate Doctor's name, & email/phone number especially if you wish to receive a medical report afterwards. |

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# Case presentation….



| Treatment | Progress report |
|---|---|
| Commenced on Oxygen Therapy via Non re-breather Face mask @15L/min | **72hours into admission, patient saturation has improved to SPO2-94-96%, tachypnoic RR-18cpm and blood pressure remain stable @ 138/80mmHg.** |
| Commenced Sc Enoxaparin 80mg 12 hourly. | |
| | |

# Q8. What approach in the long-term treatment of the patient is not correct ?



- A. Transit to Tab Rivaroxaban 15mg b.d, then 20mg daily for 3-6months.
- B. Transit to Tab Rivaroxaban 20mg b.d, then 20mg daily for 3-6months.
- C. Transit to Tab Rivaroxaban 10mg b.d, then 15mg daily for 3-6months.
- D. Transit to Tab Rivaroxaban 15mg b.d, then 20mg daily for 1month.

# Case presentation….



- He was transited to Oral anticoagulants at day 6 (Tab Rivaroxaban 15mg b.d, then 20mg daily) and counselled on the expected duration of anticoagulation of 3-6months.
- She was discharged home on day 8 of hospital admission and has been regular on clinic visits.

LETS SUPPORT
YOUR PATIENTS WITH
WORLD CLASS
CARDIAC SOLUTIONS

# Echo @ 2months of anticoagulation

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# 6-Steps to Diagnosing or Excluding Pulmonary Embolism

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**1. Clinical Presentation**
- Dyspnea
- Hypoxemia
- Chest Pain/Pleurisy
- Hemodynamics

**2. Risk & Probability**
- Wells Score
- DVT

**3. Biomarkers**
- D-Dimers
- +/- BNP
- +/- Troponin

**4. ECG**
- RV strain
- Tachycardia

**5. ECHO**
- RV/LV Ratio
- RV Dysfunction

**6. CT Pul Angio**
- Diagnostic Gold Standard

**EXCLUDE DIFFERENTIALS WHICH COULD MIMIC OR HAPPEN CONCURRENTLY:**
- Acute Coronary Syndrome
- Acute Heart Failure
- Severe Sepsis
- Pneumonia

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# Diagnostic Algorithm (Hemodynamic Stability)

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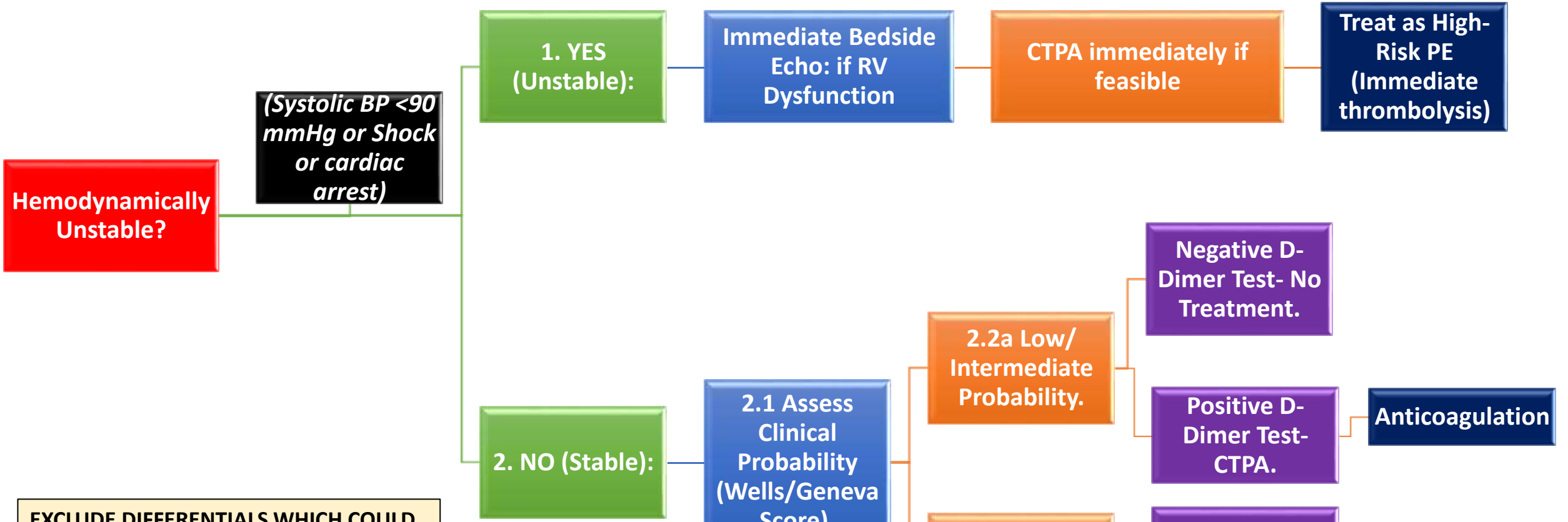


**EXCLUDE DIFFERENTIALS WHICH COULD MIMIC OR HAPPEN CONCURRENTLY:**

- Acute Coronary Syndrome
- Acute Heart Failure
- Severe Sepsis

# Conclusion & Take-home messages

**High Suspicion:** PE is common but often missed. Suspect it in unexplained dyspnea and desaturation.

**Act Fast:** P.E + Hemodynamic instability = High Risk, & Requires Immediate Reperfusion Therapy.

**Gold Standard:** CTPA is the diagnostic choice; Echo is crucial for the unstable patient.

**Therapy:** NOACs are now the standard for most stable patients.

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# THANK YOU

Our vision to curb medical tourism
Is incomplete without your collaborations

**Lets do it together!**

**Lets support your practice for better patients outcomes.**

**Lets partner with you…**

**Cardiocare Hospital Abuja appreciates you & the opportunity to be here!**

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