



# Cardiopulmonary Compromise in the Preoperative Assessment

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## Introduction

- Multimorbidity in our aging population increases surgical risk
- Comprehensive preoperative assessment for elective procedures improves outcomes and reduces mortality
- It is essential to take a holistic approach to the patient in order to provide preoperative advice<sup>1,2,3</sup>

## Case Presentation

### HPI:

- 67yo man with TUD, class I obesity, untreated OSA, and recurrent basal cell carcinoma (BCC) of the external auditory canal (EAC) who presented to the preop clinic prior to planned BCC removal, left temporal bone resection, parotidectomy, and reconstruction.
- 6-8mo EAC pain, bleeding, & discharge; 1mo increased fatigue, dyspnea on exertion (1 flight); no CP; completes all ADLs/iADLs; pt spontaneously lies down during H&P 2/2 dyspnea
  - Prior Surgery: BCC excision and reconstruction w/high graft 2018

**Objective:** HR 77, BP 134/81. RR 17, SpO2 94% RA, BMI 32 kg/m<sup>2</sup>

HEENT: mallampati 4, normal ROM & dentition, mild distress  
 CV/PULM: RRR, no M/R/G; no JVD/edema; tachypneic  
 Edmonton Frailty: 2/17 (WNL); ASA Risk: 2; Gupta: <1% MACE  
 Labs: WBC 15, Hgb 16, plt 186; Cr 1.06, Na 138, K 4.0  
 ECG: old inf infarct and left axis, new t-wave inversions III, V1/2  
 Meds: prednisolone and cipro drops for left ear, Omega 3 FA

### Plan:

- TTE: RV mildly enlarged w/decreased systolic function, LVH, mod aortic regurgitation, LV EF 55-60%
- Case canceled after multidisciplinary discussion per surgeon, anesthesia, and preop provider for expedited Cardiology eval

## Differential Diagnosis

1. Acute decompensated heart failure
2. Atypical or viral pneumonia
3. Pulmonary embolism
4. COPD exacerbation
5. Metastatic disease
6. Deconditioning
7. NSTEMI or atypical angina

## Hospital Course

### ED Course:

- Worsened dyspnea, cough, palpitations, COVID-19 negative
- O2 Sat 88% x1; NT-proBNP 1,696, WBC 14.25, HS-Trop 25
- ECG: unchanged, CXR: multifocal GGOs → Ceftriaxone + Azithro
- Wells' Criteria: 4 (moderate) & PERC Rule: 2 (positive)

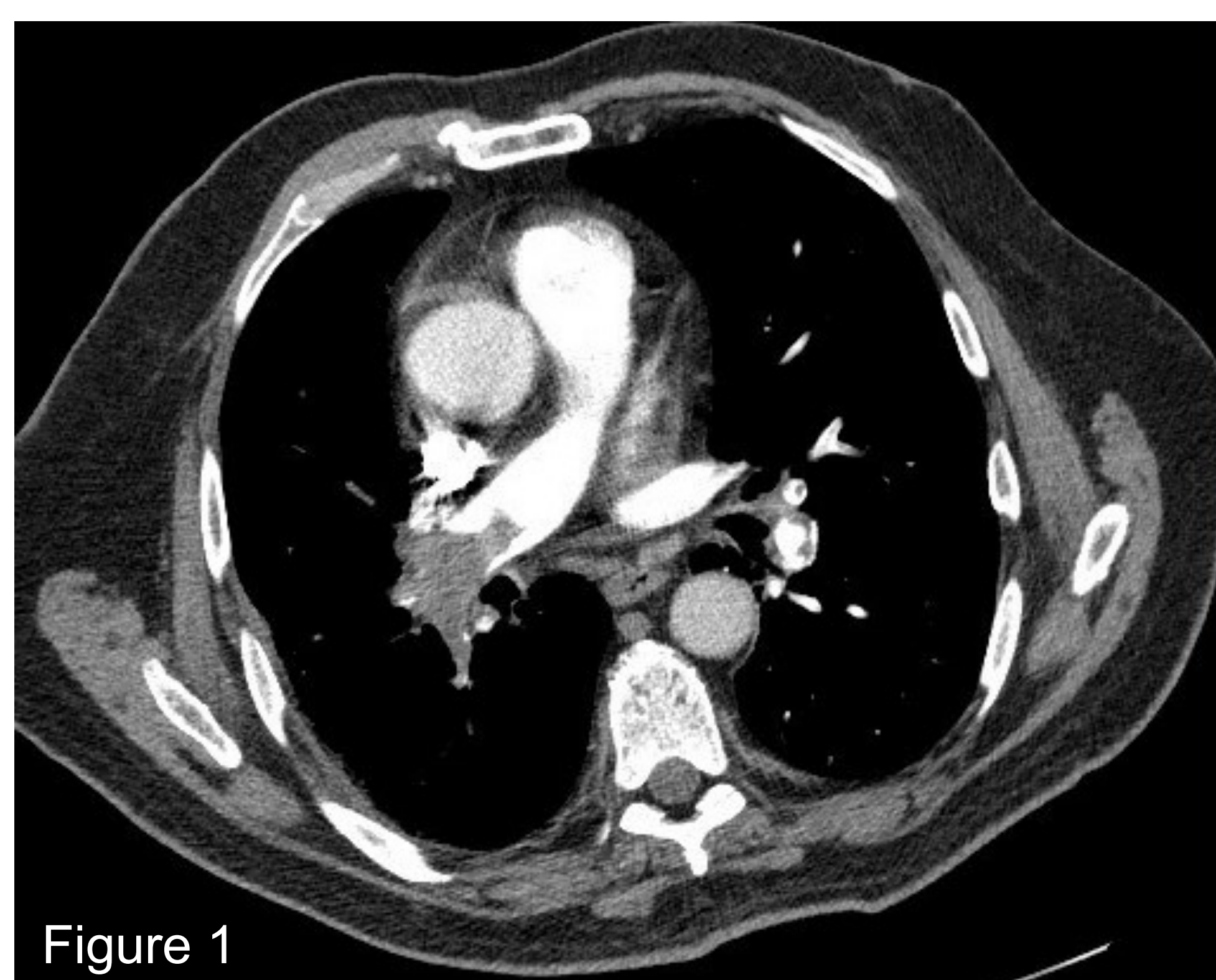


Figure 1

### Admitted for acute CHF vs PNA vs PE:

- CTA PE: bilateral main pulmonary artery embolism with right ventricular dilation concerning for right heart strain (Figure 1)
- Duplex U/S: no DVT on right, left lower extremity with extensive DVTs (common femoral, deep femoral, popliteal, etc.)
- Patient received heparin drip → PE response team noted no indication for thrombolysis → transitioned to apixaban
- Discharged: plan for repeat risk stratification prior to procedure

## Preoperative Assessment

### Preoperative Thinking

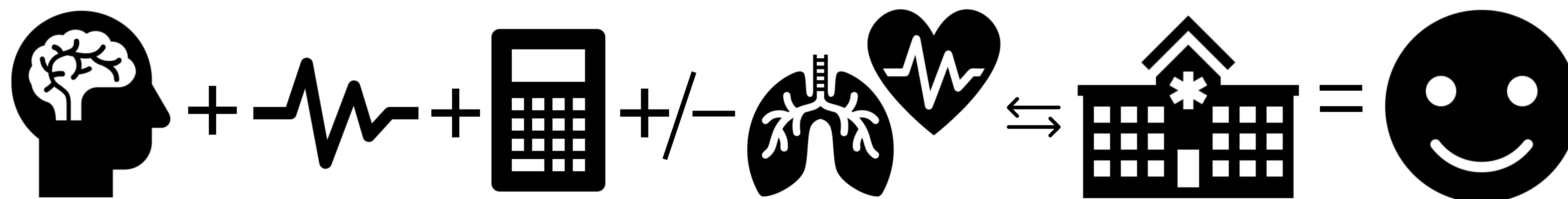
- Optimize chronic conditions
  - Consider medications & labs
- Evaluate cardiopulmonary fitness
- Consider prehabilitation activities
  - Create a SMART goal
- Assess for risky substance use
- Assess of implanted devices
- Identify surrogate decision maker and obtain Advanced Directive
- Infection prevention (e.g. Hibiclens)
- NPO status
- Day of medications (take & hold)

### Risk Stratification Tools

- ASA Physical Status Classification
- UCLA surgical risk stratification
- History of anesthesia complications
- History of delirium
- History of MRSA/C. diff infection
- Use of assistive devices
- Edmonton Frail Scale
- Duke Activity Status Index (4 METs)
- Mini-Cog or MOCA, social support
- STOP-BANG, sleep study
- MACE Risk Calculators:
  - Gupta, RICI, NSQIP, AHA

### Multidisciplinary Care

- Goal: safe & successful surgery
- Surgeon: urgency & scope/risk
- Anesthesiologist: surgical venue & risk of acute decompensation
- Perioperative medicine: limited encounter for comprehensive risk assessment and care planning
- Cardiologist: cardiac risk stratification, stabilize & optimize
- Primary Care: patient advocate & clinical contextualization of risks
- Specialist: disease optimization

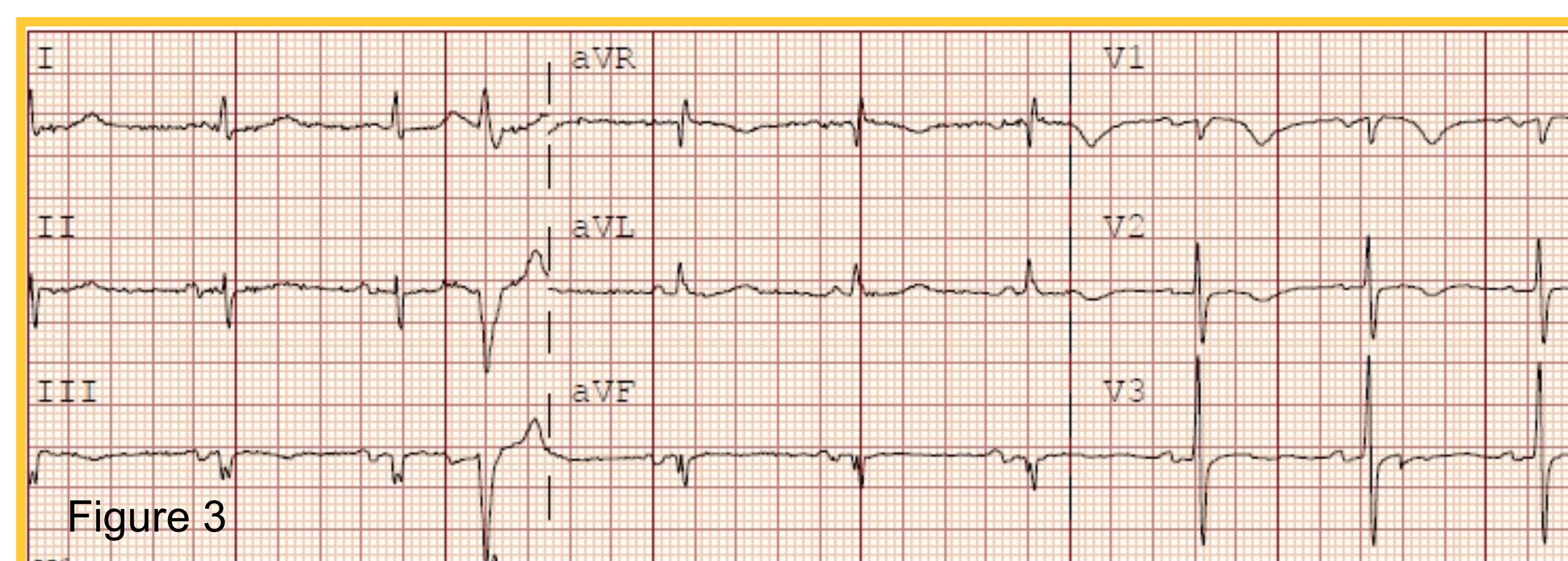
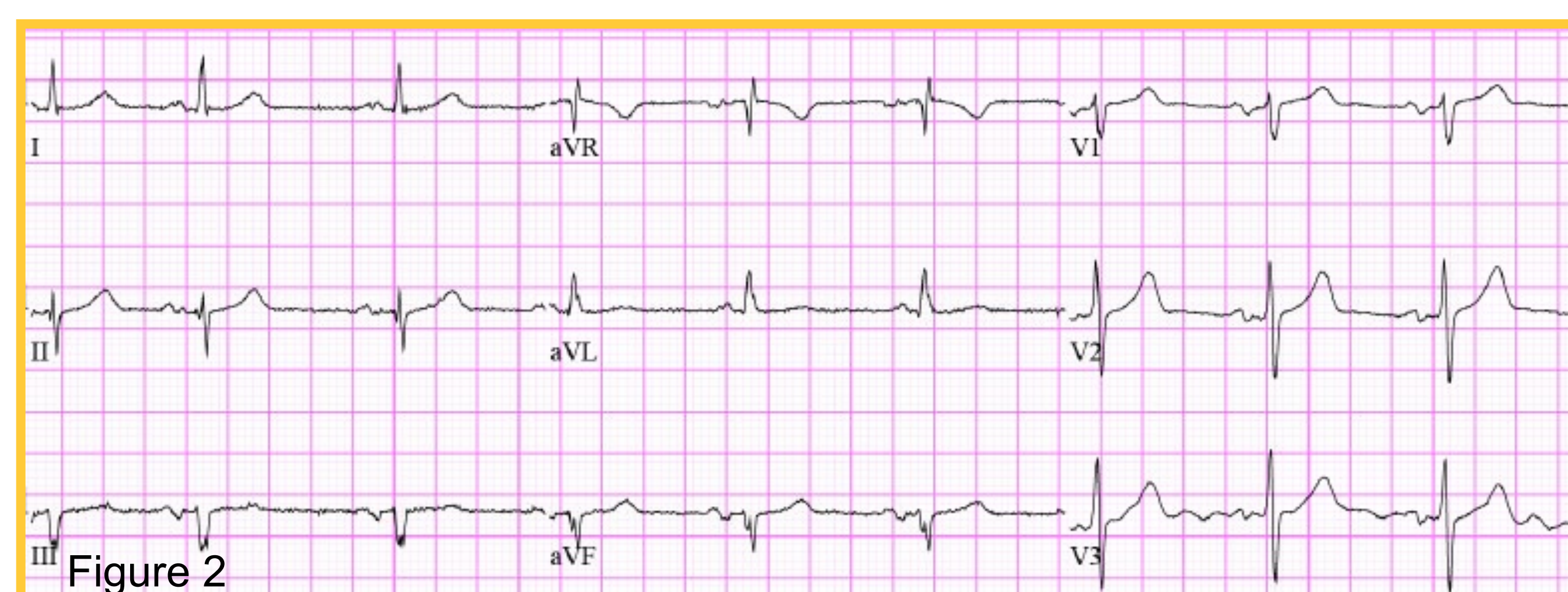


### Considering the preoperative evaluation:

Medical decision making + initial data + risk calculators +/- additional testing with bidirectional team communication = positive surgical outcome

## Considerations for Pulmonary Embolism

**Figures 2 & 3:** 4/2021 & 10/2021 ECGs showing old S1Q2 & S1Q3T3 plus V1-3 T-wave inversion respectively

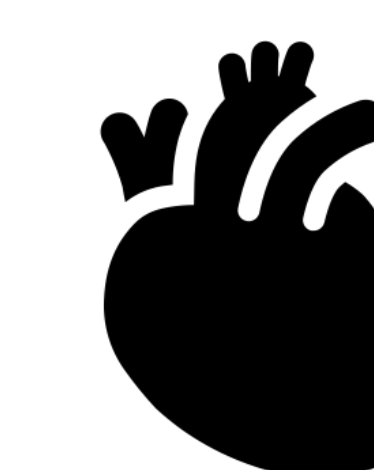


### Acute RV Dysfunction

1. RV dilation
2. Paradoxical septal systolic motion
3. Pulmonary HTN

### ECG Findings in Acute PE:

- T-wave inversions in V1-V3
  - Sens 75%, Spec 88%
- S1Q3T3 (Q wave > 0.15 mV or 1.5 mm)
  - Sens 35%, Spec 90%
- RBBB
  - Sens 30%, Spec 83%
- Tachycardia (HR ≥100 bpm)
  - Sens 60%, Spec 68%<sup>4</sup>



### Wells' Criteria for PE

- Clinical DVT signs +3
  - PE = #1 dx +3
  - Heart rate >100 bpm +1.5
  - Immobilization ≥3d / Surgery ≤4 wks +1.5
  - H/o DVT / PE +1.5
  - Hemoptysis +1
  - Malignancy w/tx ≤6mo +1
- Low 0-1: 1%, Mod 2-6: 16%, High >6: 38%

### PERC Rule for PE

- ≥50yo, ≥100bpm, <95% RA, unilat leg swelling, hemoptysis, surgery, h/o PE/DVT, hormone use
- PERC Neg + pretest prob <15%: Sens 97%<sup>6</sup>

## Discussion

- A comprehensive preoperative assessment requires a distinct perioperative thought process, incorporates historical data with clinical risk calculators, and hinges upon multidisciplinary care coordination to minimize risk
- There are several ECG findings associated with acute PE with variable diagnostic value
- Utilize risk scores (e.g. Wells' Criteria and PERC Rule) to further stratify a patient's risk of PE and need for imaging
- Clinical judgement and concern remains an important counter balance to nearly all clinical decision aids, including lab tests, imaging studies, and risk stratification tools

## References

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