Cardiogenic Shock

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Disclosures

- None

Case 1

- 65 year old female presents to ED hypotensive, minimally responsive
- Family states she has had crackles and has sounded “wet” for the past 5 days
- She has not complained of chest pain, but has had chills, lower abdominal discomfort

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- Physical Exam
  - BP 95/35, HR 117, Temp 100.8, RR 30
  - Cool, clammy extremities
  - Altered mental status (from baseline per family)
  - Low grade fever
  - Crackles and rales throughout both lung fields
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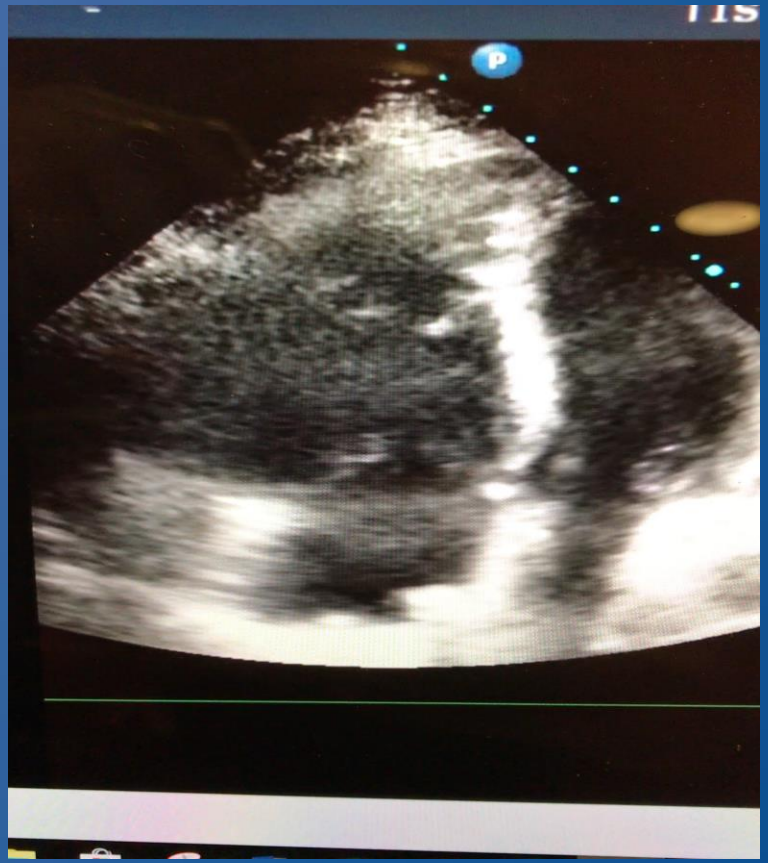
- Labs/Imaging
  - WBC count 15,000
  - Hgb 13.5 mg/dL
  - Serum Creatinine 2.2
  - CXR – Diffuse alveolar edema
  - Blood Cultures Pending
  - UA shows WBCs, RBCs, Nitrite Pos, Leukocyte Esterase, Culture pending
  - ABG 7.23/65/25/12

Case 1



Overview

- Cardiogenic Shock (CS)
  - 5-8 % of hospitalized patients with STEMI
  - Neurohormonal and cytokine pathways play key role in perpetuating this disorder
  - In the case of STEMI or NSTEMI caused CS, early revascularization significantly increases survival
- Any cause of acute, severe LV or RV dysfunction can lead to CS

Overview

- What is Cardiogenic Shock?
  - It is a state of end organ (heart) hypoperfusion
- Definition
  - Persistent hypotension (SBP < 80-90 mmHg or MAP < 30 mmHg from baseline) with severe reduction in Cardiac Index (CI)
    - CI < 1.8 L/min * m2 without support or
    - CI < 2.0-2.2 L/min * m2
- Normal or elevated filling pressures
  - LVEDP > 18 mmHg or RVEDP > 10-15 mmHg

Diagnosis

- PAC is helpful in diagnosis however, Doppler Echocardiography can be used to diagnose elevated LV filling pressure
- Wide spectrum
  - Mild hypoperfusion
  - Profound shock

Diagnosis

- Most common causes of cardiogenic shock
- Important to rule out mechanical causes of shock in MI patients
  - In non-anterior MI patients:
    - VSD or Ventricular Septal Rupture
    - Contained Free Wall Rupture
    - Papillary Rupture resulting in Acute Ischemic MR
  - Echocardiography EARLY
  - If extensive anterior MI → Cath Lab ASAP for revascularilzation
  - However, if Echo shows valvular disease or LV pseudoaneurysm, surgical management may be recommended over PCI

Non-MI Causes of CS

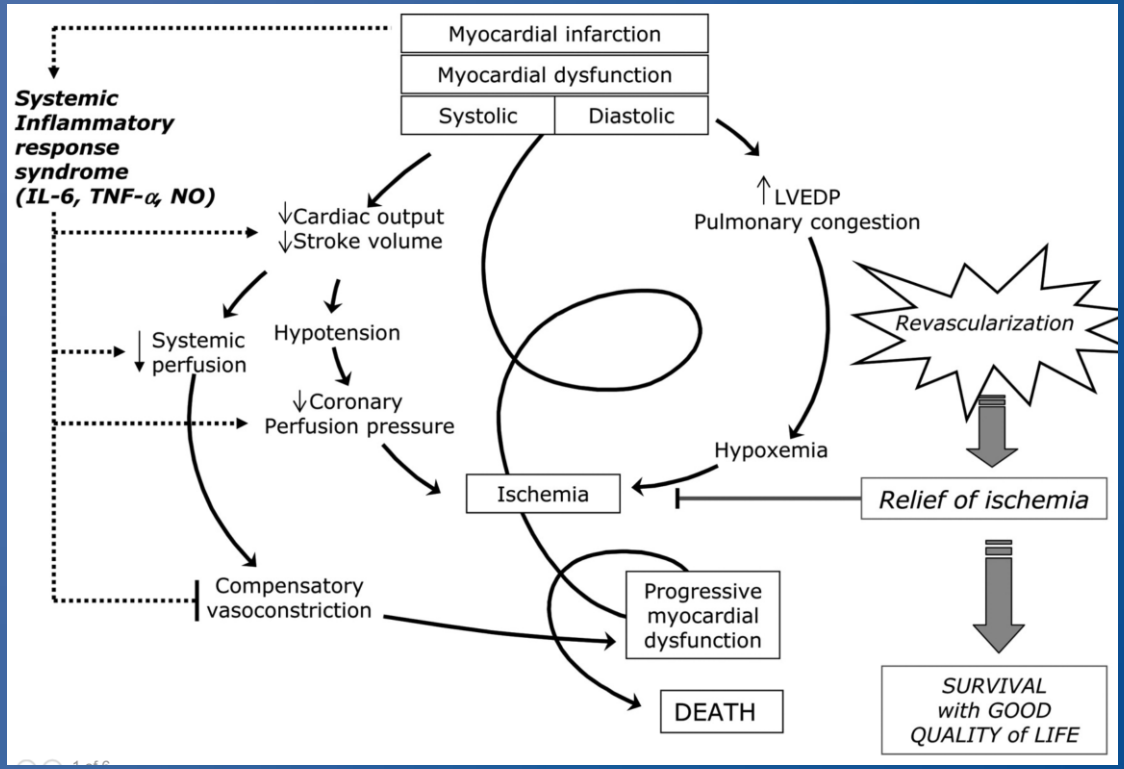
- Acute Myopericarditis
- Tako-Tsubo Cardiomyopathy
- Hypertrophic Cardiomyopathy
- Acute Valvular Regurgitation
  - Chordal Rupture
  - Endocarditis
- Aortic Dissection secondary to MI or severe AI
- Pericardial Tamponade or Massive PE

Circulation. 2008;117:686-697

Diagnosis

- Clinical Diagnosis Key!
  - Cool extremities
  - Altered mental status
  - Decreased urine output

END ORGAN PERFUSION DEFICIT!



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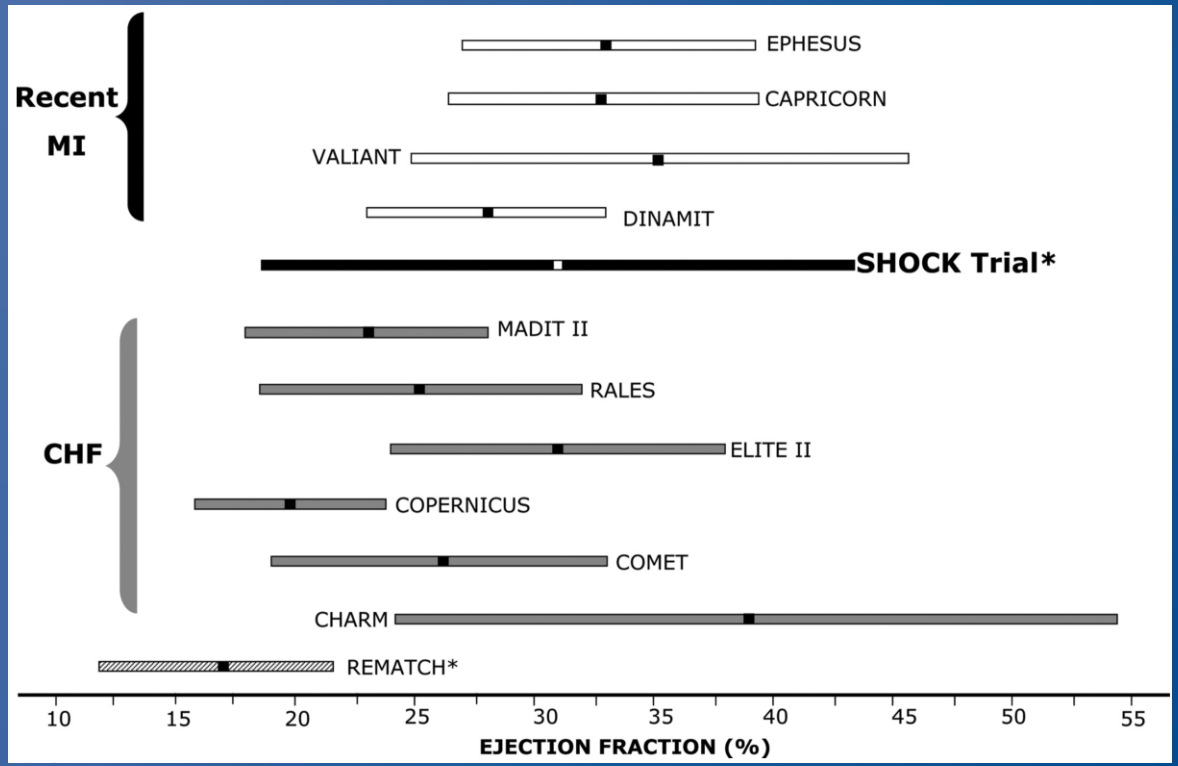
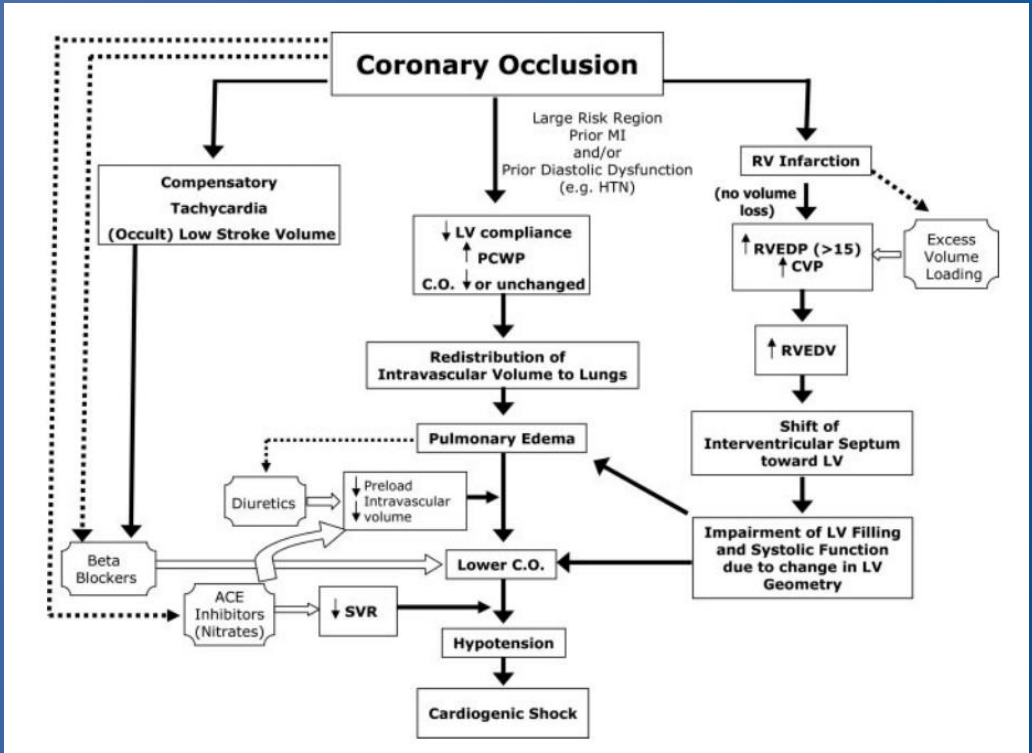

Recent MI
EPHESUS
CAPRICORN
VALIANT
DINAMIT
SHOCK Trial*
CHF
MADIT II
RALES
ELITE II
COPERNICUS
COMET
CHARM
REMATCH*
10
15
20
25
30
35
40
45
50
55
EJECTION FRACTION (%)



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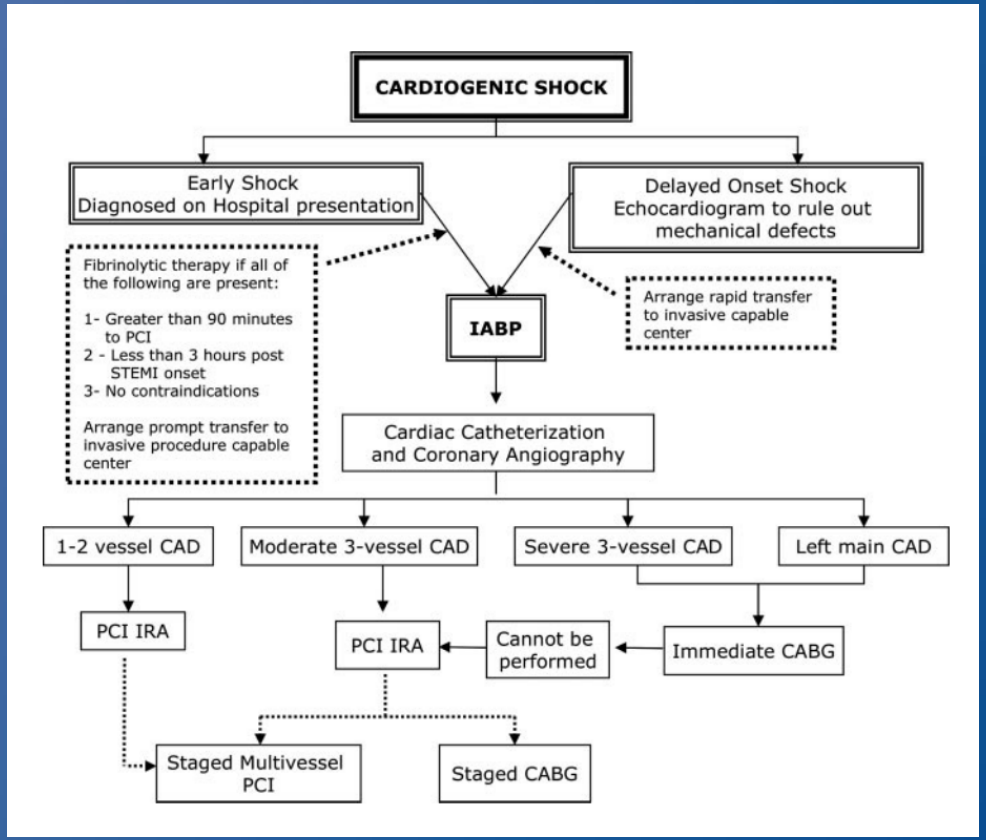

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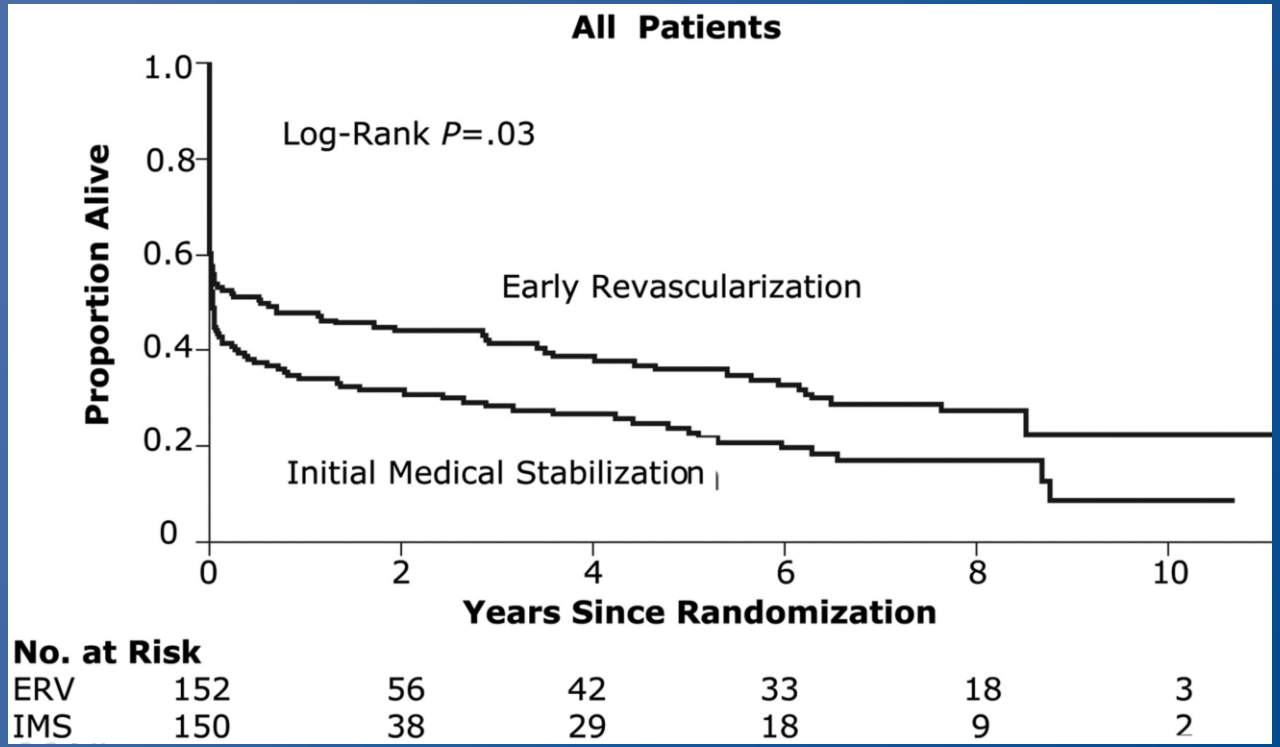
Long Term Follow Up - SHOCK



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Intraoperative CS

- CS in the operating room may be initially masked by increased SVR
  - Which patient is more likely to be in CS?
    - BP 105/95
    - BP 110/45

Intraoperative CS

- Hypotension due to CS, may be initially masked by increased SVR
  - **Reduced PP** – Reduced PP may be due to a low cardiac output with vasoconstriction, which occurs in most types of shock. For example, a vasoconstricted shock patient with BP 90/60 mmHg has a small PP of only 30 mmHg, which is less than the diastolic BP.
  - **Increased PP** – Increased PP may be due to a high cardiac output with vasodilation, which occurs in distributive shock. For example, a vasodilated patient with BP 90/35 has a large PP of 55 mmHg, which is higher than the diastolic BP.

Hrymac et al. https://www.uptodate.com/contents/intraoperative-management-of-shock-in-adults#H226196103

Cardiogenic Shock?

Cardiogenic Shock?

Rapid Assessment in the OR
The Pump

- Assessment of the left ventricle (LV), right ventricle (RV), and pericardium can rapidly diagnose the etiology of shock.
- •Cardiogenic shock – Severely decreased contractility of the LV, RV, or both.
- •Hypovolemic shock – Small LV and RV.
- •Distributive shock – Small LV with hyperdynamic contractility.
- •Obstructive shock – Pericardial effusion, pneumothorax (suggested by absence of lung sliding) or pulmonary embolus (suggested by RV enlargement and dysfunction)

Rapid Assessment in the OR
The Tank

- Leaking tank – Pleural effusion, peritoneal fluid accumulation, leaking aortic aneurysm.
- Overloaded tank – Pulmonary edema due to volume overload (suggested by presence of B lines [narrow vertical hyperechoic reflections that arise at the pleural line and extend to the bottom of the ultrasound screen]).

Rapid Assessment in the OR
The Pipes

- Assessment of the abdominal and thoracic aorta and the femoral and popliteal veins can detect vascular problems.
- Aortic dissection or aneurysm
- Deep vein thrombosis in the lower extremities

Revisit Case 1

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What is the Diagnosis?

- Cardiogenic Shock….or Something Else?

Initial Treatment for Cardiogenic Shock

- Inotropy!!!
- Watch your volume!
- Maximize FORWARD flow!
- Address Underlying Cause!
- Be vary of multiple causal factors!

Inotropy

- Milrinone
- Dobutamine
- Epinephrine
- +/- Norepinephrine

Adjuncts

- Epoprostenol
- Nitric Oxide

Questions?