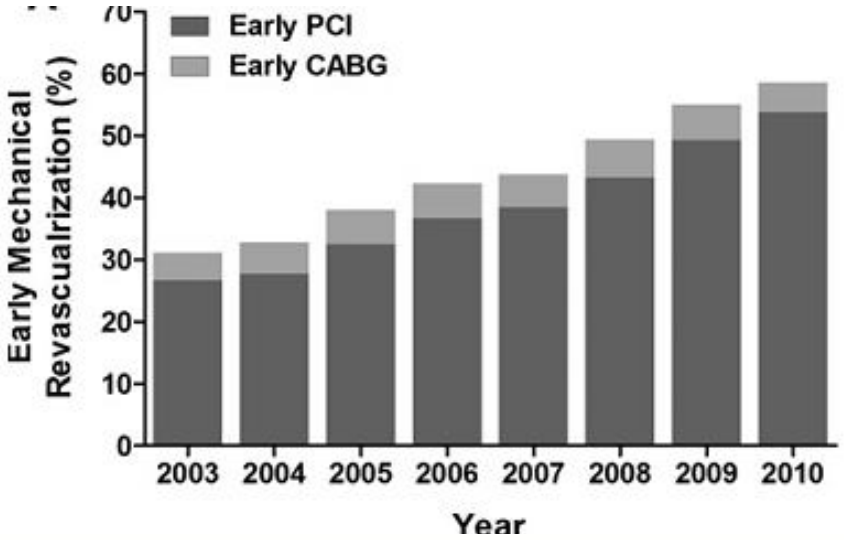
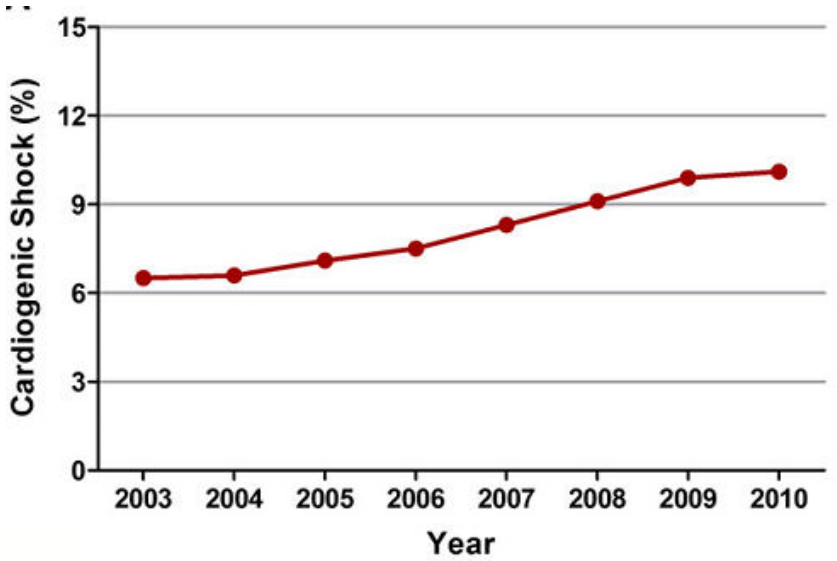
HEART FAILURE

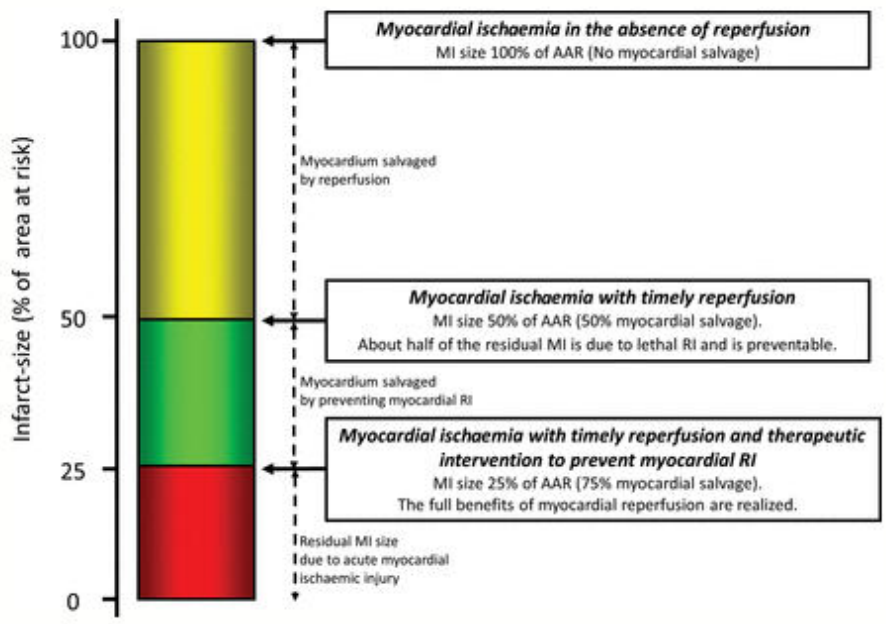
RULES

40 MINUTES

Are we missing the point?







- **Despite timely PPCI** with STEMI
- **mortality decreased to 7%**
- but **heart failure increased to 22%**

(1 year after event)

WHAT IS EXPECTED TO KNOW?

- **Definitions**
- **Etiology**
- **Types**
- **Symptoms**
- **Signs**
- **Medical Tx**
- **Surgical Tx**
- **HEMODYNAMICS**
- **CLINICAL RECOGNITON & DIFFERENTIATION**
- **ASSESSING SEVERITY**
- **ORDERING TESTS**
- **IMMEDIATE MANAGEMENT**
- **LONG TERM MANAGAMENT**

WHAT HAPPENS IN HEART FAILURE?

SVC 5	PV 10
RA 5	LA 10
RV 25/0-5	LV 120/0-10
PA 25/10	AO 120/80

NORMAL

SVC 8	**PV 25 PCWP 25**
RA 8	**LA 25**
RV 40/0-8	LV 100/**0-25**
PA 40/25	AO 100/60

AHF: LVEDP 25

LVEDP=mLAP=mPCWP **CPP=DBP-LVEDP**

SVC 5	PV 12 PCWP 12
RA 5	LA 12
RV 30/0-5	LV 10/0-12
PA 30/12	AO 100/70

COMPENSATED HF

SVC 5	PV 20 PCWP 20
RA 5	LA 20
RV 40/0-5	LV 10/0-20
PA 40/20	**AO 80/60**

DECOMPENSATED HF
LVEF reduced: Perfusion Low

CLINICAL RECOGNITION

LEFT HEART FAILURE

- DOE
- ORTHOPNEA (LAP>24)
- BENDOPNEA*
- PND (LAP>18)
- PINK FROTHY SPUTUM
- RAPID THREADY PULSE
- SBP LOW
- CARDIOMEGALY
- S3 (LVEDP>18)
- BILATERAL BASAL CREPS
- COLD EXTREMITIES

RIGHT HEART FAILURE

- SWELLING
- ABDOMINAL PAIN
- JVP ELEVATED
- HJR+ (PCWP> 18)
- PEDAL EDEMA

ALSO

- LOW URINE OUTPUT
- CONFUSION
- FATIGUE

NYHA

Class I	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation or dyspnoea. **LAP<12**
Class II	Slight limitation of physical activity. Comfortable at rest but ordinary physical activity results in fatigue, palpitation or dyspnoea. **LAP 12-18**
Class III	Marked limitation of physical activity. Comfortable at rest but less than ordinary activity results in fatigue, palpitation or dyspnoea. **LAP 18-24**
Class IV	Unable to carry out any physical activity without discomfort. Symptoms at rest. If any physical activity is undertaken, discomfort is increased. **LAP>24**

Outdoor Work
Household Choirs
Personal Activities
PND
Orhtopnea

MODIFIED ROSS SCALE

Class I: Asymptomatic

Class II: Mild tachypnea or diaphoresis with feeding in infants, dyspnea on exertion in older children

Class III: Marked tachypnea or diaphoresis with feeding in infants, marked dyspnea on exertion, prolonged feeding times with growth failure

Class IV: Symptoms such as tachypnea, retractions, grunting, or diaphoresis at rest

SUCK REST SUCK
DIAPHORESIS
FEEDING DIFFICULTY
FTT

ACC/ AHA

ACC-AHA Stage	NYHA Functional Classification
A At high risk for heart failure but without structural heart disease or symptoms of heart failure (eg, patients with hypertension or coronary artery disease)	None
B Structural heart disease but without symptoms of heart failure	I Asymptomatic
C Structural heart disease with prior or current symptoms of heart failure	II Symptomatic with moderate exertion
	III Symptomatic with minimal exertion
D Refractory heart failure requiring specialized interventions	IV Symptomatic at rest

FRAMINGHAM CRITERIA
2 MJ/ 1MJ+2MN

Major criteria
- Paroxysmal nocturnal dyspnea
- Orthopnea
- Elevated jugular venous pressure
- Crepitations
- Third heart sound
- Radiological evidence of cardiomegaly
- Radiological evidence of pulmonary edema

Minor criteria
- Extremity edema
- Night cough
- Exertional dyspnea
- Hepatomegaly
- Pleural effusion
- Heart rate >120
- Loss of >4.5 kg in 5 days following diuretic treatment

FOR CHILDREN
NADAS CRITERIA
1 MJ/ 2MN

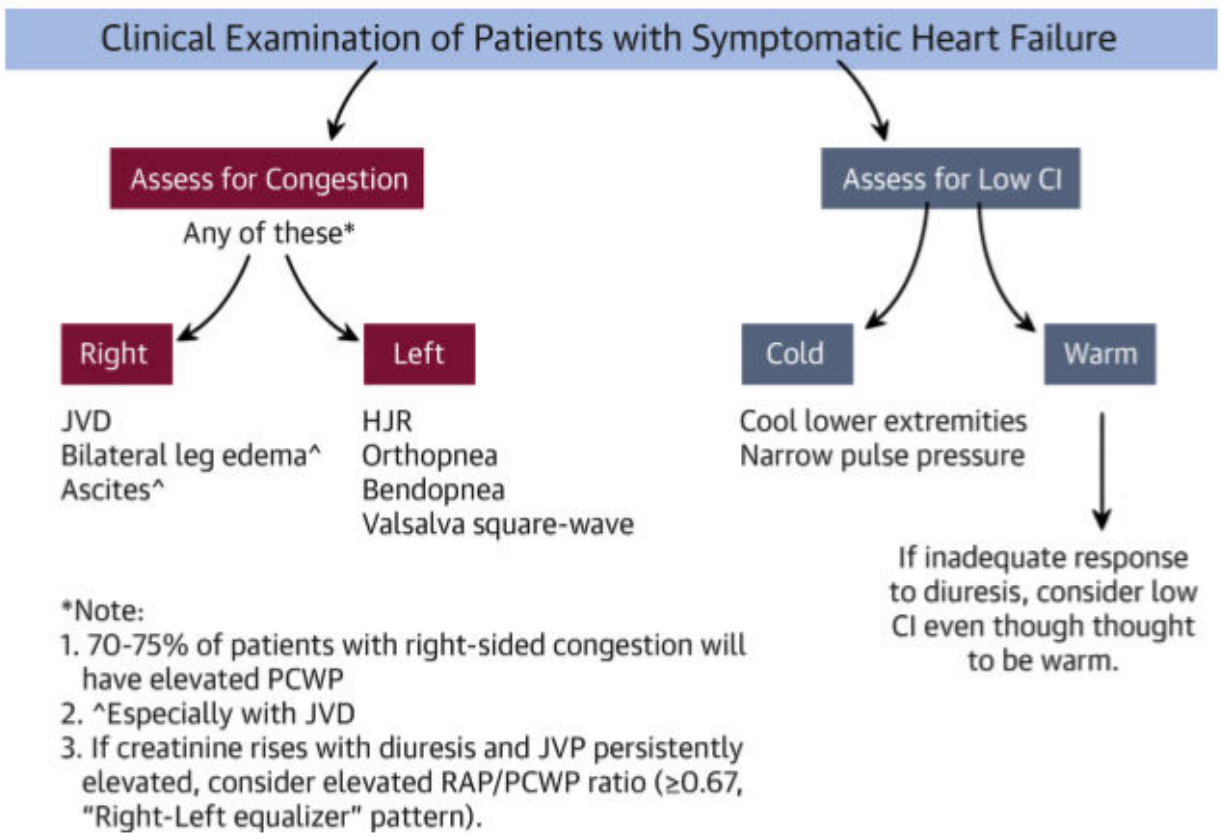
- MAJOR
- Systolic murmur III or more
- Diastolic murmur
- Cyanosis
- CHF

- MINOR
- Systolic murmur II or less
- Abnormal S2
- Abnormal CXR
- Abnormal ECG
- Abnormal BP

BENDOPNEA

A patient sits in a chair, bends at the waist, and touches his or her feet. Bendopnea is considered present if dyspnea occurs within 30 s of bending.

VOLUME STATUS
PERFUSION STATUS



*Note:
1. 70-75% of patients with right-sided congestion will have elevated PCWP
2. ^Especially with JVD
3. If creatinine rises with diuresis and JVP persistently elevated, consider elevated RAP/PCWP ratio (≥0.67, "Right-Left equalizer" pattern).

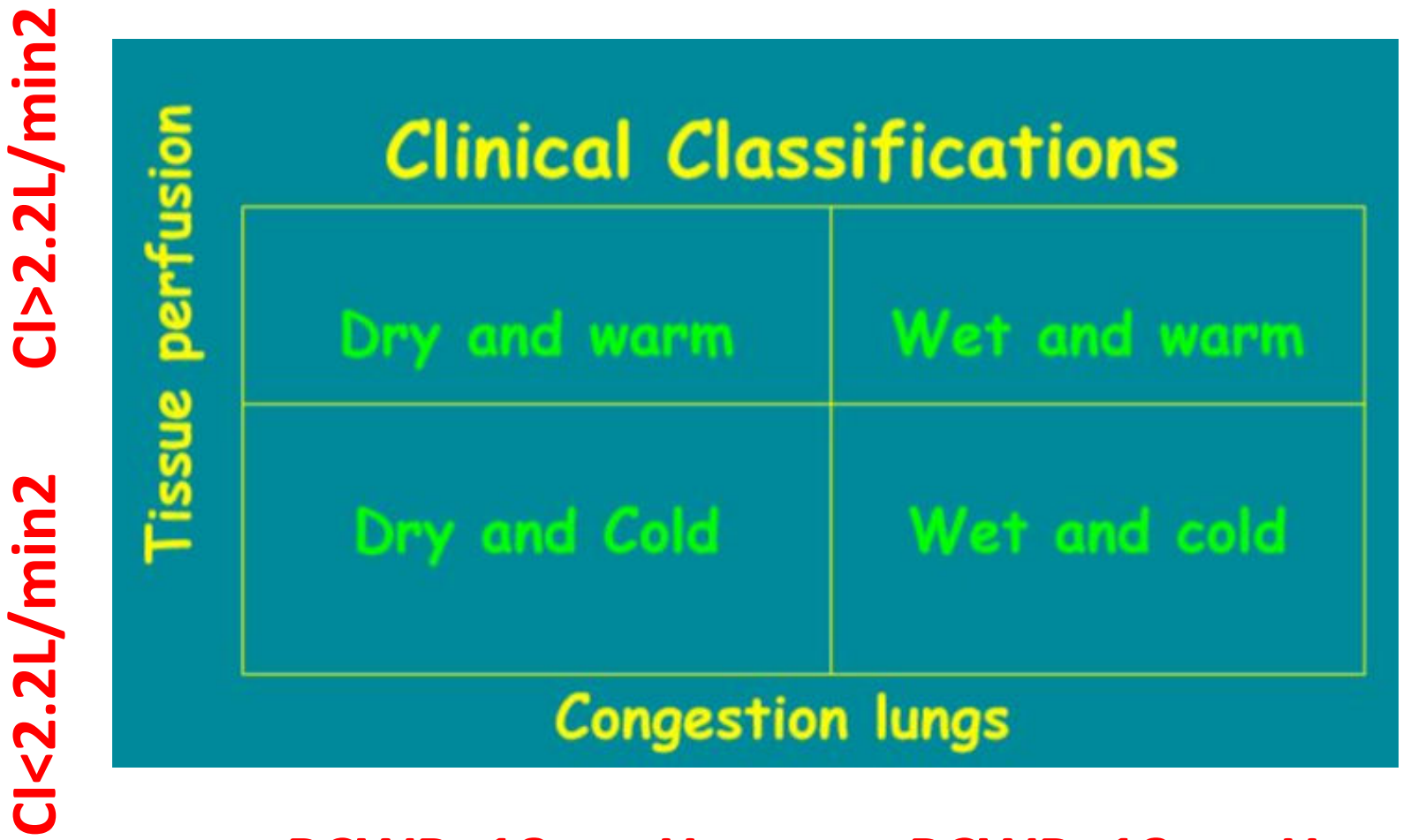
HOW GOOD ARE THE CLINICAL SIGNS?

Variable	Sensitivity (%)	Specificity (%)	Accuracy (%)
Hx of HF	62	94	80
Dyspnea	56	53	54
Orthopnea	47	88	72
Rales	56	80	70
S3	20	99	66
JVD	39	94	72
Edema	67	68	68

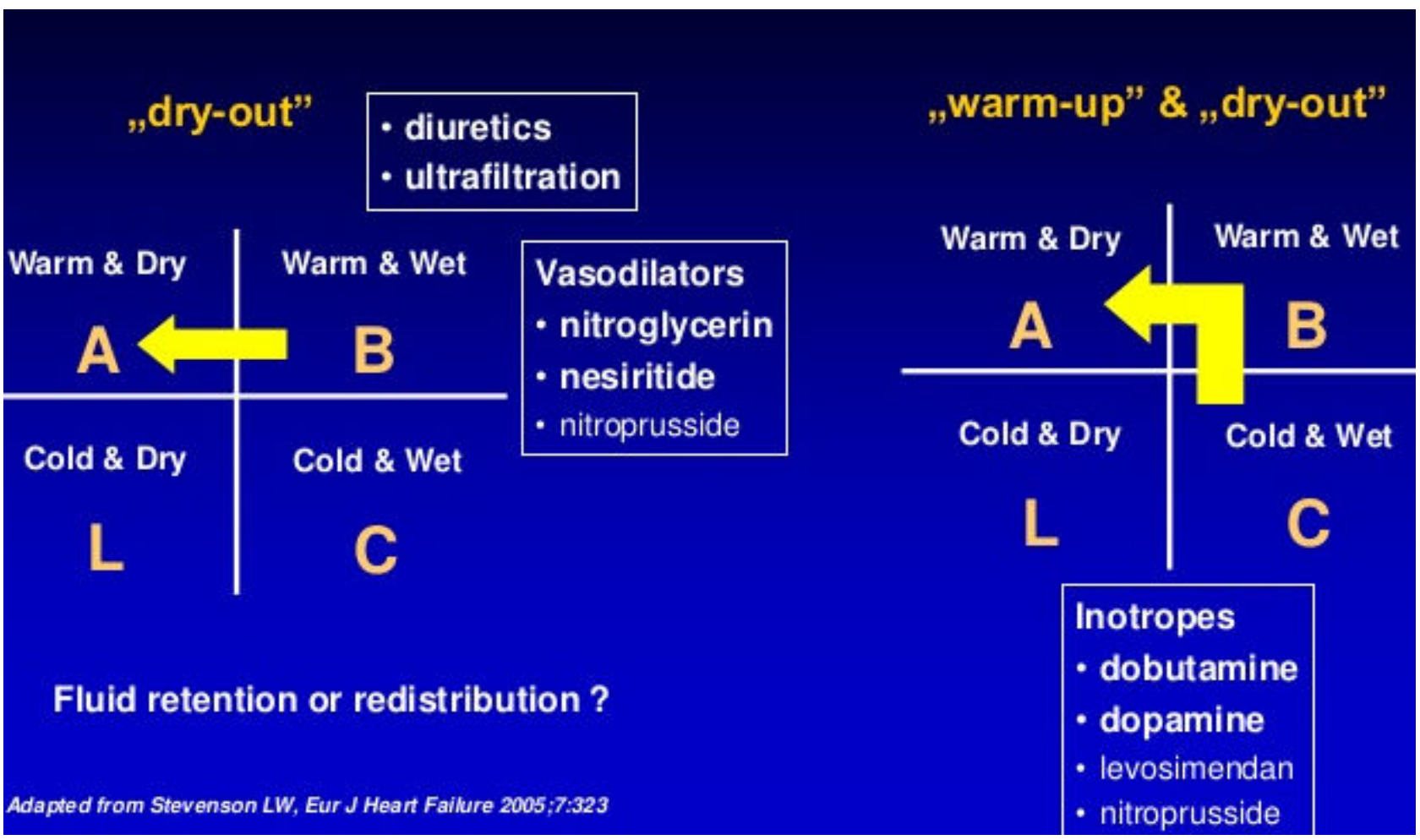
KILLIP Class and AMI

Killip Class	Definition
I	No evidence of HF
2	Rales up to ½ of lung fields or S3 heart sound, and Systolic BP > 90 mmHg
3	Frank pulmonary edema and Systolic BP > 90 mmHg
4	Cardiogenic shock with rales, Systolic BP < 90 mm Hg and Signs of tissue hypoperfusion

FORRESTER

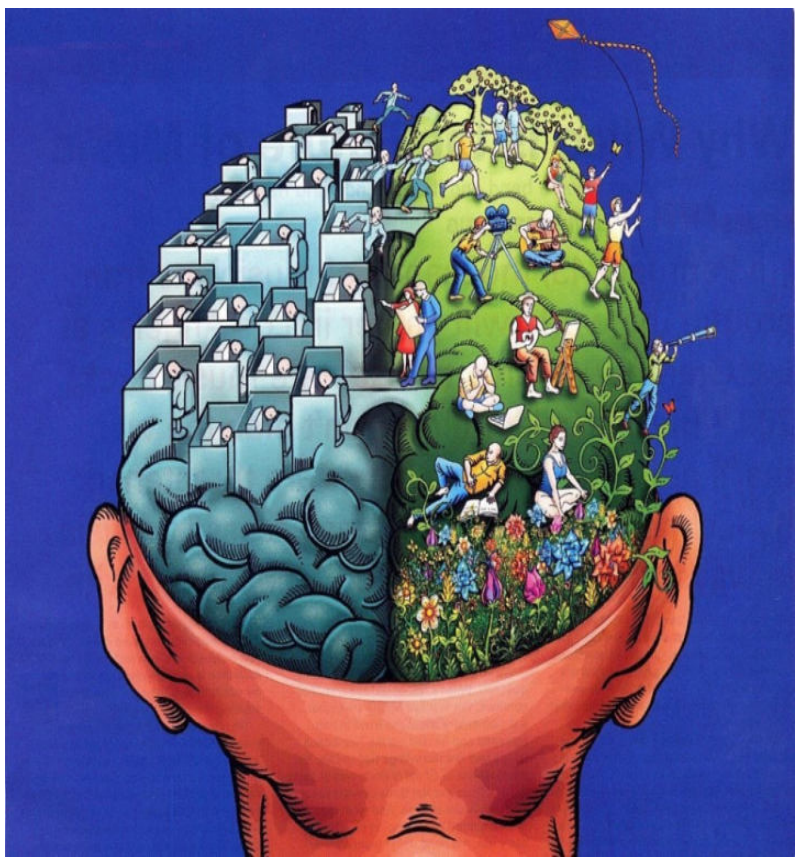


STEVENSON



ELLIS

Stage of Congestive Heart Failure		
Stage 1 Redistribution PCWP 13-18 mmHg	NYHA 2	Redistribution pulmonary vessels Cardiomegaly Broad vascular pedicle (non acute CHF)
Stage 2 Interstitial edema PCWP 18-25 mmHg	NYHA 3 PND	Kerley lines Peribronchial cuffing Hazy contour of vessels Thickened interlobar fissure
Stage 3 Alveolar edema PCWP > 25 mmHg	NYHA 4 Orthopnea	Consolidation Air bronchogram Cottonwool appearance Pleural effusion



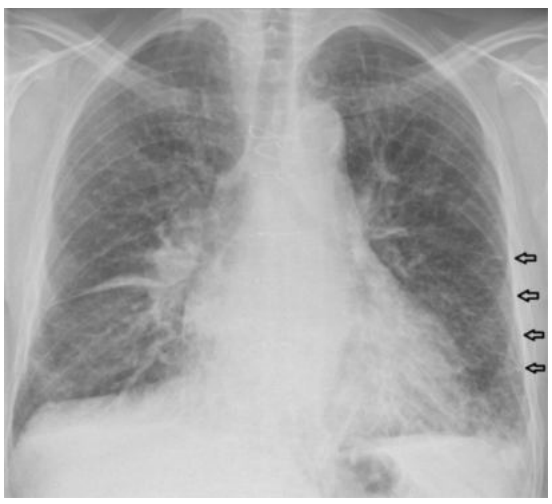
TYPES!!

- ACUTE/ CHRONIC
- COMPENSATED/ DECOMPENSATED
- SYSTOLIC/ DIASTOLIC/ both
- HFREF/ HFPEF/ both
- LHF/ RHF/ CHF
- Mild/mod/severe
- A/B/C/L

GROSS, OKAY & SUBTLE

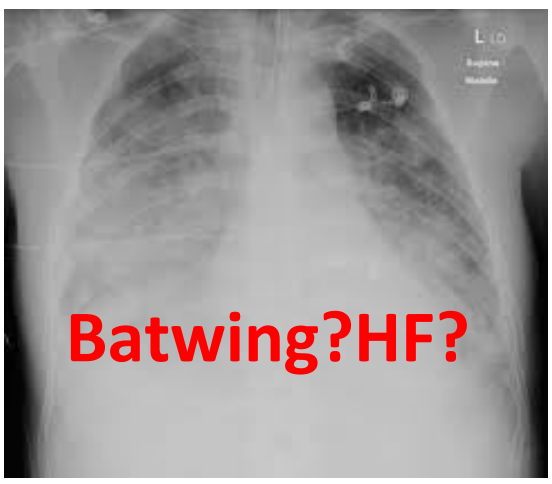
Cephalization

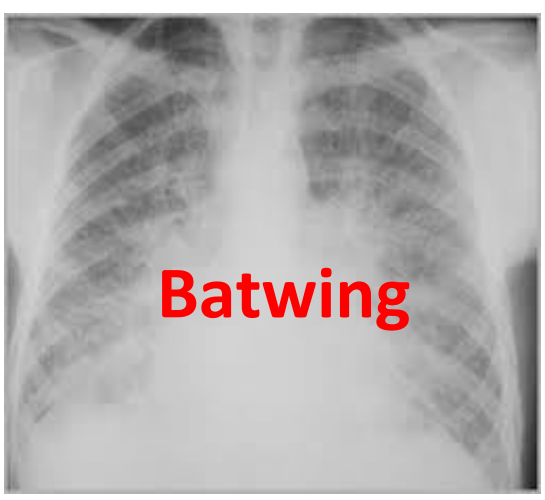
Pulm Venous Congestion



Kerley B

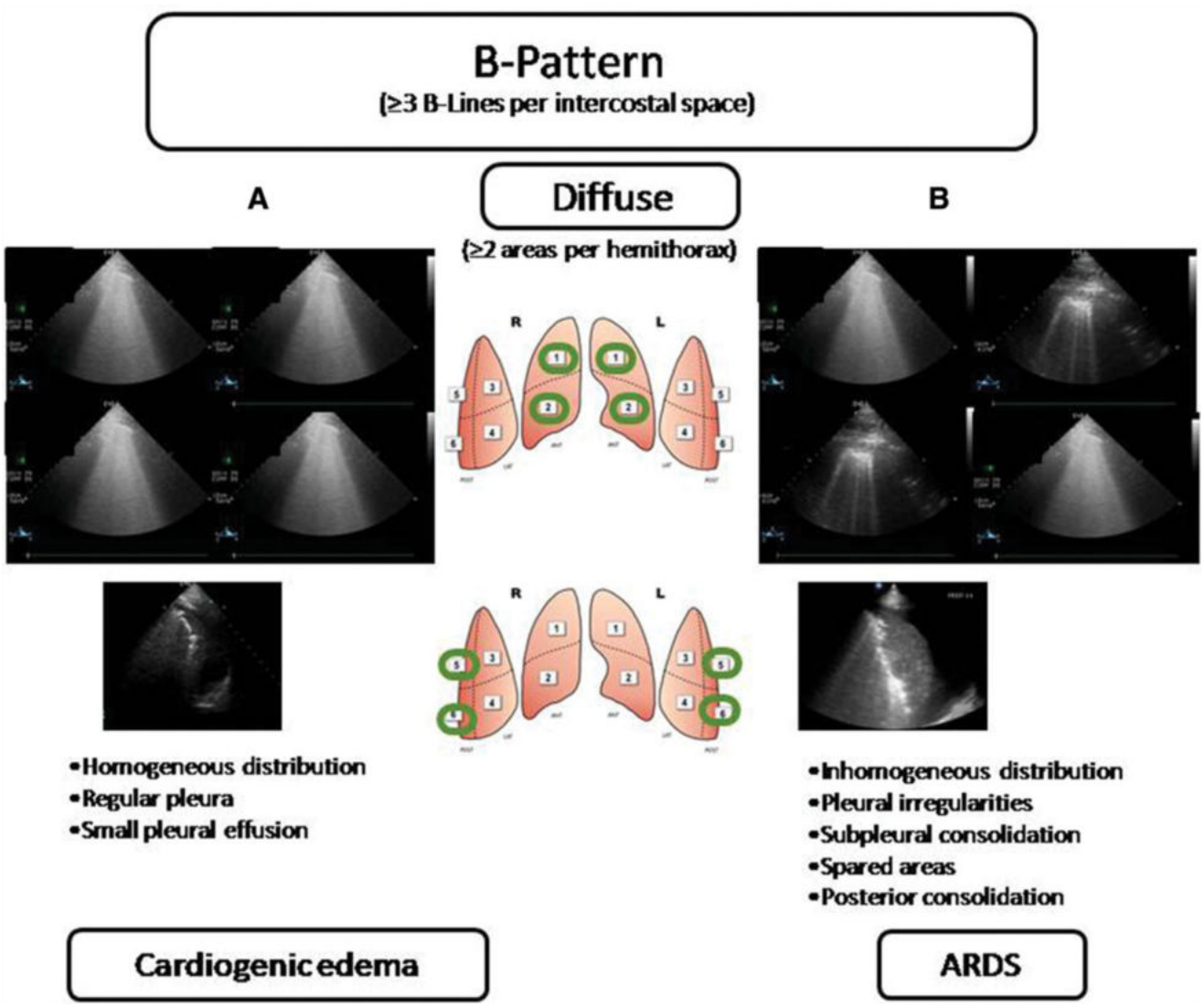
Interstitial edema





Alveolar edema

ARDS VS HF



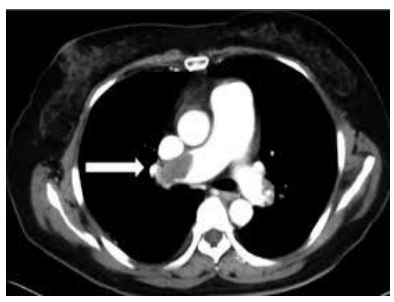
ACUTE ONSET SOB

ASTHMA
RONCHI+
PCO2
high

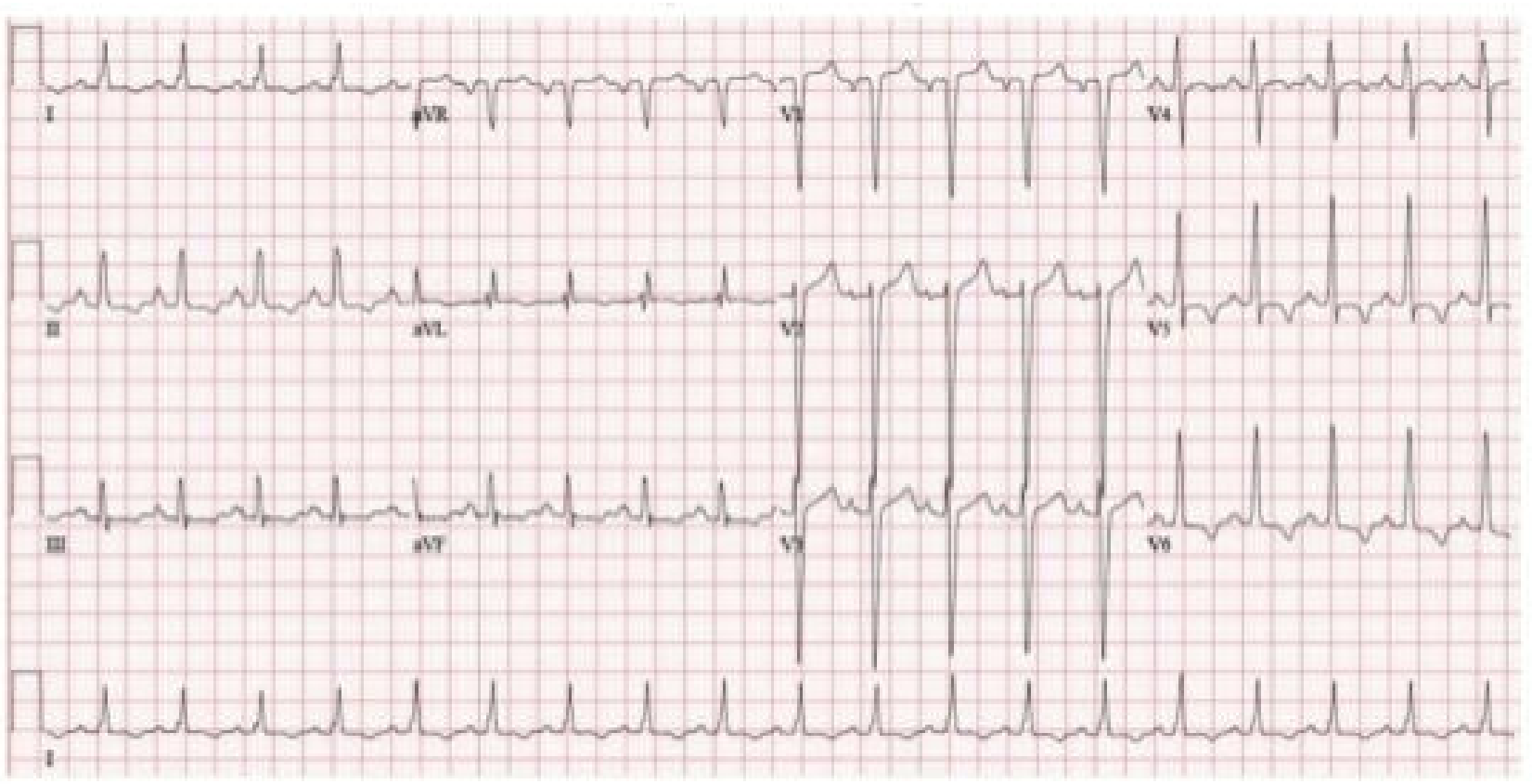
Pneumothx
Absent BS

Pneumonia
DKA
Metabolic
acidosis

Pulmonary
Embolism

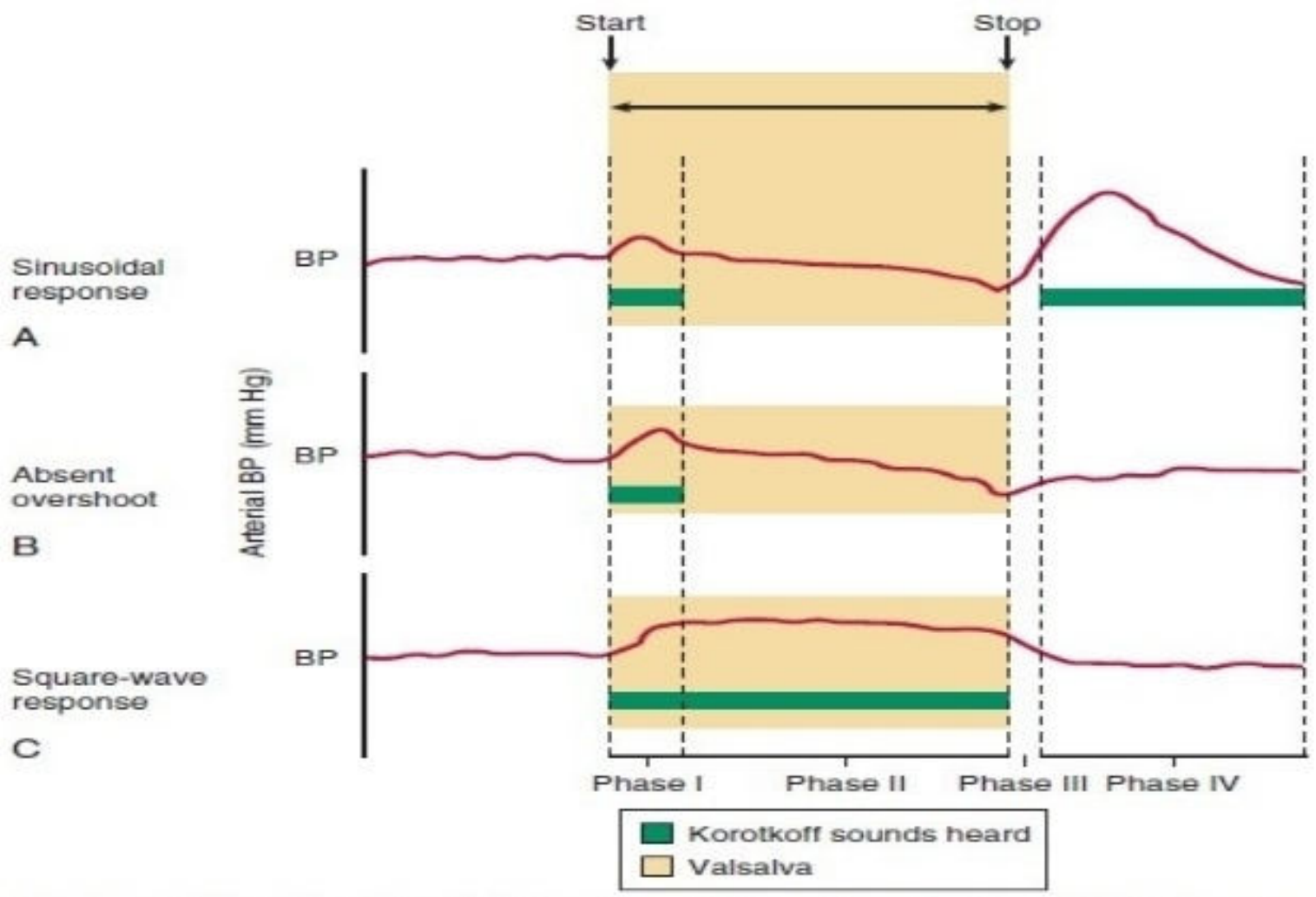


ECG in HF

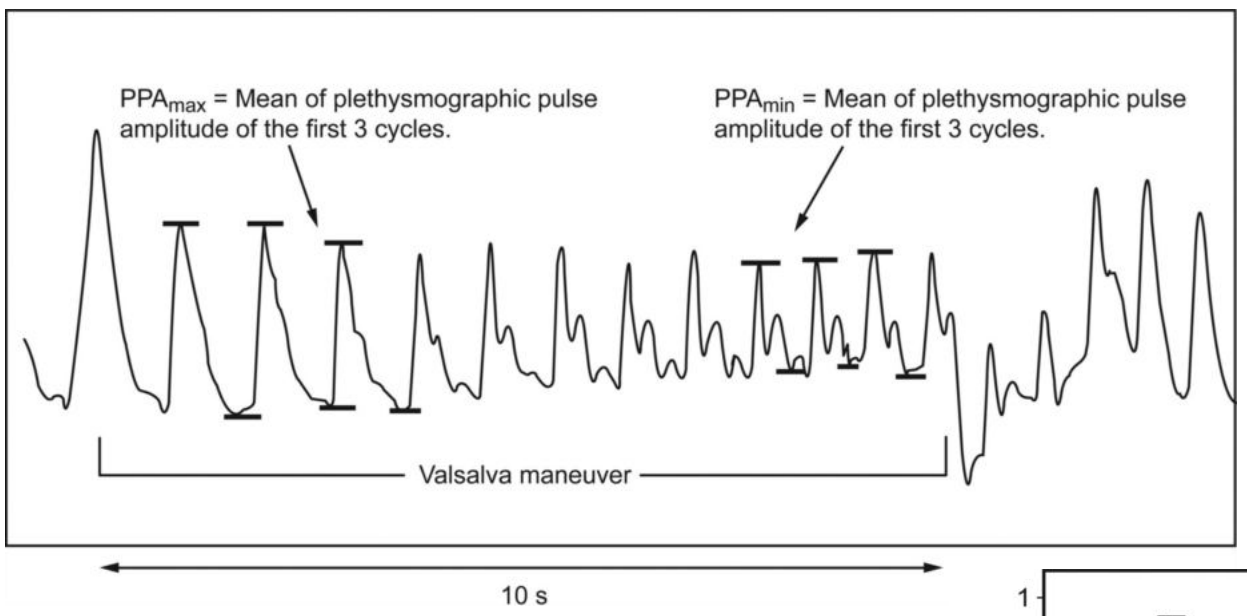


Goldberger's triad
LBBB+ Wide QRS
LAE

VALSALVA IN HF



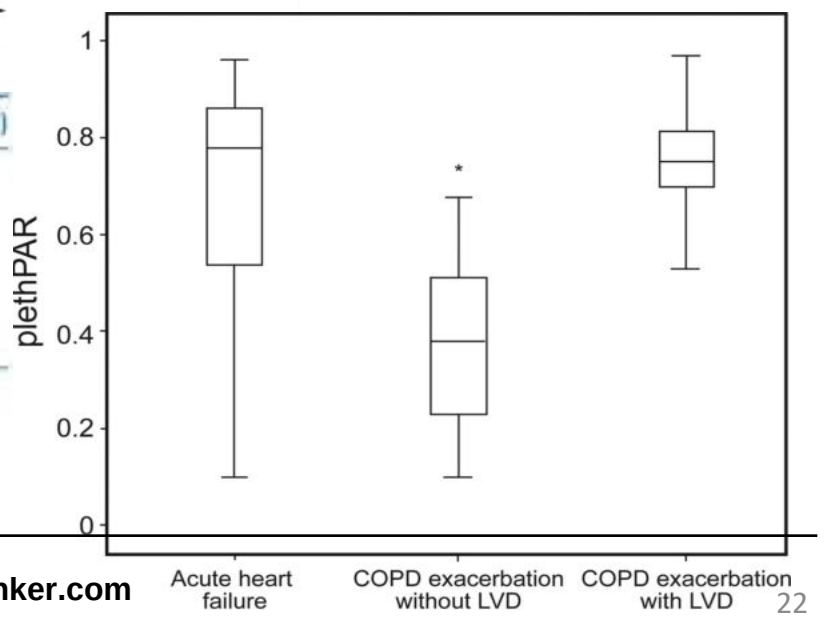
COPD VS HF



VENTILLATED: "VALSALVA" Pulse oxymetry

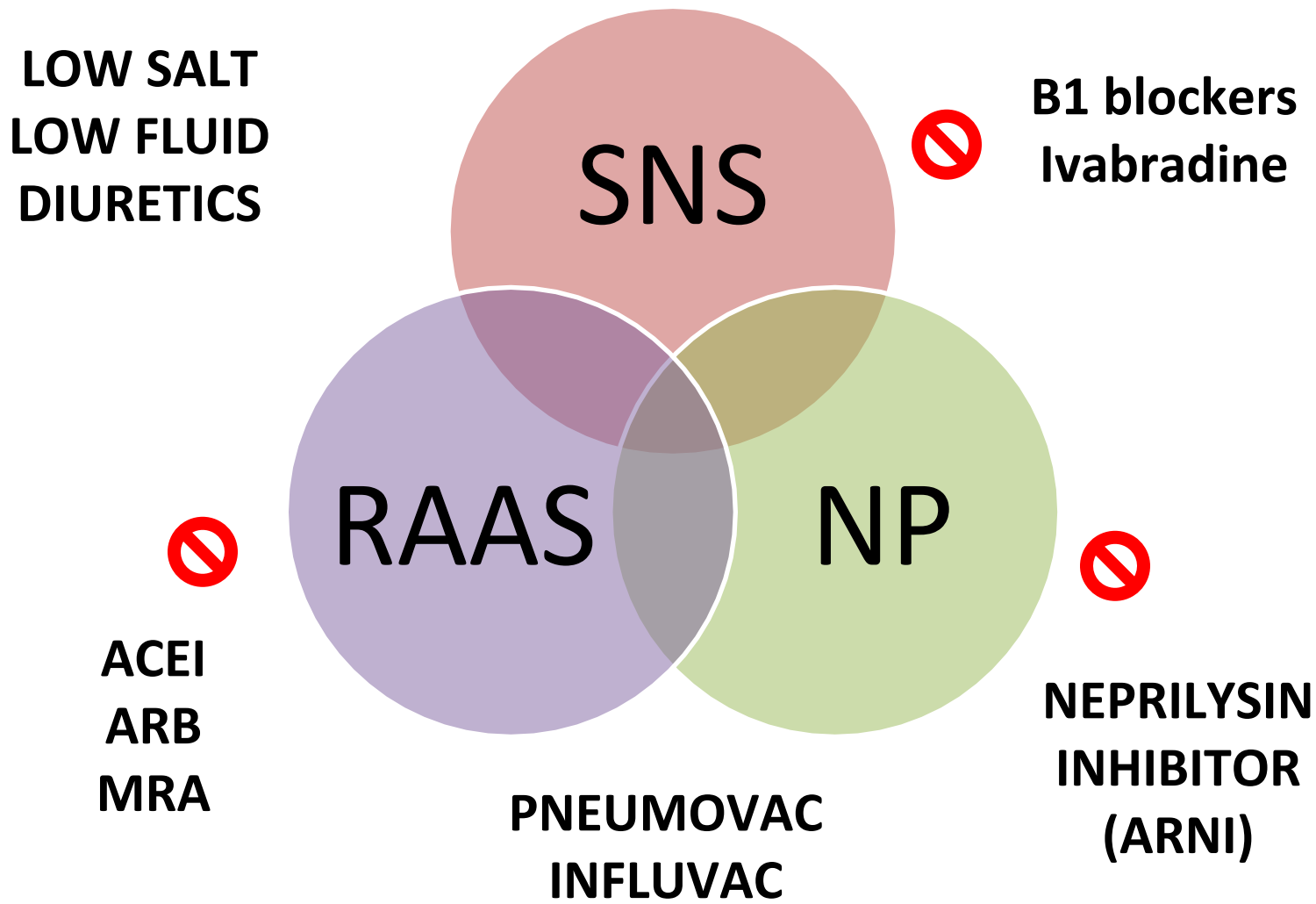
	Rule out CHF (pg/ml)	Rule in CHF (pg/ml)
BNP	100	500
NT-proBNP (years)		
<50	300	450
50-75	300	900
75	300	1800

BNP: Brain natriuretic peptide, CHF: Congestive heart failure, NT-proBNP: N-terminal pro-brain natriuretic peptide

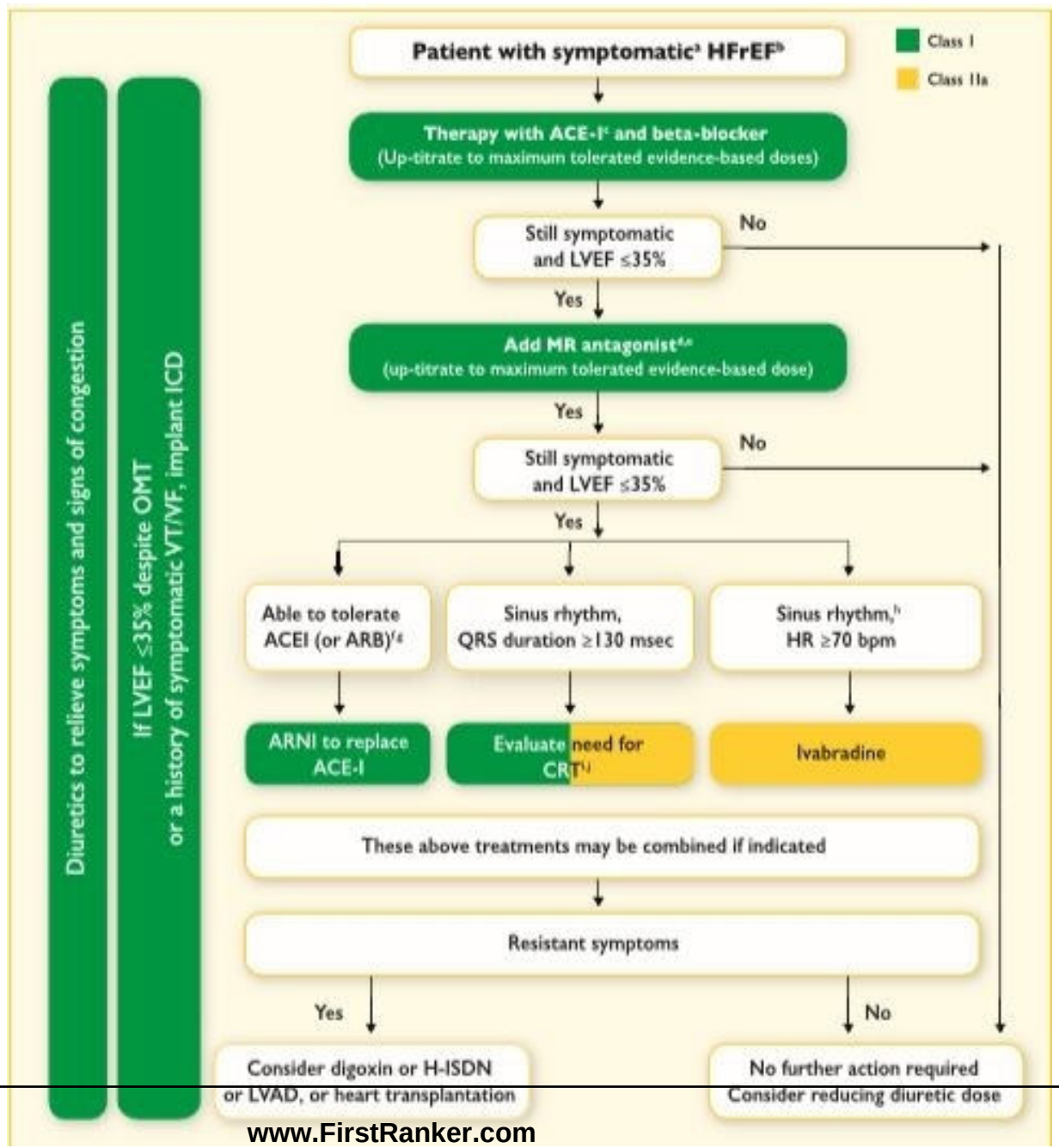


Biomarkers: Diagnosis/ prognosis

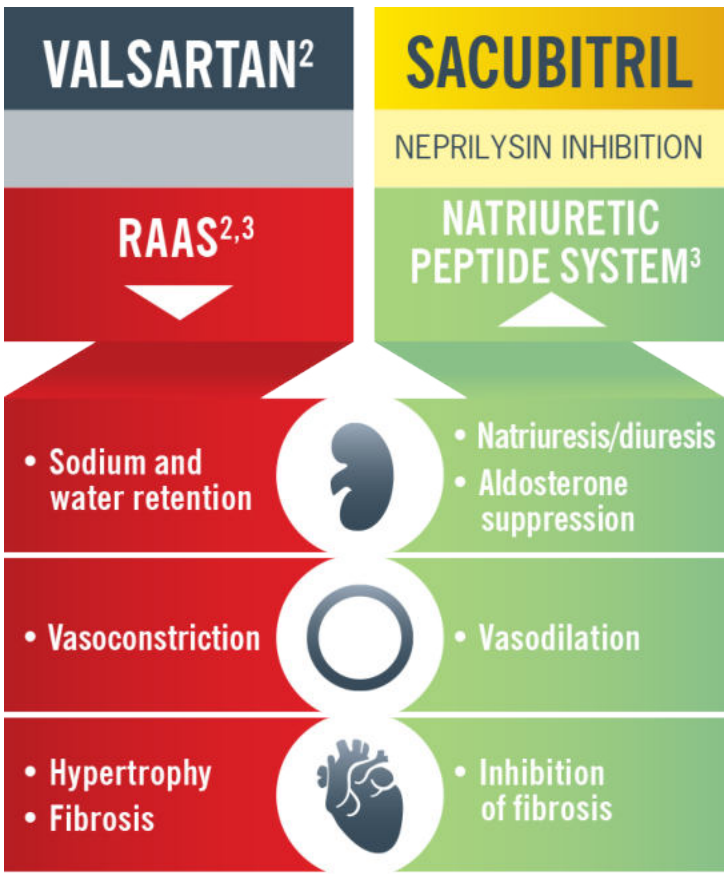
WHAT LIES BENEATH?



ESC GUIDELINE



ARNI: SACUBITRIL VALSARTAN



PARADIGM-HF: Summary of Findings

In heart failure with reduced ejection fraction, when compared with recommended doses of enalapril:

LCZ696 was *more effective* than enalapril in . . .

- Reducing the risk of CV death and HF hospitalization
- Reducing the risk of CV death by *incremental* 20%
- Reducing the risk of HF hospitalization by *incremental* 21%
- Reducing all-cause mortality by *incremental* 16%
- *Incrementally* improving symptoms and physical limitations

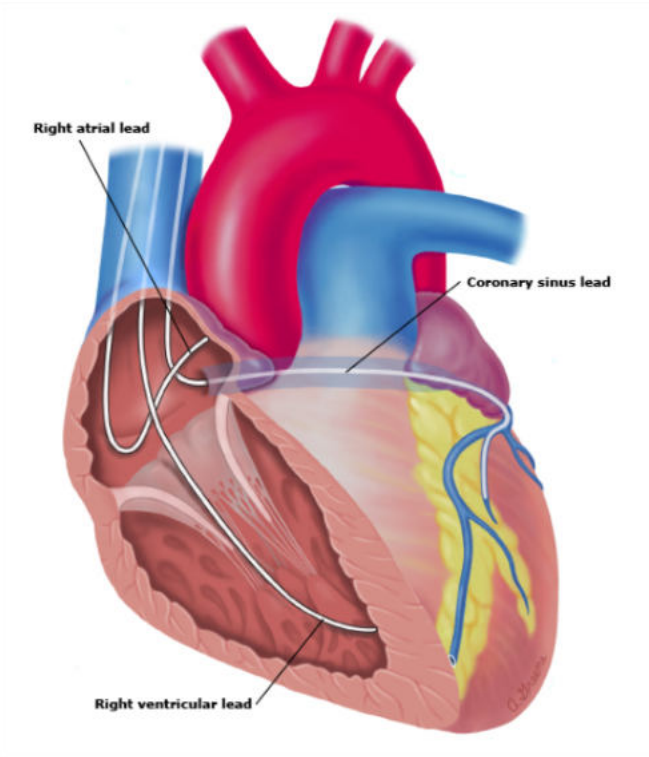
LCZ696 was *better tolerated* than enalapril . . .

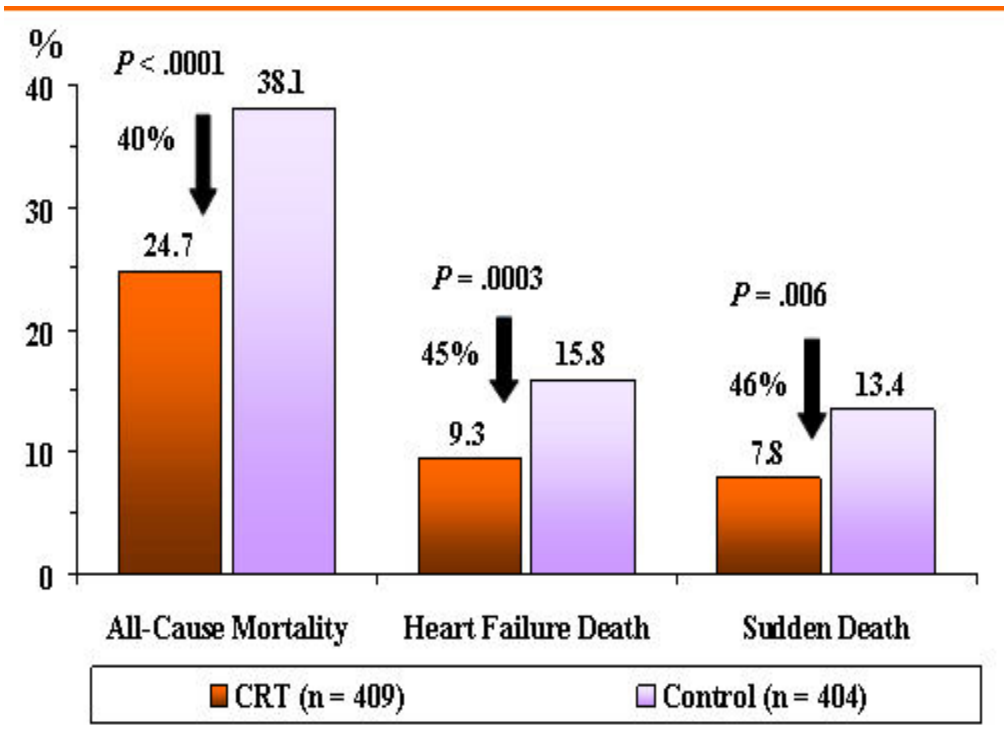
- Less likely to cause cough, hyperkalemia or renal impairment
- Less likely to be discontinued due to an adverse event
- More hypotension, but no increase in discontinuations
- Not more likely to cause serious angioedema

21

Source: PARADIGM late breaker presentation Aug 31, 2014 by Milton Packer

CARDIAC RESYNCHRONISATION THERAPY





NYHA II-IVa + LVEF< 35%

NYHA I + LVEF <30%

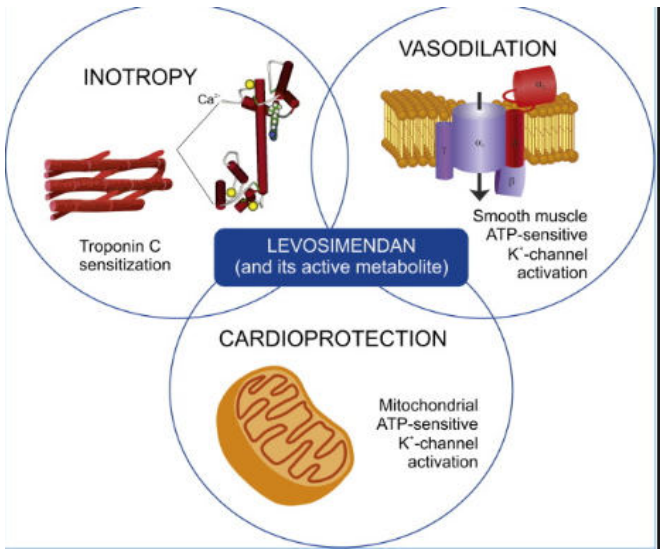
LBBB + QRS>150 ms (>120ms)

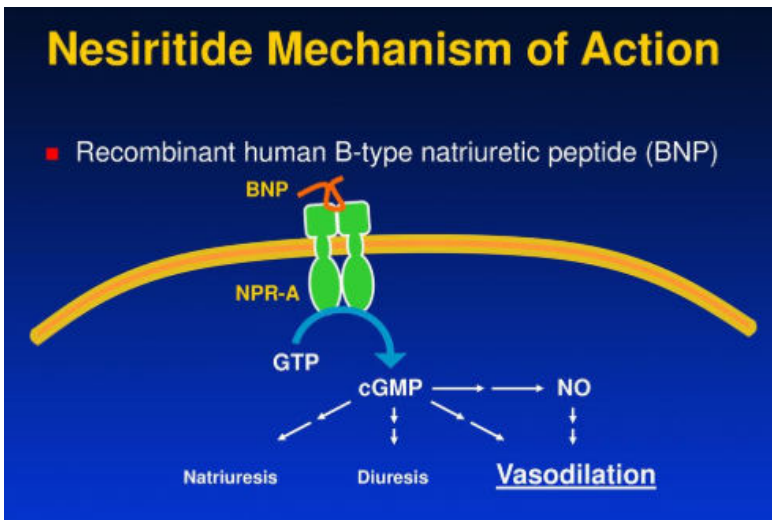
NSR (AF)

Life expectancy > 1 yr

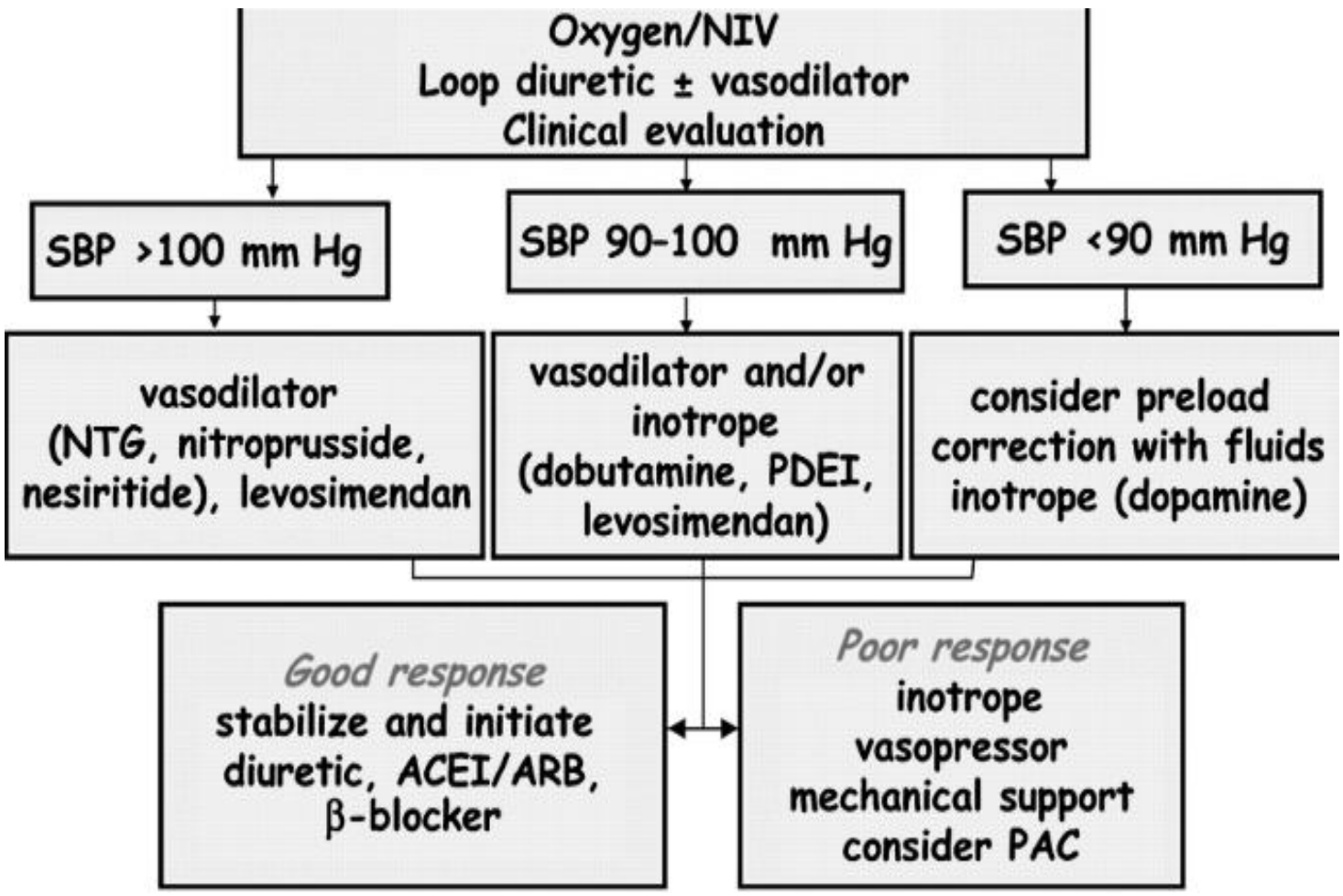
Ionotrops & more

Drug	Mean Arterial Pressure (MAP)	Pulmonary Capillary Wedge Pressure (PCWP)	Cardiac Output (CO)	Systemic Vascular Resistance (SVR)	Heart Rate (HR)
Dobutamine	↓↔	↓↔	↑↑↑	↓	↑
Dopamine	↑↑ High	↑↔	↑↑	↓↔Low ↑↑ High	↑
Isoproterenol	↓↓	↓↓	↑↑↑	↓↓↓	↑↑↑
Norepinepherine	↑↑↑	↑↔	↑	↑↑↑	↑↔

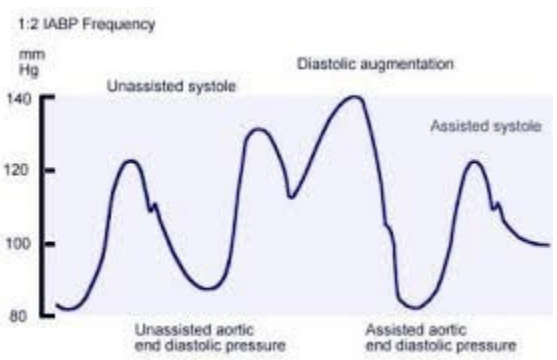


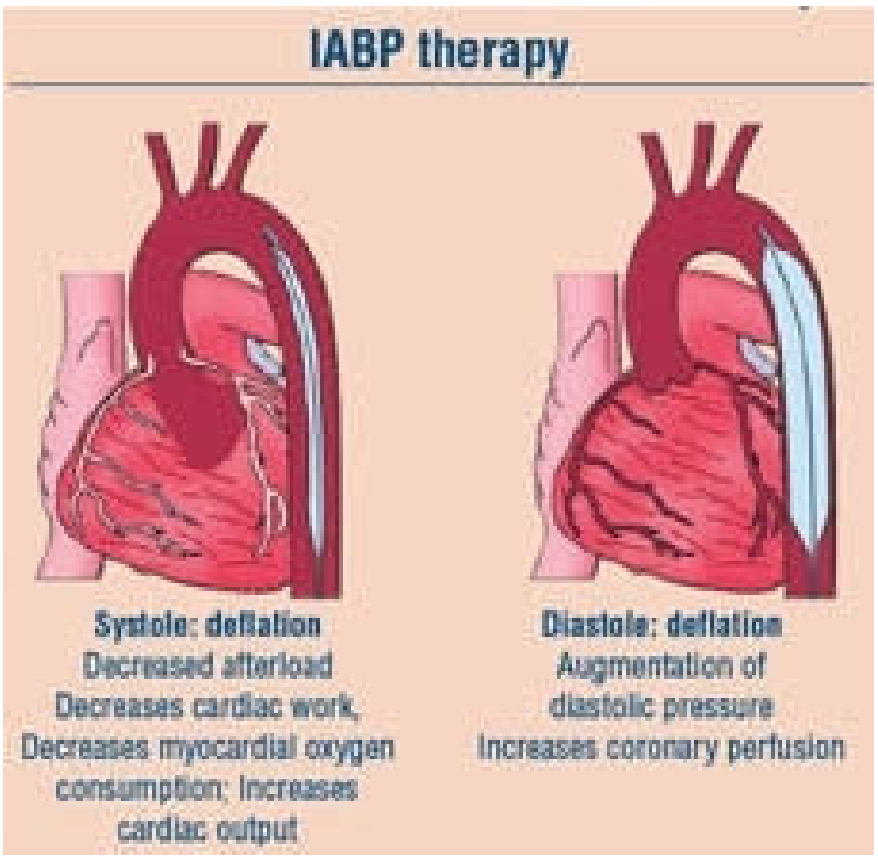


Treatment Summary



MECHANICAL CIRCULATORY DEVICE





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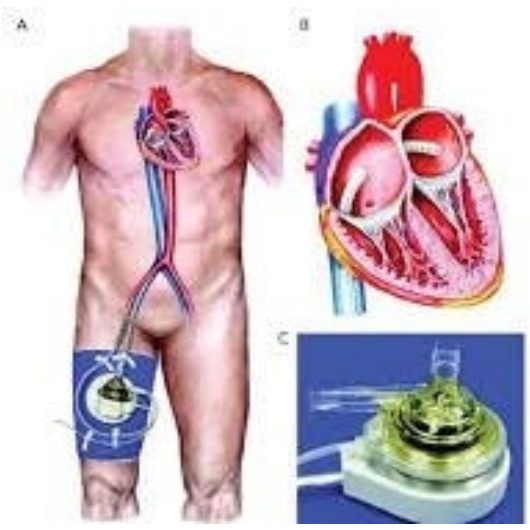
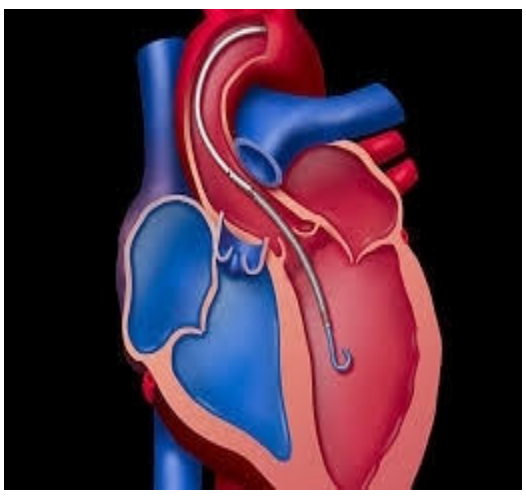
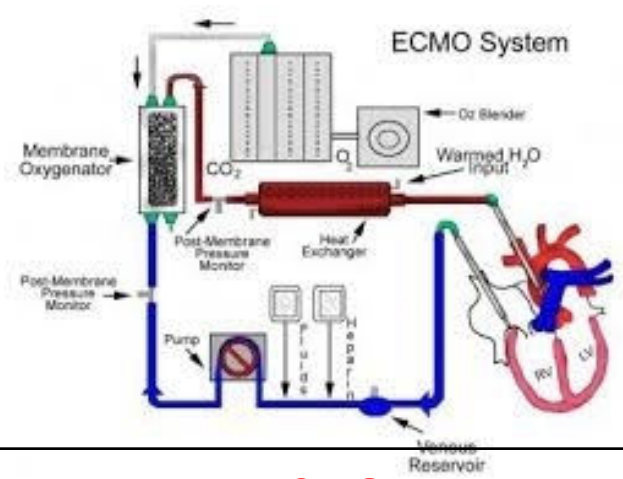


TANDEM HEART

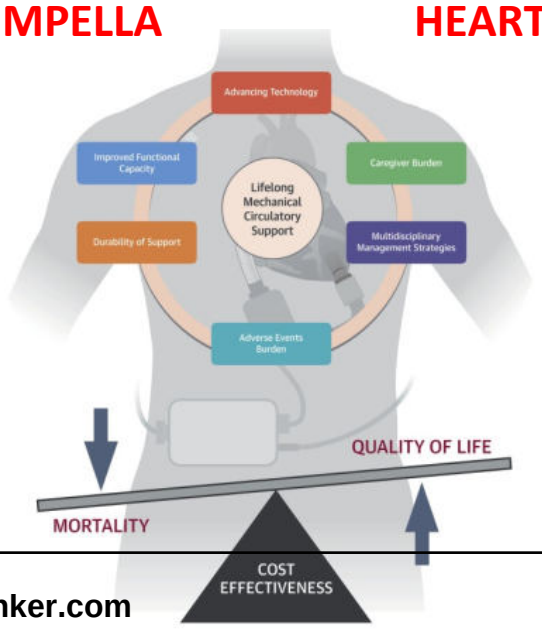


IMPELLA

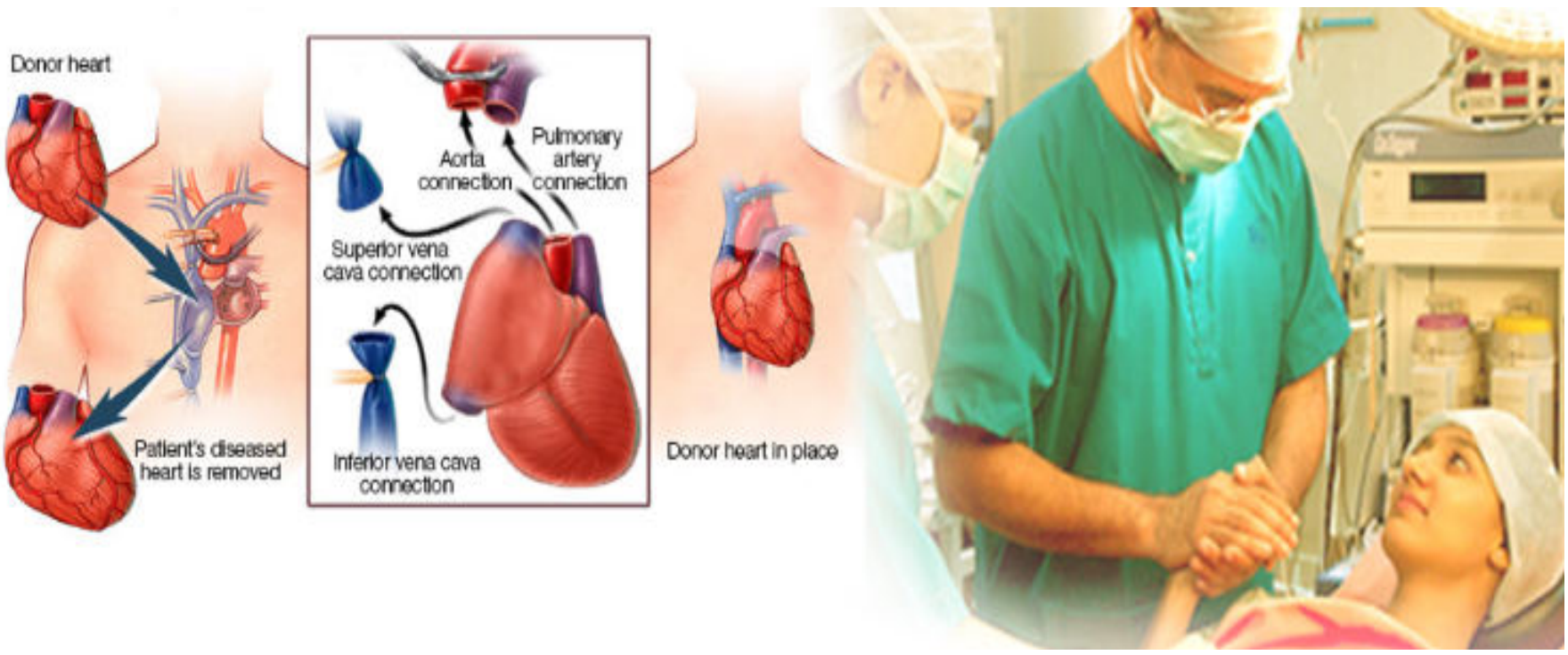
HEARTMATE



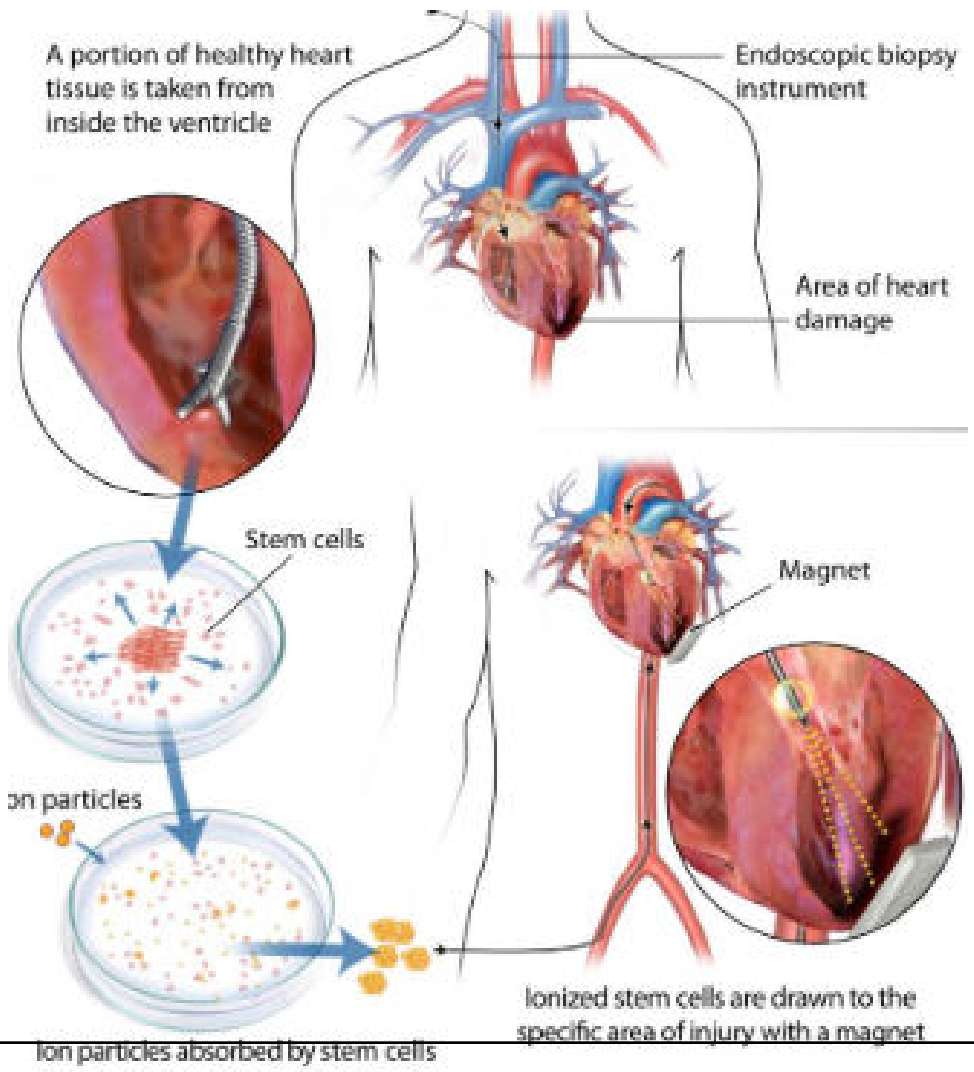
ECMO



HEART TRANSPLANT



Stem cell therapy



What causes Acute heart failure?

- **<5 years:** CHD (PDA>VSD)
- **5-15 years:** Rheumatic carditis (h/o joint pain)
  viral (h/o fever) (MC Coxsackie)
- **15-35 years:** Myocarditis (h/o fever)
  arrythmias (palpitation) (SVT>VT)
  HTN
- **>35 years:** Ischemic (Chest pain – ACS)
  arrhythmia (palpitation) (AF>VT>SVT)
  myocarditis (fever)
  CKD

ALWAYS RULE OUT HTN CRISIS AND AF

What causes Chronic heart failure?

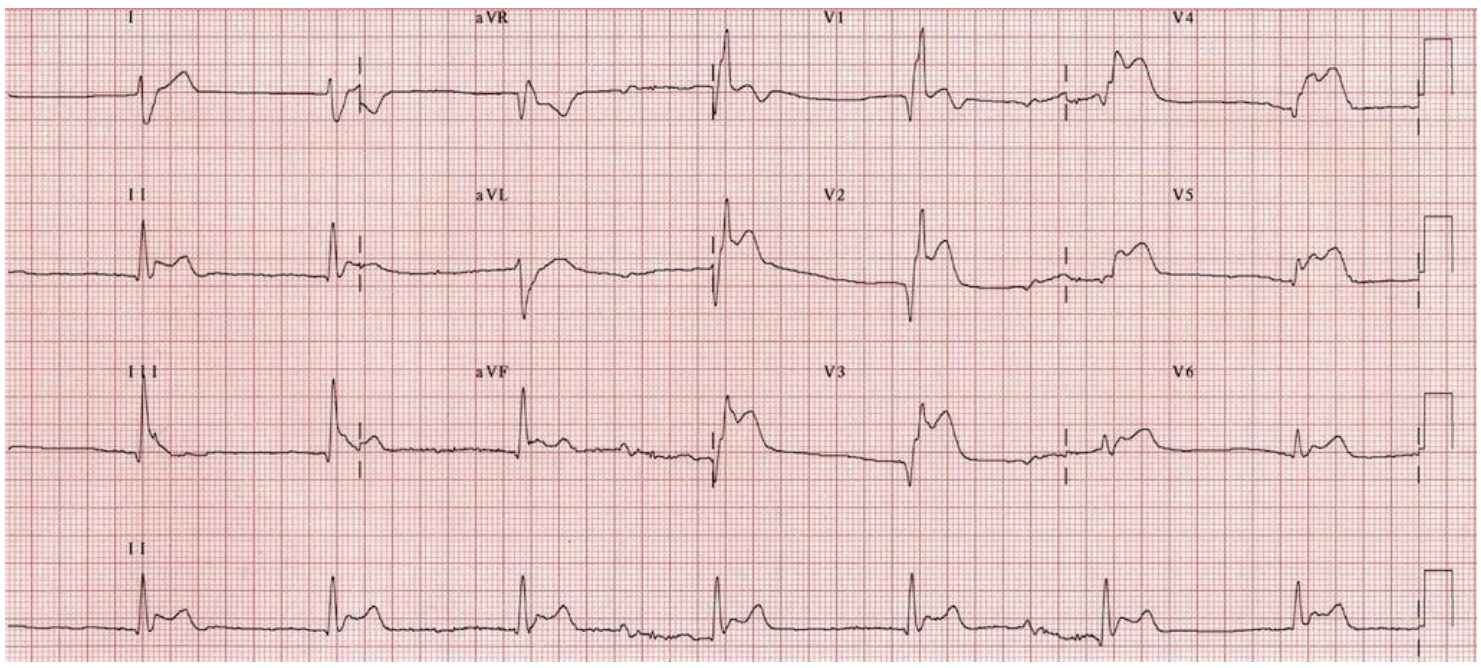
- **<5 years:** CHD (PDA>VSD)
- **5-15 years:** Rheumatic heart dis (h/o joint pain)
  viral (h/o fever) (MC Coxsackie)
- **15-35 years:** RHD
  CHD
- **>35 years:** Ischemic
  CMP (r/o alcohol CMP)

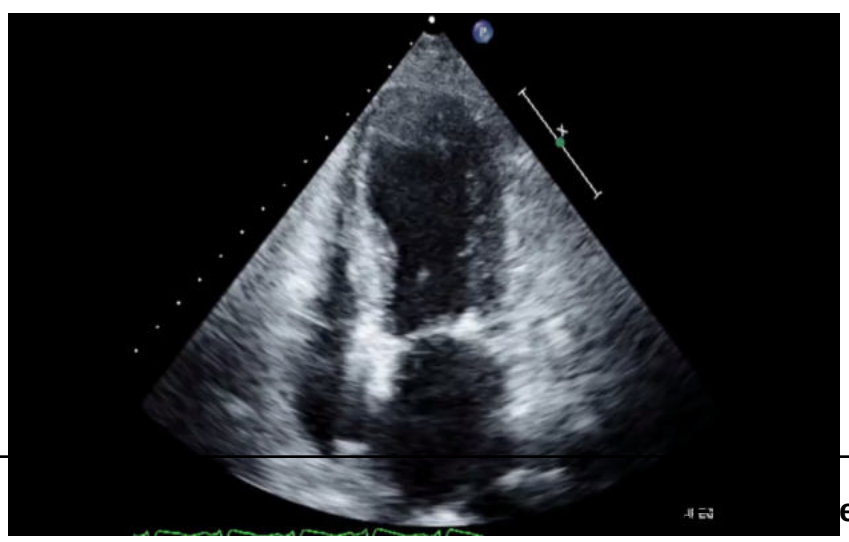
ALWAYS RULE OUT ANAEMIA, hypoThy

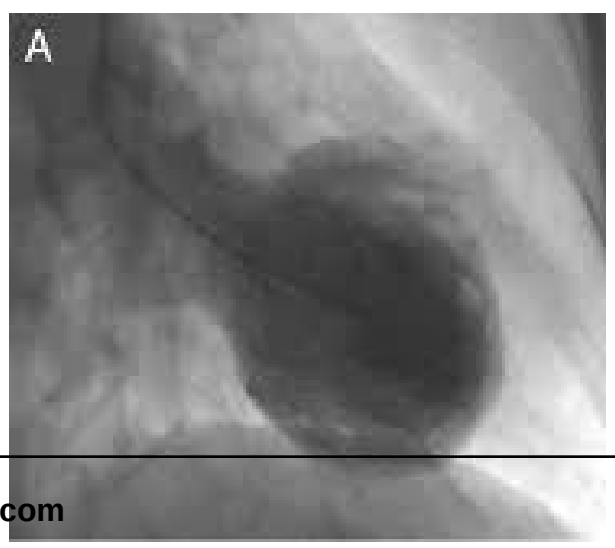
Treat the underlying cause!

- Myocarditis: supportive therapy only
- Arrhythmia: DC shock (SVT 50-100J, VT 200J)
- ACS: PTCA+S
- Anemia: keep Hb around 10
- **DO NOT GIVE IV FLUID (NS) TO HF PATIENTS**
- **Old MI EF 35%: No role of PTCA w/o viability**
- Rule out Cardiomyopathies by Echo/ Imaging

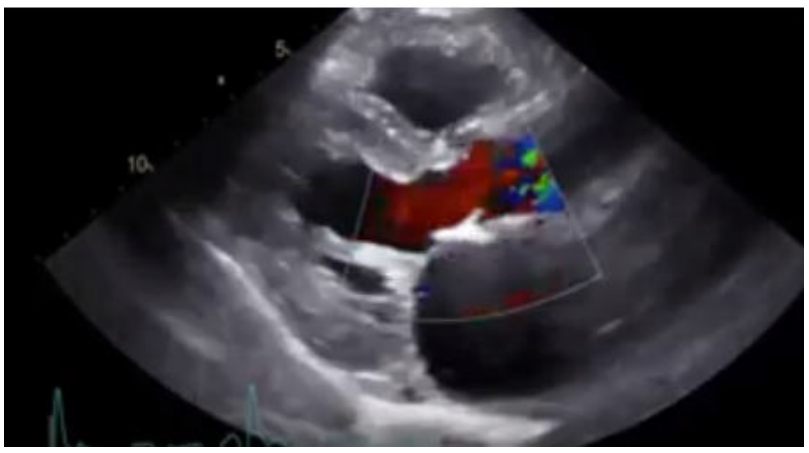
ACUTE CHEST PAIN + SOB + NORMAL CAG

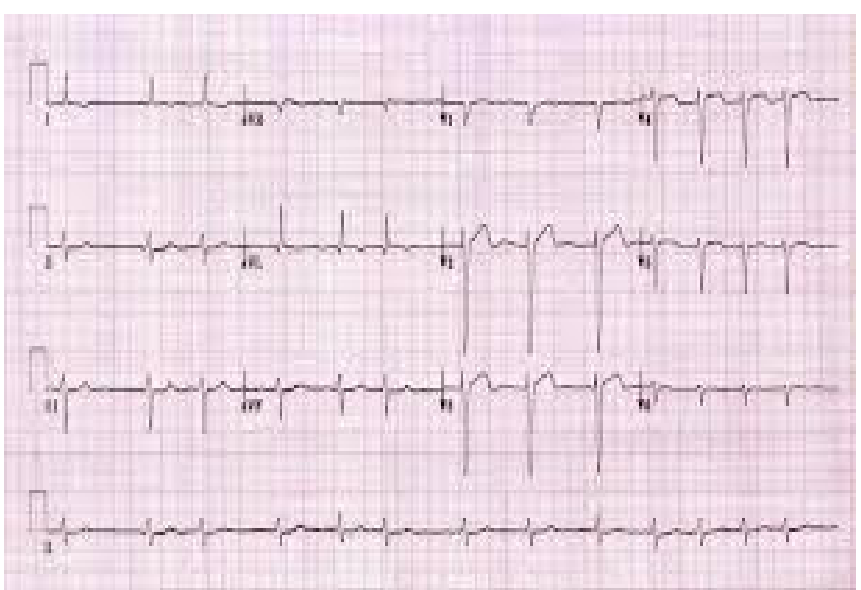


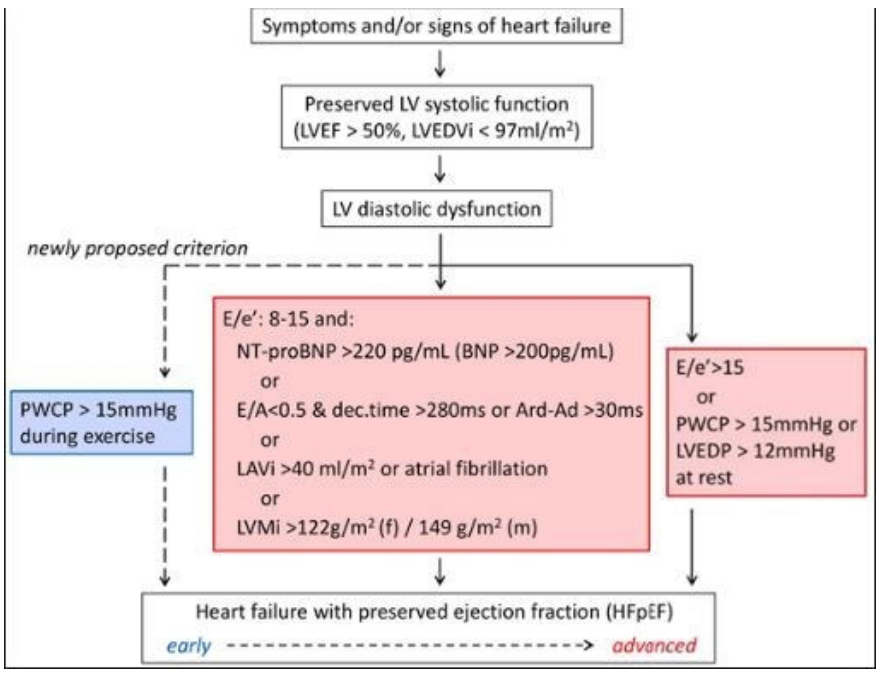


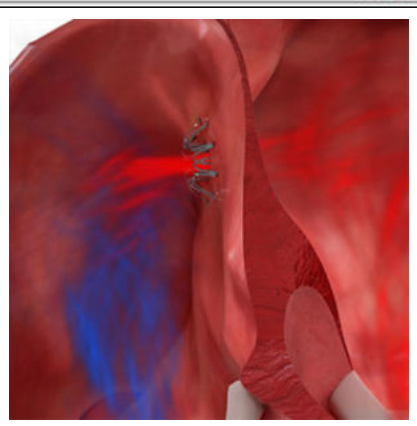


50 yr old+ HTN + Obese Lady+ DOE

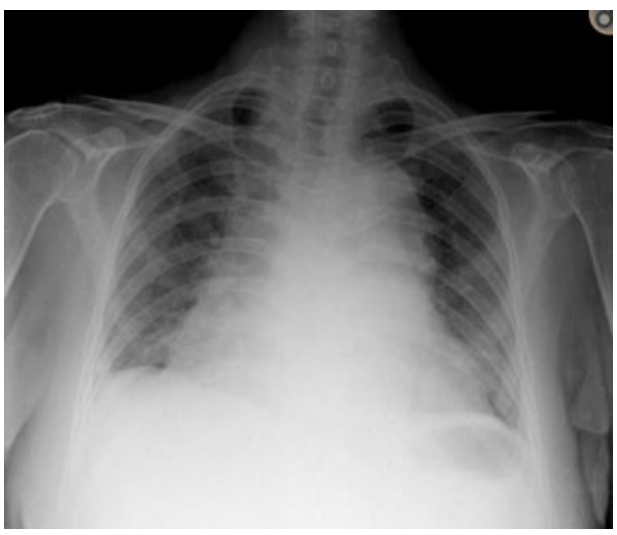








10 year child CHF no murmer



So, very little to learn actually..

- **HEMODYNAMICS**

Increased LVEDP – LAP - PCWP

- **CLINICAL RECOGNITON & DIFFERENTIATION**

Volume status/ perfusion status/ HTN/ anemia/ AF

- **ASSESSING SEVERITY**

AHA/ ACC, Killip, NYHA, CPK level

- **ORDERING TESTS**

Pallor/ Hb (r/o Anemia)
Murmer (r/o structural heart dis)
ECG and trop I (r/o ACS)
CXR (r/o pneumothx)
CPK (confirming HF)
ABG (r/o Asthma/ COPD)
Echo (r/o CMP, structural heart dis)

- **IMMEDIATE MANAGEMENT**

O2/ IV Diuretics/ NIV (BIPAP, CPAP)/ ionotrops

- **LONG TERM MANAGAMENT**

Pharmacotherapy/ CRT/ low salt + fluid/ vaccines
LVAD – HTX – Stem Cell therapy