

HEART FAILURE

CHANGING FAILURE

TO SUCCESS

DEFINITION

- It is a syndrome of myocardial dysfunction
- Heart failure exists when the heart is unable to pump sufficient blood to meet the metabolic needs of the body.
- Included in this definition, is a decreased exercise tolerance & shortened life expectancy.

DEFINITION

- Congestive heart failure (CHF) is a general term that encompasses the entire classification. It is a marked breathlessness & abnormal retention of sodium & water resulting in peripheral edema or lung congestion or both

N.B.

- The chambers of the heart do not function in isolation. Any damage or anything affecting one chamber, will eventually affect other chambers.

CAUSES

- 1. C.A.D.
- 2. Cardiomyopathy
- 3. HTN
- 4. Valvular heart disease
- 5. Adult congenital heart disease

PRECIPITATING CAUSES

1. Decrease or stopping medications
2. Dysrhythmias
3. Pulmonary embolism
4. Systemic infection
5. Exercise/ stress
6. Endocarditis
7. Myocarditis

PEOPLE AT RISK

- elderly
- males
- people with HTN
- people with CAD
- smokers
- diabetics
- patients with hyperlipidemia

THE CONSEQUENCES OF HEART FAILURE

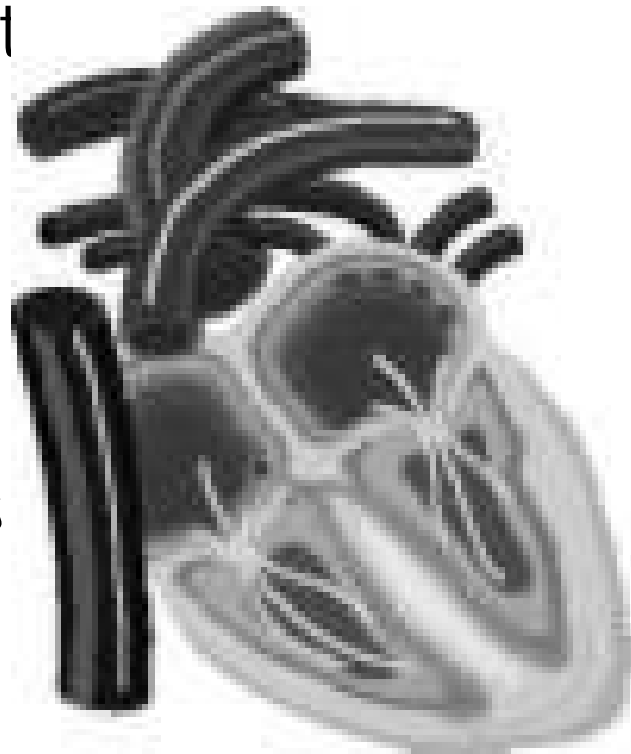
- 1 Pressure overload, e.g. A.S., HTN
- 2 Volume overload, e.g. fluid overload, fluid retention
- 3 Loss of muscle, e.g. M.I., myopathy
- 4 Decreased contractility, e.g. M.I., angina, myopathy, myocarditis
- 5 Restricted filling, e.g. M.S., T.S., myopathy, tamponade, restrictive pericarditis.

PATHOPHYSIOLOGY

Two major determinants of cardiac output are:

- heart rate
- stroke volume

Anything which affects these, affects C.O.



PATHOPHYSIOLOGY

- Heart rate : fever, exercise, stress, anxiety, drugs, smoking, hyperthyroidism, pain, etc.



PATHOPHYSIOLOGY

Stroke Volume:

- 1 Preload - degree of fiber stretch at end of diastole
- 2 Contractility - change in force of contraction
- 3 Afterload - pressure the L.V. must exert/generate for ejection of blood to occur

CLASSIFICATIONS OF HEART FAILURE

- 1 Forward heart failure
- 2 Backward heart failure
- 3 Low output heart failure
- 4 High output failure
- 5 Right-sided (R.V.) heart failure
- 6 Left-sided (L.V.) Heart failure
- 7 Chronic heart failure
- 8 Acute heart failure
- 9 Systolic heart failure
- 10 Diastolic heart failure



CLASSIFICATIONS OF HEART FAILURE

Forward and Backward Heart Failure refer to left ventricular failure.

- Forward Heart Failure
 - inadequate delivery of blood into the arterial system
 - occurs when systemic resistance (afterload) is increased, causing decreased flow of blood out of ventricle
 - symptoms are due to decreased C.O. and hyperperfusion of organs
 - examples, A.S. , systemic HTN



CLASSIFICATIONS OF HEART FAILURE

- Backward Heart Failure
 - failure of ventricle to empty
 - results in increased venous pressure & accumulation of fluid behind failing ventricle
 - symptoms are due to pulmonary or venous congestion
- Low Output Failure
 - heart failure in which cardiac output is decreased; associated with C.V. disease
 - caused by M.I., hypotension, hemorrhage, cardiomyopathy
 - symptoms are those of decreased peripheral perfusion
 - SX: those of decreased peripheral perfusion.
 - e.g. M.I., hypotension, hemorrhage, cardiomyopathy.



CLASSIFICATIONS OF HEART FAILURE

- High Output Failure
 - rare
 - syndrome in which symptoms of pulmonary congestion/edema which are secondary to increased diastolic pressure, occur while C.O. is normal or increased
 - associated with conditions causing increased blood volume (fluid or sodium accumulation due to excess fluid intake, sodium intake, steroids, anuria, oliguria, acute glomerular nephritis. Also associated with venous return, as with hyperthyroidism, severe anemia, cirrhosis
 - can result in severe pressure overload, hypertrophy, ventricular dysfunction and decreased cardiac output

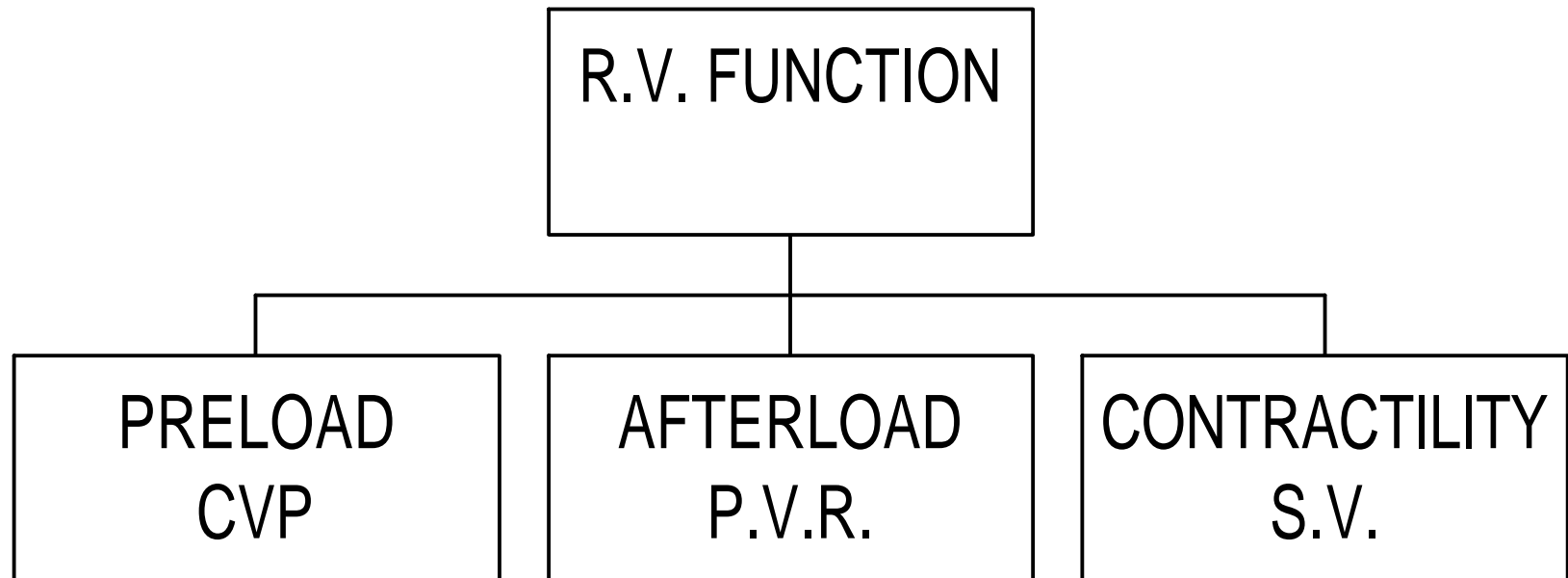


CLASSIFICATIONS OF HEART FAILURE

- Right Sided or Rt. Ventricular Failure
 - ineffective R.V. contractile function
 - R.V. failure may be caused by R.V. infarction, P.E. , pulmonary htn , COPD, most common cause is Lt. ventricular H.F.
 - when due to L.V.H.F. , pressure in pulmonary vasculature increases to the point that the R.V. can't eject blood into lungs for oxygenation. R.V. can't accept blood from R.A. , R.A. can't accept blood from V.C..
 - Venous return is impeded, leading to venous pooling & eventual organ congestion.



HEMODYNAMICS

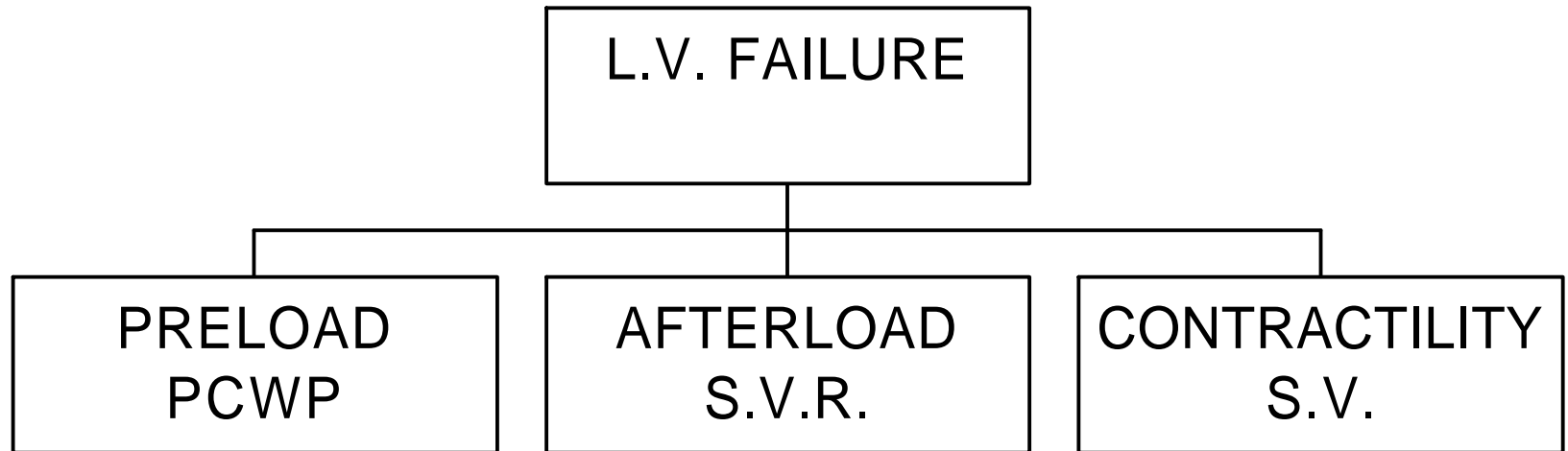


CLASSIFICATIONS OF HEART FAILURE

- Left Sided or L.t. Ventricular Failure
 - failure of L.V. to maintain a normal output of blood, this decreases C.O.
 - since L.V. doesn't empty completely, it can't accept all the blood returning from lungs. There is a build-up of blood volume & pressure from L.V. into pulm. vasculature-pulm. veins engorge, fluid from capillaries leaks into interstitial spaces & alveoli (usually when pressure exceeds 18-25mmhg)
 - most often seen in patients with L.V. infarcts, HTN, aortic or mitral valve disease



HEMODYNAMICS



CLASSIFICATIONS OF HEART FAILURE

- Acute & Chronic Heart Failure
 - Acute or chronic refers to the rapidity with which the syndrome develops, the activation of compensatory mechanisms & the presence or absence of fluid accumulation in the interstitial space.
 - Acute- sudden onset without compensatory mechanisms.
 - Chronic- progressive onset with symptoms that may be controlled by compensatory mechanisms, medications, diet or decreased activity; may be exacerbated by precipitating causes.



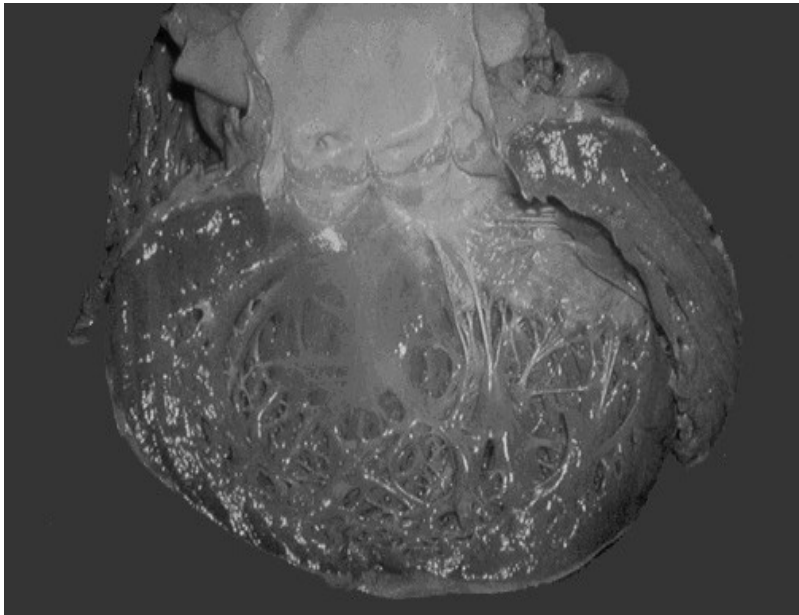
CLASSIFICATIONS OF HEART FAILURE

- Systolic Failure
 - more frequently used term
 - impaired L.V. contractility (pump function)
 - E.F.-less than 40%
 - causes include M.I., valvular disease-e.g.-A.S. , A.R. , dilated cardiomyopathy.
- Diastolic Failure
 - difficulty in filling L.V., but with a normal E..F. ; impaired relaxation - stiff ventricle
 - causes include : M.I., hypertrophy, tachycardia, calcium overload, constrictive pericarditis, restrictive pericarditis

ATRIAL FAILURE

- Rarely heard term
- inadequate filling of ventricle from atrium
- due to loss of atrial kick
- e.g.- atrial fib. , atrial flutter

R.V.& L..V. FAILURE : SIGNS & SYMPTOMS



- S&S IN COMMON:
- Fatigue
- Weakness
- Diaphoresis
- Anorexia
- Change in mentation
- S3 & a systolic murmur

R.V. FAILURE : SYMPTOMS

- weight gain
- ascites
- abdominal distention
- edema
- dilated peripheral veins
- g.i. distress-nausea, vomiting, jaundice
- hepato/splenomegaly

R.V. FAILURE SYMPTOMS

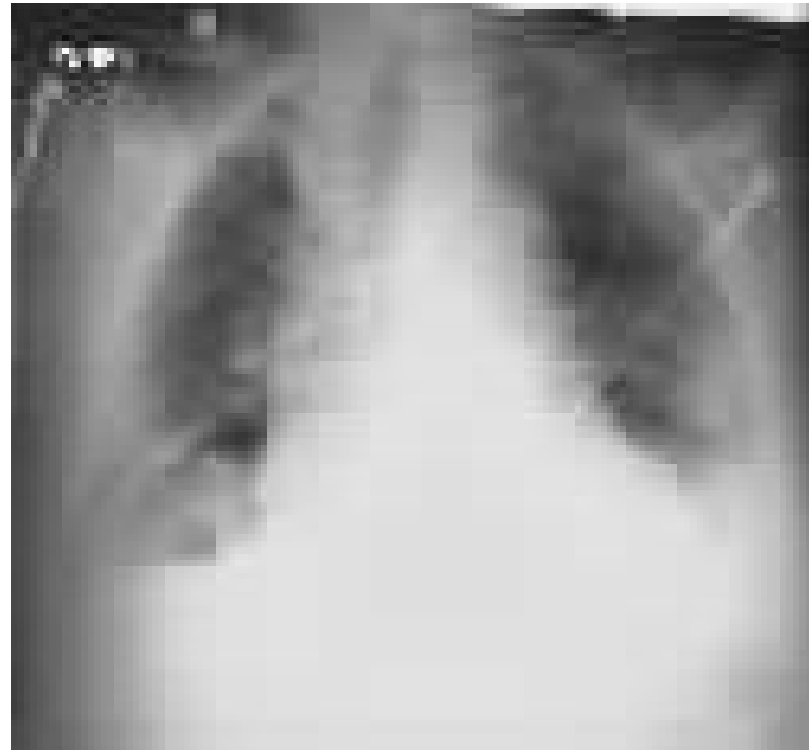
- CLEAR LUNGS
- ELEVATED JVP
- ELEVATED HJR
- ELEVATED
R.A./CVP

L..V. FAILURE SYMPTOMS

- ORTHOPNEA / PND
- DYSPNEA / TACHYPNEA
- RESTLESSNESS/INSOMNIA
- CYANOSIS
- COUGH
- TACHYCARDIA
- DISPLACED APICAL IMPULSE
- THRILLS

L.V.FAILURE SYMPTOMS

- RALES (CRACKLES)
- DECREASED SPO₂
- DECREASED PO₂
- INCREASED PAP
- INCREASED PCWP



ECG CHANGES

- LBBB -- chronic L.V. dysfunction (poor prognosis)
- LVH -- A.S. , HTN , CAD
- RAD , RVH , RBBB -- R.V. dysfunction

COMPENSATORY MECHANISMS

- When the heart begins to fail & C.O. decreases such as to be insufficient for metabolic needs, the body tries to maintain adequate perfusion pressure & increase C.O. by changing one or all of the following :
 - 1. H.R.
 - 2. S.V.
 - 3. Preload
 - 4. Afterload
 - 5 .Contractility

ADRENERGIC SYSTEM

- This is the result of increased sympathetic activity, which stimulates release of catecholamines especially epinephrine. This results in peripheral vasoconstriction, which leads to shunting of blood from non-vital organs (skin & kidneys) to vital organs (brain & heart). This increases venous return & preload.
- Increased H.R. , B/P , contractility & S.V. = increased C.O.

RENIN-ANGIOTENSIN- ALDOSTERONE SYSTEM

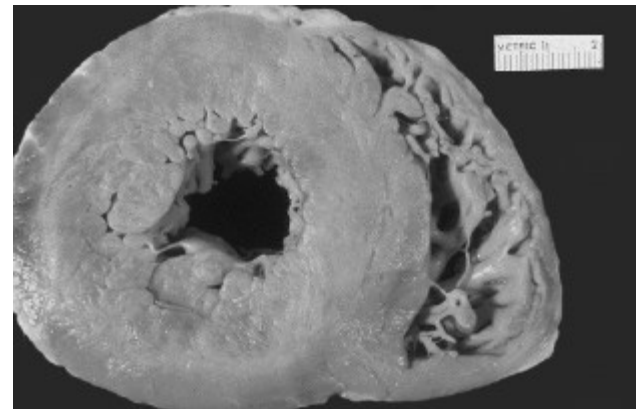
- Sympathetic activity constricts renal arterioles, which decreases renal blood flow & glomerular filtration rate (G F R) & triggers RAAS--there is reabsorption of Na⁺ from proximal & distal tubules, which causes fluid retention. This increases venous return & therefore preload & C.O.
- Severe H.F. increases antidiuretic hormone level & increases fluid retention.

RAAS

- Decreased liver perfusion leads to decreased liver metabolism of aldosterone, resulting in Na & fluid retention .

LEFT VENTRICULAR HYPERTROPHY

- Increased left ventricular wall thickness / ventricular dilation
- Increased stress on L.V. during systole (due to increased pressure load) results in increased muscle fiber size & therefore increased thickness or chamber size. This hypertrophy increases the force of contraction so the ventricle can overcome increased afterload.



LT. VENTRICULAR HYPERTTROPHY

- Overdistention results in decreased contractile force & a decrease in C.O.
- This is FRANK-STARLING law

FUNCTIONAL CLASSIFICATIONS

Functional classification of patients with heart failure is based on the activity level that initiates the onset of symptoms.

There are two classification systems :

1. Killip Class - Canada
2. New York Heart Association (NYHA) - U.S.

KILLIP CLASSIFICATION

Killip Class	I	- no symptoms with normal activities, clear lungs
Killip Class	II	- normal activities initiate symptoms, but subside with rest
	IIA	- crackles < 1/3
	IIB	- crackles > 1/3
Killip Class	III	- symptoms on minimal activity or rest / pulmonary edema
Killip Class	IV	- cardiogenic shock

NYHA CLASSIFICATION

- Class I - normal daily activity does not initiate symptoms
- Class II - normal activities initiate onset of symptoms, but subside with rest
- Class III - minimal activity initiates symptoms; patient is usually symptom-free at rest
- Class IV - any type of activity initiates symptoms and symptoms are present at rest

Management of Heart Failure

Goal of Treatment:

1. Prompt and correct diagnosis
2. Identify and correct precipitating or underlying causes
3. Appropriate treatment to enhance cardiac performance and relieve symptoms
4. Discuss with patient the quality of life the patient wants and can achieve - make a plan for this and educate the patient accordingly

INVESTIGATIONS

- 1 LAB WORK :
 - - ABG'S
 - - electrolytes
 - - urea
 - -creatinine
 - - CBC
 - - TSH
 - - digoxin level
 - - LFT'S
 - - urinalysis
- 2 CXR

INVESTIGATION

S

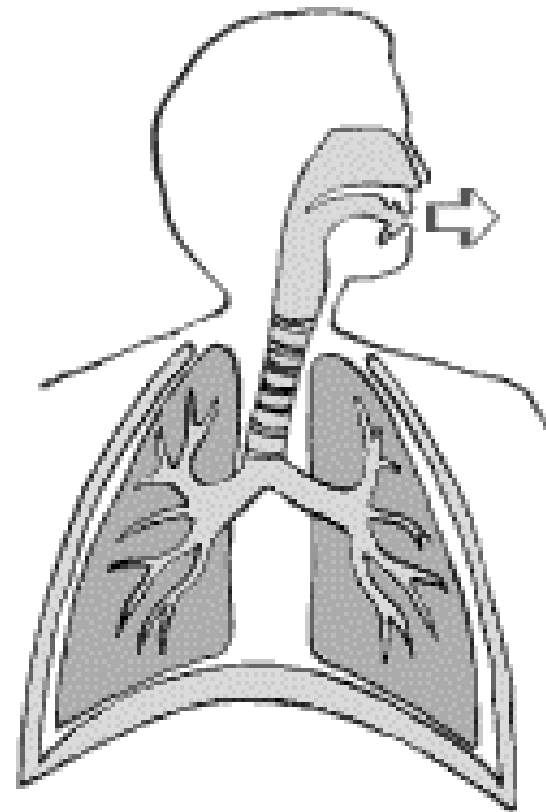
- 3 Echocardiogram / Transesophageal Echo
- 4 Cardiac Scan
- 5 ECG
- 6 PFT's
- 7 Ventilation Scan
- 8 Holter monitor / bedside monitoring
- 9 Cardiac catheterization
- 10 Electrophysiological studies

INVESTIGATIONS

11 Hemodynamic monitoring with P.A. catheter

TREATMENT & NURSING CARE

- 1 Assessment
- 2 I & O
- 3 O₂ / Humidified O₂
- 4 Daily Weight
- 5 A.A.T.
- 6 Elevate H.O.B. / Positioning
- 7 Fluid & Dietary Restrictions
- 8 Nutrition



TREATMENT & NURSING CARE

9 Skin Care

10 Restful Environment

11 Be prepared for Intubation

12 Be prepared for I.A.B.P. Insertion

13 Be prepared for Hemodynamic Monitoring with
Pulmonary artery catheter to direct and evaluate treatment

- L.V. Failure: increased wedge, PAD decreased C.O.
- RV. Failure: increased PAP, R.V. & R.A. pressure

TREATMENT & NURSING CARE

14 Be prepared for cardioversion
if hemodynamically stable
arrhythmia, ie A.F.

15 Be prepared for defibrillation
as V.T./V.F. is a common
cause of death in H.F. patients

16 Be prepared for pacemaker
insertion - arrhythmias, ie
A.F., S.S.S., post M.I. arrhy. ;
prefer DDD pacemaker

DRUG MANAGEMENT

- 1 Diuretics
- 2 A.C.E.I.
- 3 Beta Blockers
- 4 Digoxin
- 5 Antocoagulation
- 6 Nitrates
- 7 Aldactone
- 8 Inotropes



DRUG MANAGEMENT

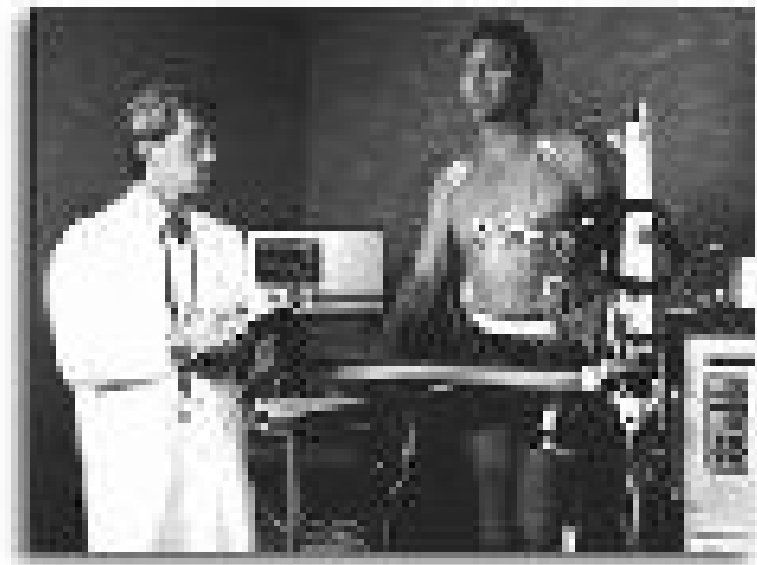
- 9 Antiarrhythmics
- 10 Angiotensin Receptor Blockers
- 11 Calcium Channel Blockers
- 12 Morphine

Note:

- If patient is acutely ill, a temporary ↑ in dose of certain drugs can achieve short term goals, then return to maintenance dose.
- NSAID's can inhibit the effects of diuretics, acei & worsen both cardiac and renal fx - avoid.

PATIENT TEACHING

- 1 Early s & sx
- 2 When to seek treatment;
who to call
- 3 Na & fluid restrictions
- 4 Diary of daily weight
- 5 Compliance with meds
and regime
- 6 Diuretic Management
- 7 ADL - rest, activity,
meals, daily weight,
socializing



PATIENT TEACHING

- 8 Support system / living arrangements
- 9 Financial - drug plan, home O2
- 10 Dealing with stress / family issues
- 11 Education about disease and treatment
- 12 Adapt treatment to lifestyle
- 13 Exercise - depending on F.C.
- 14 End of life issues - family, will, palliative care
- 15 Smoking - quit

Demographics

- Mortality rate is 20% in first year
- 5 year survival rate < 50%
- Annual mortality rate is 12-15%
 - 40% due to pump failure
 - 50% due to sudden deaths
- 54% of patients with heart failure are female
- > 80% of patients with heart failure are > 65 years
- On average, males live 1.7 years after dx; females live 3.2 years after dx
- readmission rate is 20-40%
- Volume overload is most common reason for readmission

In summary.....

- Heart failure is a complicated syndrome with many facets to be considered in it's diagnosis & management . However, with prompt & appropriate attention, patients will be able to have the quality of life they aim for & turn their failure into success .

