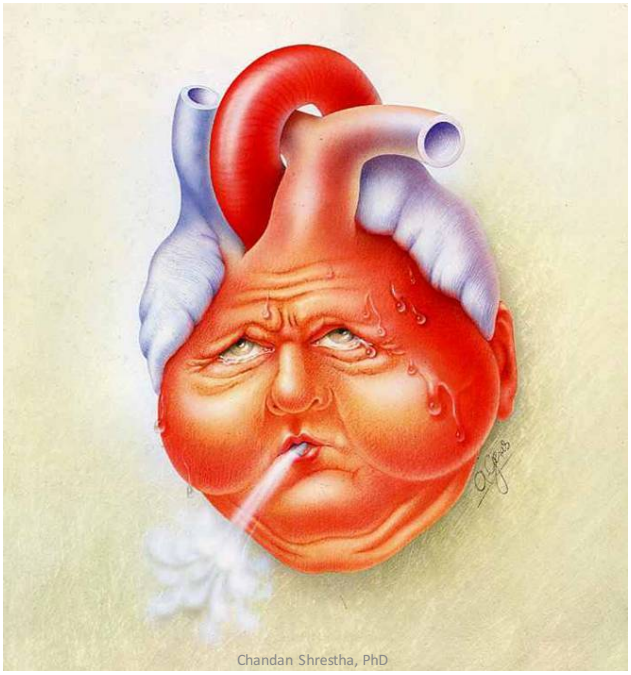

Congestive Heart Failure

- Inability of heart to pump sufficient blood to meet the needs of the tissues for oxygen and nutrients.
- Recognized as the clinical syndrome characterized by sign and symptoms of fluid overload and of inadequate tissue perfusion (due to low Cardiac Output)
- Types

1) Systolic HF: Weakened heart muscle
2) Diastolic HF: stiffness of heart muscle → difficult for the ventricles to fill with blood properly

Causes of Heart Failure

- Weakened Heart muscle
- Damage to heart muscle due to blockage (Coronary Artery Disease)
- High blood pressure (hypertension)
- Heart valve problems
- Abnormal rhythm or irregular heartbeat

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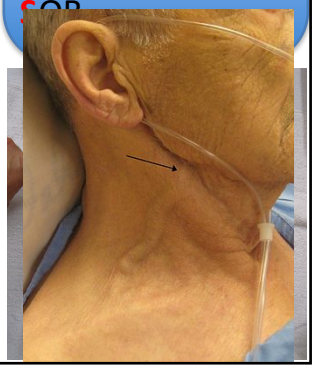
Clinical Manifestions

1. Left sided heart Failure
- Pulmonary congestion
- SOB or dyspnea (exertion)
- Dry cough

2. Right sided Heart failure
- Edema of lower extremities
- Pitting edema, ascites, Hepatomegaly
- Weight gain

FACES
Fatigue
Activities Limited
Chest Congestion
Edema
SOB



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Stages of Heart Failure

New York Heart Association

Class I: No symptoms of heart failure ***Class II***: Symptoms of heart failure with moderate exertion. ***Class III***: Symptoms of heart failure with minimal exertion but no symptoms at rest ***Class IV***: Symptoms of heart failure at rest

American College of Cardiology/American Heart Association

Stage A: High risk for developing heart failure
Stage B: Asymptomatic heart failure
Stage C: Symptomatic heart failure
Stage D: Refractory end-stage heart failure (symptoms at rest)

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Diagnosis

- Chest X-ray
- ECG
- Blood Test: B-type Natriuretic Peptide (BNP)
- Echo
- Stress testing
- MRI
- Angioplasty

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Management

- Bed rest and reduction of physical activity
- Salt restriction diet
- Avoidance of alcohol and NSAIDs
- Oxygen inhalation

Treatment

- The overall goals are to correct underlying causes, to relieve symptoms, and to prevent worsening of the condition.
- Symptoms are relieved by removing excess fluid from the body, improving blood flow, improving heart muscle function, and increasing delivery of oxygen to the body tissues.

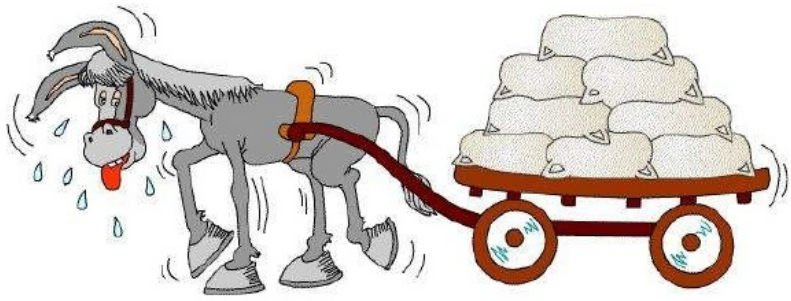
DRUGS AND DRUG CLASSES USED TO TREAT HEART FAILURE

Vasodilators - Drugs that decrease either preload or afterload. Major vasodilators used are ACE inhibitors and angiotensin II receptor antagonists.
Other agents include organic nitrates, hydralazine and nitroprusside.
Diuretics - promote the elimination of edematous fluid, improving tissue perfusion and pulmonary function. Noteworthy are loop diuretics and aldosterone receptor antagonists.
Beta blockers: Metroprolol, Carvedilol (β + α1 blocker)
Positive Inotropic Agents- Drugs that increase contractile force; $beta_1$ receptor agonists, cAMP PDE inhibitors, cardiac glycosides.

Drug therapy in CHF

A) Relief of congestive/low output symptoms and restoration of cardiac performance:
a. Inotropic drugs- digoxin, dobutamine/dopamine, amrinone / milrinone
b. Diuretics-furosemide, thiazides
c. Vasodilators-ACE inhibitors/ ARBs, hydralazine, nitrate, nitroprusside
d. Beta blocker- Metoprolol, bisoprolol, carvedilol
B) Arrest/reversal of disease progression and prolongation of survival:
a. ACE inhibitors/ARBs
b. Beta blockers
c. Aldosterone antagonist-Spironolactone

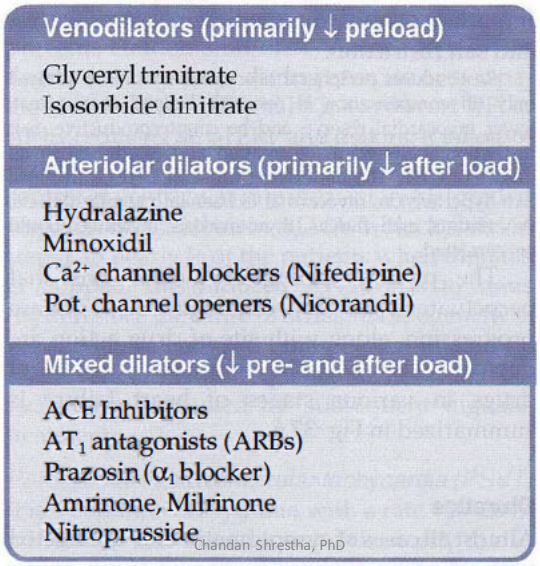
Ventricular dysfunction limits the patient's ability to perform the routine activities of daily living



Vasodilators

- drugs that dilate blood vessels
- are not used as often as ACE inhibitors or angiotensin II receptor blockers, which are more effective.
- People who do not respond to or cannot take ACE inhibitors or angiotensin II receptor blockers can benefit from vasodilators, such as hydralazine, isosorbide dinitrate and nitroglycerin
- In a few people with advanced symptoms, these drugs may improve quality and quantity of life when added to ACE inhibitors or angiotensin inhibitors.

Vasodilators



ACE- Inhibitors

- First line therapy for CHF.
- Inhibit conversion of angiotensin I to angiotensin II by blocking ACE.
- Cause arteries and vein to dilate
- Reduction in aldosterone synthesis→ ↓ salt and water retention.
- Net effect-Reduce heart workload

ARB

- alternate to ACE-I (Patient not responding to ACE-I due to side effect; cough)

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Diuretics

- Indicated in patients with symptoms of heart failure who have evidence of fluid retention
- Enhance response to other drugs in heart failure such as beta-blockers and ACE inhibitors
- Therapy initiated with low doses followed by increments in dosage until urine output increases and weight decreases by 0.5-1kg daily

Benefits

- Remove peripheral edema and pulmonary congestion
- Decrease preload and improve ventricular efficiency by reducing circulating volume.

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Aldosterone antagonist

- potassium sparing diuretics
- Weak diuretic
- block the action of aldosterone inhibiting the reuptake of sodium and water.

ACE-I and Diuretics

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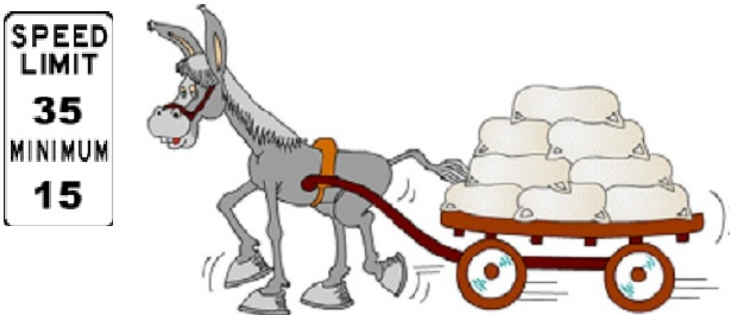
Beta Blockers

- Target sympathetic nervous system (SNS)
- Reduce the force of contraction, HR.



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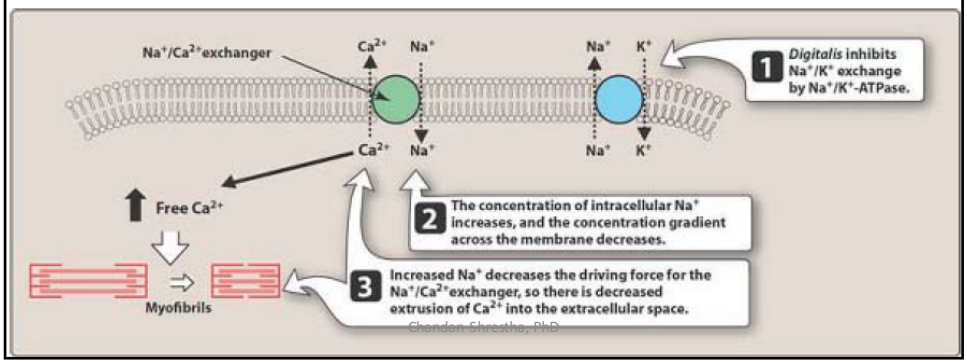
Digoxin

- Cardiac glycosides obtained from the foxglove plant *Digitalis Lanata*

MOA: inhibit Na+/K+ ATPase

✓ Increases the force of contraction
✓ slowing of the heart rate;
✓ decreased conduction velocity through the AV node



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A/E

- Narrow therapeutic index (0.8-2.0ng/mL).
- Most common: Hypokalemia
- loss of appetite, nausea, vomiting and diarrhea
- Visual disturbance (Blurred or yellow vision), confusion, drowsiness, dizziness
- Less: heart block

Reversal of Toxicity

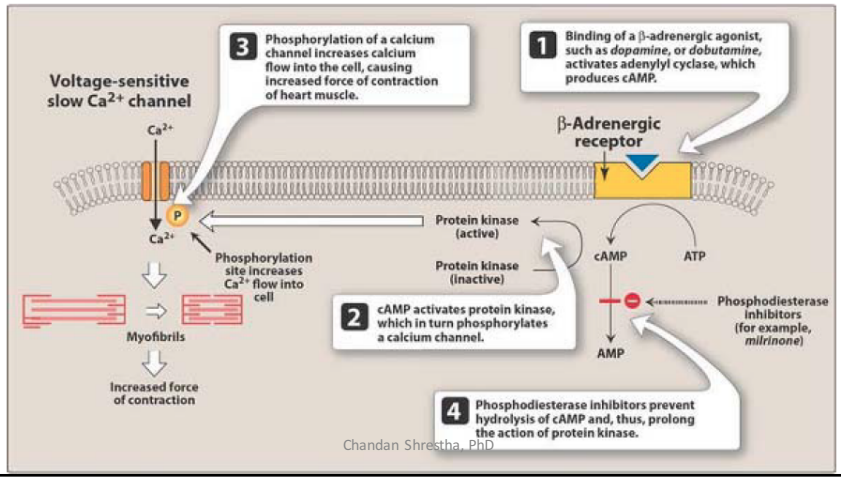
Digoxin immune FAB (Digibind)

Nursing Consideration

- Monitor apical pulse for 1 min before administering; hold dose if pulse < 60 in adult or < 90 in infant; retake pulse in 1 hr. If adult pulse remains < 60 or infant < 90, hold drug and notify prescriber.
- Monitor ECG, rhythm or rate.
- Monitor carefully for adverse reactions.
- Report weight gain >1 kg/d.
- Maintain intake/ output for the few first days because it increases renal output.
- Monitor serum digoxin, potassium, magnesium and calcium level.

Dopamine and Dobutamine

- Sympathomimetic drugs
- Doses of 2-8 µg/kg/min improve contractility and cardiac output.



Phosphodiesterase III inhibitors

- Amrinone and milrinone are phosphodiesterase inhibitors; that increase the intracellular concentration of cAMP.
- This results in an increase of intracellular calcium.
- Increase cardiac contractility and cause vasodilation.

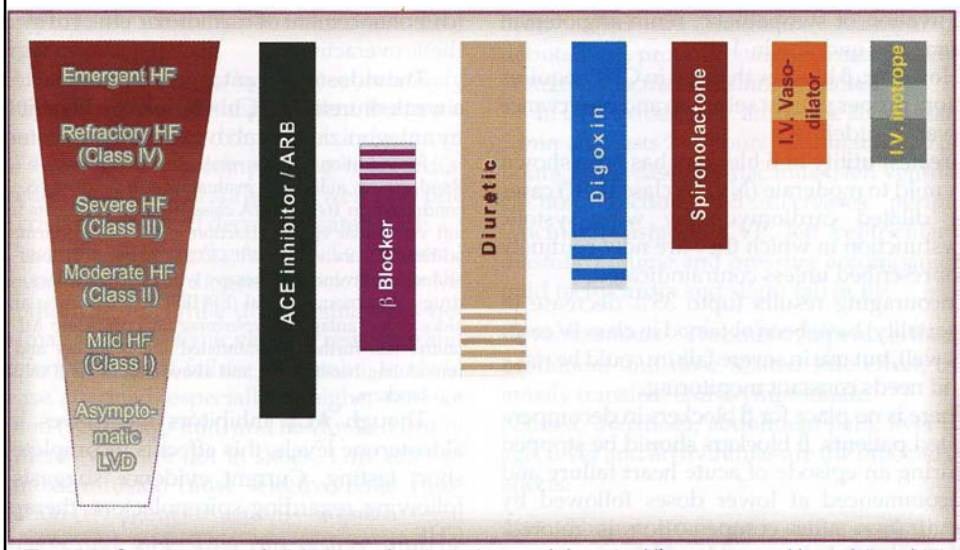


Fig. 37.6: Current pattern of clinical use of various classes of drugs in different stages of heart failure (HF)
LVD—Left ventricular dysfunction; ACE—Angiotensin converting enzyme; ARB—Angiotensin receptor blocker

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