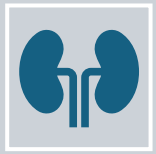
Congestive Heart Failure

Congestive Heart Failure

Previously called congestive cardiac failure (CCF)



Where the heart fails to pump blood to meet the circulatory or metabolic needs of the body.

Heart failure means failure on the part of the heart to:

Systolic failure: maintain an output necessary for the metabolic needs of the body at rest or during stress

Diastolic failure: Failure to receive blood into the ventricles during diastole

Etiology

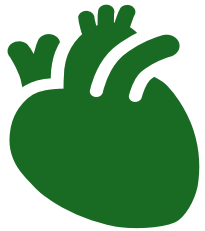
Cardiac causes

Congenital heart diseases:

- VSD, TGA, TAPVD, PDA, Coarctation of Aorta (CoA)

Acquired heart diseases:

- Valvular heart diseases e.g. mitral, aortic etc
- Infective endocarditis
- Hypertensive heart diseases e.g. acute glomerulonephritis
- Viral myocarditis etc.



Non-cardiac causes

Fluid overload

Septicaemia

Asphyxial cardiomyopathy

Severe anaemia

Beriberi (wet)

Thyrotoxicosis

Causes of CCF according to age

Age	Conditions
Fetus	Severe anaemia from fetomaternal transfusion or hemolysis, tachycardia (supraventricular or ventricular), complete heart block.
Newborn	Transposition of the great vessels, aortic atresia, CoA, PDA, pulmonary stenosis/atresia, hypoplastic left heart syndrome
1-2 months	Transposition of the great vessels, endocardial cushion defects, VSD, patent ductus arteriosus, aortic stenosis, CoA, anomalous pulmonary venous connection.
3-6 months	Endocardial fibroelastosis, transposition of the great vessels, VSD, CoA.
6-12 months	Endocardial fibroelastosis, VSD
1-4 years	Carditis, anemia, nephrotic syndrome, acute nephritis, endocardial fibroelastosis, atrial or VSD.
4-12 years	All foregoing causes plus rheumatic heart and later disease

Clinical features

Infants:

- **Irritability/excessive crying, excessive sweating**, poor or/and difficulty feeding, respiratory distress, wheezing
- Edema: Usually involving eyes, sacrum, legs and feet
- Noisy laboured breathing/tachypnea

Children:

- Effort intolerance, dyspnoea on exertion/rest, **excessive sweating**, cough, abdominal pain, **Poor weight gain**
- Tachycardia, raised JVP, Hepatomegaly, bilateral basal crepitations, oedema, peripheral cyanosis, Gallop rhythm

Sign of heart failure (based on side)

Left-sided heart failure:	Right-sided heart failure:	Both
• Tachypnea, Tachycardia, Persistent cough (more so on lying down), Wheezing, Hoarse cry, Basal crepitations (sometimes).	• Enlarged tender liver, Facial puffiness, Pedal oedema may be delayed.	• Cardiomegaly • Poor peripheral pulses • Cyanosis • Third heart sound gallop

A. General physical examination

- Tachypnoea
- Tachycardia
- Cold peripheries
- Weak thready pulse
- Low blood pressure
- Prolonged capillary refilling time
- Raised JVP
- Dependent oedema
- Cyanosis, may be

B. Chest examination

- Cardiomegaly
- Gallop rhythm
- Murmurs
- Wheeze
- Basal crepitation

C. Other features

- Tender hepatomegaly
- Positive hepatojugular reflux

Investigations

Chest X-ray

- Assessing the cardiac size and pulmonary congestion
- Exclude pulmonary cause
- Detecting CHD
- Increased cardiothoracic ratio

Electrocardiography: nonspecific T and ST segment changes, tall P wave and specific patterns of congenital and acquired heart diseases

Echocardiography: assessing structural pathology

Other: hemogram, serum electrolytes, serum electrolytes, blood gas analysis, renal function and blood culture

- X-ray chest showing Cardiothoracic ratio >60%

Treatment

- Goals
  - Reducing cardiac work
  - Increasing myocardial contractility
  - Reducing cardiac size to improve its performance
  - Treating underlying cause

General measures

- Decubitus: Upright position
- O2 inhalation: Humidified oxygen by head box/ mask/nasal prongs
- Bed rest and restriction of physical activities
- Maintenance of body temperature
- Feeding: Breast feeding or nasogastric tube feeding of foods rich in calory and low in sodium

Reducing cardiac work

- Bed rest: propped up at an angle of 30–45°
- Restriction of physical activities
- Sedation:
  - Morphine (0.5 mg/kg subcutaneously)
  - Benzodiazepine (midazolam, diazepam), phenobarbital, chloral hydrate or promethazine
- Oxygen and Antibiotics
- Correction of anemia
- Vasodilators: nitroglycerine and nitroprusside

Augmenting myocardial contractility by inotropic agents

Digoxin: Total digitalization dose: 0.02-0.04 mg/kg

Sympathomimetic amines e.g. Dopamine, Dobutamine

Phosphodiesterase inhibitors e.g. Bipyridines, Amrinone and Milrinone, xamoterol, flosequinan

Reducing cardiac size to improve its performance

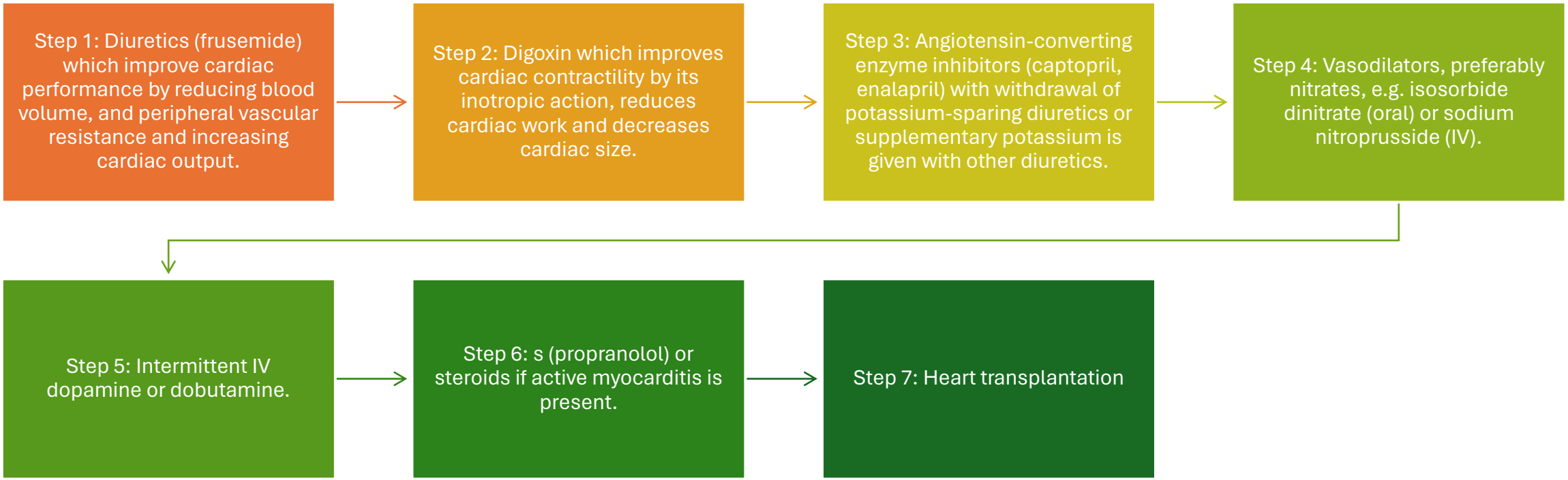
- Digoxin
- Diuretics e.g. Frusemide (1–3 mg/kg orally and 0.5–1.5 mg/kg parenterally) + K sparing diuretics e.g. spironolactone, amiloride
- ACE inhibitors e.g. Captopril, Enalapril, to reduce the impedance to left ventricular ejection
- Restrict sodium intake

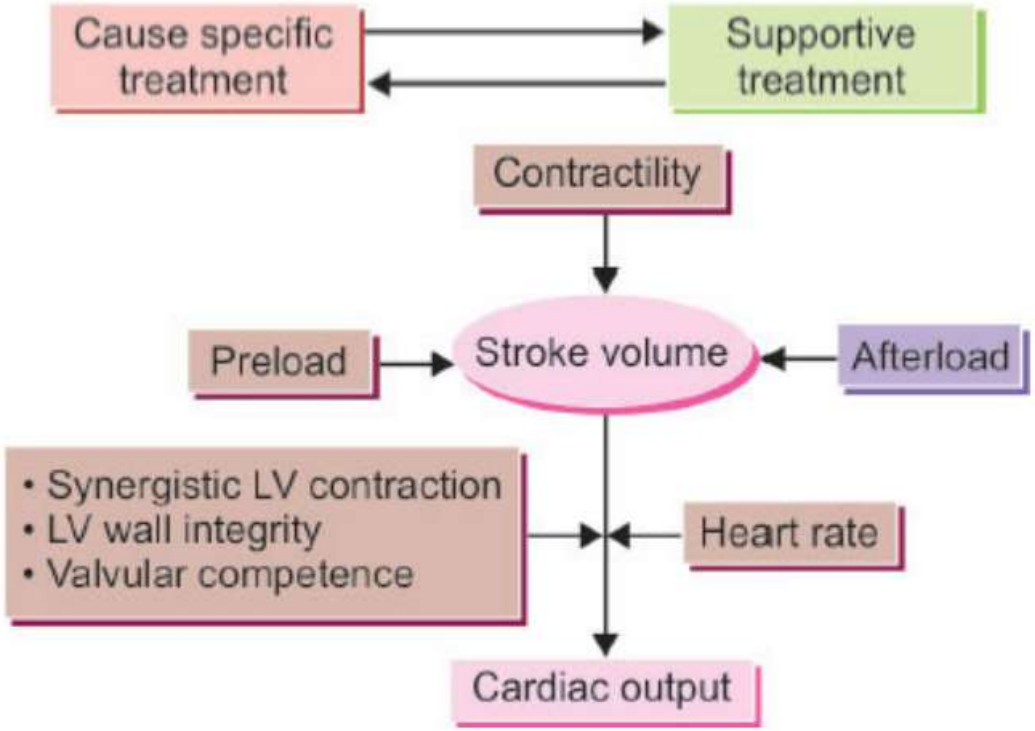
Correction of the Underlying Cause

INVESTIGATION LIKE ECHO

DEFINITIVE, PALLIATIVE CARE

Stepwise-treatment of pediatric heart failure





Drugs for CCF

Preload reduction: Diuretics
- Mainstay of treatment
- Action starts in 20 minutes
- Mechanism of action: Reduce the blood volume, decrease venous return and ventricular filling
- S/E: Volume depletion, hypokalemia, hyponatremia
- Frusemide 0.5-1 mg/kg/day

Afterload reduction: ACE inhibitors
enalapril 0.3-1 mg/kg/d
- Safety and efficacy proven in children
- May improve survival besides giving symptom relief
- Contraindications: Renal dysfunction, hypovolemia,
- Fixed obstructive lesions (aortic stenosis, mitral stenosis)
- Cough is a troublesome side effect

Increased myocardial contractility
Inotropes, digoxin
- Digoxin indicated in CHF with or without sinus rhythm
  Role in volume overload situations with normal cardiac function controversial
- Recent trend is to limit the use of digoxin (it was once a first line drug) due to lack of major survival benefit

References

- Ghai Essential Pediatrics-10th edition
- Nelson Essential of Pediatrics

Thank you