Heart Failure in Children

Hospital Based Heart Failure Education for Non-Cardiovascular Nurses
Heart Failure (HF) Definition

- A complex clinical syndrome in which the heart is incapable of maintaining a cardiac output adequate to accommodate metabolic requirements and the venous return.
- Heart failure is the final common pathway of most primary cardiovascular diseases, including, cardiomyopathy, myocarditis, and valvular and congenital heart malformations, hypertension, diabetes, coronary atherosclerosis.
HEART FAILURE (HF)

- About 5.1 million people in the US have HF.
- HF contributes to 1 in 9 deaths.
- About half of the people with HF die within 5 years of diagnosis.
Etiology of Heart Failure

- What causes heart failure?
- The loss of a critical quantity of functioning myocardial cells after injury to the heart due to:
  - Idiopathic Cardiomyopathy
  - Infections (e.g., viral myocarditis, Chagas’ disease)
  - Cytotoxic drugs (Doxorubicin)
  - Coronary Insufficiency
  - Prolonged Arrhythmias
  - CHD (Single Ventricle, Systemic RV)
CHF Symptoms
Newborn and Infant

- General
- Decreased intake - poor feeding
- Increased feeding time - initially may feed well, but seem to tire with feeding, have increased work of breathing
- Failure to thrive (FTT) - problem gaining weight
- Pallor/Cyanosis
- Diaphoresis - sweating with crying, feeding or exertion

- Respiratory
  - Nasal flaring
  - Tachypnea
  - Grunting
  - Retractions
  - Wheeze
  - Freq. Resp. infections
CHF Symptoms
Newborn and Infant

- Cardiac
- Tachycardia
- Cardiomegaly
- Gallop
- Murmur

- Hepatomegaly
  - Facial/Eyelids—periorbital, swollen feet/ankles in older children
CHF Symptoms
Child and Adolescent

- **Cardiac**
  - Tachycardia
  - Gallop
  - Murmur
  - Cardiomegaly

- **GI**
  - Hepatomegaly
  - Anorexia
  - Abdominal pain
  - FTT

- **Neuro (advanced CHF)**
  - Disorientation
  - Confusion

- **Edema**
  - Pedal
  - Sacral
## Modified Ross Heart Failure Classification for Children

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Class I</td>
<td>Asymptomatic</td>
</tr>
</tbody>
</table>
| 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 |
Volume overload

- Symptoms may be caused by volume overload
  - Indiscriminate use of intravenous fluid resuscitation, or even maintenance IV fluids is contraindicated.
    - will worsen condition of children with CHF symptoms
  - Diuretics play an important role in the management of symptomatic heart failure.
If you notice any of the signs and symptoms discussed in the previous slides or any worsening of the symptoms, inform the doctor immediately.
Current Treatment of Heart Failure
General Measures

- **Lifestyle Modifications:**
  - Proper diet: avoid obesity and malnutrition
  - Discontinue smoking/drugs
  - Avoid alcohol and other cardiotoxic substances
  - Exercise

- **Medical Considerations:**
  - Close outpatient monitoring
  - Anticoagulation
  - Immunization
  - Sodium/fluid monitoring
  - Daily weights
  - Treat arrhythmias and any associated disease
Basic HF meds

- Three main classes of drugs are used for HF in children:
  - Inotropic Agents
  - Diuretics
  - Afterload Reducing Agents
Diuretics

• Loop diuretics
  – effectively reduce symptoms
  – reduce episodes of worsening HF
  – increase exercise capacity

• Lasix
  – Usual dose 1 mg/kg/dose IV or PO
  – Can be given BID, TID, QID depending on response
  – Same dosage whether IV or PO
Diuretics

- Thiazide diuretics
  - Such as Diuril can be added in patients with limited response to loop diuretics
  - Diuril usual dose
    - 5-10 mg/kg/dose IV or PO BID (IV and PO dose the same)
Inotropic Agents

- Used in the:
  - critically ill child
  - child with renal dysfunction
  - post-operative cardiac surgery patients with heart failure

- Rapidly acting catecholamine agents are preferable to digoxin in these patients
# Inotropic Agents

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milrinone</td>
<td>0.25-1 mcg/kg/min</td>
<td>Hypotension, arrhythmias</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>0.05-1 mcg/kg/min</td>
<td>Hypertension, arrhythmias</td>
</tr>
<tr>
<td>Dobutamine</td>
<td>2-10 mcg/kg/min</td>
<td>Tachycardia and vasodilation, arrhythmias</td>
</tr>
<tr>
<td>Dopamine</td>
<td>5-10 mcg/kg/min</td>
<td>Tachycardia, arrhythmias, hypertension</td>
</tr>
</tbody>
</table>
Milrinone

- Increase cardiac index
- Reduce pulmonary capillary wedge pressure
- Reduce systemic vascular resistance
- May cause peripheral vasodilation

** should be used with caution in hypotensive patients
• Most commonly used digitalis preparation in children
• Can be given IV or PO
• Usual maintenance dosing:
  – Digoxin 8-10 mcg/kg/day divided into 2 doses
• Can give loading dose, but often maintenance dose is administered orally without loading doses
• Nurses should always check an apical heart rate prior to administering Digoxin
Chronic therapy

- Angiotensin Converting Enzymes inhibitors (ACEI)
- Captopril, Enalapril
  - used for afterload reduction
  - may decrease blood pressure
- B-Adrenergic antagonists
- Carvedilol, Metroprolol
  - usually started after ACEI.
Chronic therapy

- Aldosterone antagonist therapy
- Spironolactone
  - typically used in patients where therapy with ACEI and B-blocker has not resulted in improved ventricular function

** close monitoring of renal function and serum potassium is required when giving this therapy plus ACEI therapy
Other Considerations
Dietary considerations

- Children with heart failure may need:
  - low salt diet or children who take water pills may need added salt.
  - longer time to eat a meal as they can tire easily with any activity.

- What you can do…
  - Alert the doctor to changes in eating habits: many times increasing heart failure leads to decreased appetite, poor feeding or sweating / distress while eating.
  - Try to limit free water, encourage higher calorie beverages such as Pediasure.
Stressful Procedures... such as IV inserts and lab draws

- If child is a difficult stick and it is taking a long time to draw blood, make sure to reassess child frequently as they may need a break. These kids do not tolerate crying and agitation very well. Frequent breaks may be needed.

- Make every attempt to run labs even if the sample is a smaller amount than what is preferred. This may be the only blood we can get and we should identify which labs are most important.
During Testing

- Often times, children with heart failure have difficulty laying flat. Young children may not be able to communicate this, so if a child becomes frantic when the head of the bed is lowered, do not force them to lie flat for a study. They cannot breathe when laying flat.
- Heart failure patients may have difficulty tolerating positional changes required for some studies. Be alert for changes in breathing, child’s behavior (desperate, frantic behavior is often a bad sign), and they may require urgent intervention.
Conclusion

- Heart failure is not a hopeless condition. It can often be treated. No matter what is your job description, You Can Help!
- If you suspect a child may have signs and symptoms of heart failure, talk to a doctor
- If you need more information about heart failure, visit the American Heart Association website: http://www.heart.org/HEARTORG/Conditions/CongenitalHeartDefects/TheImpactofCongenitalHeartDefects/:%2520Heart-Failure-in-Children-and-Adolescents_UCM_311919_Article.jsp