Device Therapy Options for Treatment of Heart Failure

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Introduction

• Heart failure is a diagnosis that is affecting a greater portion of the population every year. This presentation is designed to familiarize the healthcare provider with the most recent evidence-based practice device therapies to aid in the care of this complex population.

• Christina L. McCaw, RN BSN has worked at Palmetto Health Heart Hospital in Columbia, SC since 2007 providing direct patient care prior to moving into staff education. She was part of the inter-disciplinary team that developed the Accountable Care Unit model for Heart Failure in 2015 and oversees continuing staff education for heart failure.
Objectives

• Differentiate between systolic and diastolic heart failure
  ▫ Discuss heart failure phenotypes
• Define the treatment goals for the different stages of Heart Failure
  ▫ Evidence-based practice treatment recommendations
  ▫ Cardiac rehabilitation recommendations
• Discuss advances in use of device therapies for treatment of Heart Failure
Connect to Purpose
Heart Failure at a Glance

• There are 960,000 new HF cases annually (ARIC 2005–2013)

• The number of people diagnosed with heart failure is projected to rise by 46 percent by 2030, resulting in more than 8 million adults with heart failure

• Projections show that by 2030, the total cost of HF will increase almost 127% to $69.7 billion from 2012

• 50% Mortality within 5 years of diagnosis

AHA. 2017 Heart and Stroke Statistical Update
HFrEF

• Reduced Ejection Fraction
• Causes
  • Ischemic Heart Disease (50-75%)
  • Hypertension
  • Dilated Cardiomyopathy
    • Overstretched left ventricle
    • Thin, loss of elasticity
  • Heart valve disease
  • Pericarditis
  • Pregnancy-induced
  • Alcohol abuse
  • Co-morbidities – COPD, diabetes
HFpEF

- Preserved Ejection Fraction
  - Hypertrophic, stiff, noncompliant ventricles impair filling
  - EF is normal or less

- Causes
  - Greater than 75% of HFpEF is caused by hypertension
  - Metabolic syndromes
HFiEF

• Improved Ejection Fraction can occur for a number of reasons:
  ▫ Spontaneous myocardial recovery/repair
  ▫ Reverse remodeling
  ▫ Reversible illnesses
  ▫ Myocardial recovery with LVAD support
Treatment Goals for HFrEF

• Improve symptoms/Optimize volume status
• Restore normal oxygenation/support ventilation
• Preload/Afterload reduction
• Optimize chronic oral therapy, minimize side effects
• Use of + inotrope medications, evidence-based practice drugs, new medications
• Consider revascularization for ischemic causes
• Consider device therapies: LVAD, CRT, CardioMems, Life Vest
• Provide anticoagulation for afib
• Limit Progression of the disease
Treatment Goals for HFpEF

Limit progression of the disease!

• Focus on heart rate and blood pressure control
  ▫ Goal to maintain less than 130/80

• Control Co-morbidities
  ▫ Obstructive Sleep Apnea
  ▫ Diabetes
  ▫ Cholesterol

• Modifiable risk factors
  ▫ Weight management
  ▫ Smoking cessation
  ▫ Nutrition
Treatment Goals for HFiEF

• Limit progression of the disease
  ▫ Patients need to stay on the same medication regimen as HFrEF to maintain gains

• VAD assisted
  ▫ Bridge-to-Transplant versus Destination therapy
Evidence Based Practice Medications

Class 1 Recommendation Drugs:
- Beta Blockers
- ACE/ARB/ARNi

Class 2 Recommendations
- Corlanor (Ivabradine)
- Lowers heart rate without affecting blood

Infusion Therapies
- + Inotropes - Dopamine, Dobutamine, Milrinone
- Diuretics - Lasix, Bumex
Cardiac Rehabilitation in HF

• Aerobic exercise training for patients with HFrEF is possible, safe, and results in improvements in mortality and hospitalization

• The HF-ACTION trial assessed the safety and efficacy of exercise training for medically stable patients with HFrEF (EF ≤35%, NYHA functional classes II to IV)
  ▫ In this study, exercise training was associated with an 11% reduction in all-cause mortality/hospitalizations and a 15% reduction in cardiovascular mortality/HF hospitalizations

• Barriers to Cardiac Rehab utilization
  ▫ Participants can not be enrolled until 6 weeks after hospitalization for decompensated HF
  ▫ Patient adherence
  ▫ Referral obstacles
NYHA Functional Classification

Class I
(Mild) No limitation of physical activity.

Class II
(Mild) Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea.

Class III
(Moderate) Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnea.

Class IV
(Severe) Unable to carry out any physical activity without discomfort.
Heart Failure Overview

HEART FAILURE PROGRESSES OVER TIME

Possible treatment option: optimal medical management by a heart failure specialist, pacemaker &/or defibrillator

Mild (Class I)
No symptoms

Mild (Class II)
Slight symptoms that slightly limit physical activity. Comfortable at rest or with mild activity

Moderate (Class III)
Many physical activities are limited. Only comfortable at rest

Severe or Advanced (Class IV)
Any/all physical activity is limited. Not comfortable at rest or lying down

Possible treatment option: intravenous medications, VAD &/or Heart Transplant, Palliative care.
Zoll Life Vest

- External, wearable defibrillator
- HF patients with an EF of 35% or less qualify
- Reduced EF predisposes the patient to Sudden Cardiac Arrest
- May need ICD or CRT
CardioMEMS

• Permanently implanted during a right heart cath procedure

• Enables the heart failure team to monitor PA pressures remotely after discharge and adjust medications before symptoms develop
CardioMEMS

- Criteria for CardioMEMS implantation:
  - At least one hospitalization for HF in the past year
  - NYHA Class III functional symptoms
  - Body Habitus/Chest Circumference
  - Compliance
  - Medicaid does not currently pay for the device
  - Also helpful in managing HFpEF patients with diastolic dysfunction as well as pulmonary hypertension
Cardiac Resynchronization Therapy

• Indicated for HF patients with extensive intraventricular conduction delays or BBB

• Severe HF patients qualify (NYHA Class III/IV)

• CRT builds on existing pacemaker/ICD technology with traditional right atrial and ventricular leads and an additional lead placed over the left ventricle via the coronary sinus to allow synchronized pacing of both sides of the heart, or **bi-ventricular pacing**
  - CRT-D - Bi-ventricular Pacing with ICD capability
  - CRT-P - Bi-ventricular Pacing
Cardiac Resynchronization Therapy

Bi-ventricular pacing results in narrowing of conduction abnormality and resynchronized pumping function

- Bi-ventricular therapy being delivered - results in a narrower paced QRS complex

- Wide QRS complex- therapy is NOT being delivered
Ventricular Assist Devices

- **VAD**
  - Ventricular Assist Device
  - mechanical heart pump that takes over circulation for the left side of the heart - Provides continuous flow from the LV
  - Heartware, HeartMate II, Heartmate 3

- **Bridge to Transplant (BTT)**
  - patient currently qualifies for the heart transplant waiting list and is actively seeking a new heart

- **Destination Therapy (DT)**
  - Patient does not currently and may not ever qualify for heart transplantation
Ventricular Assist Devices

- Help patients live longer
  - Survival to heart transplant
  - Indefinitely on support
- Improve quality of life
  - Living normal lives with minimal restrictions
  - Improved exercise tolerance
  - Improved end-organ function
  - Improved neuro-cognitive function
VAD Implants at Prisma Health

HeartMate II

Continuous Flow pump

Power Source Options:
- 2 batteries
- 2 AC (wall) connections
- Always re-establish power with one power cable before disconnecting the second power cable

HeartMate 3

Fully magnetically levitated, continuous flow pump- “pulsatile pump”

External power sources are the same as the HeartMate II
VAD Implants at Prisma Health

HeartWare/ HVAD

Continuous flow, centrifugal pump

Power Source Options:
• 2 batteries
• 1 battery and AC (wall) power
• Always re-establish power with one power connection before disconnecting the second power connection

Use Caution:
If BOTH power sources are disconnected at the same time, the pump will STOP.
Ventricular Assist Devices

• Because the LVAD is a continuous flow pump:
  ▫ Pulse may not be palpable, if present it will be weak
  ▫ Blood Pressure: Use Doppler BP and Automated BP together
    • VAD Patients are treated off of the Mean Arterial Pressure (MAP)
  ▫ It may be difficult to obtain an accurate pulse ox
  ▫ VAD “hum” will ensure device is on and functioning appropriately

• EKG should not be affected but interference from the device may make interpretation difficult

• OK to defibrillate – no modifications to pump necessary

• Patients are anticoagulated with Coumadin and ASA
Ventricular Assist Devices

DO NOT DO CHEST COMPRESSIONS, unless instructed to do so by a member of the VAD Team.

Never disconnect any of the cables.
Ventricular Assist Devices
Emergency Back-Up Bag

• Remember: the patient’s emergency back-up bag should be with them AT ALL TIMES.
• What back-up equipment is included in the emergency back-up bag?

HeartMate:
- Back-up System Controller
- 2 Charged Batteries
- 2 Battery Clips

HeartWare:
- Back-up System Controller
- 2 Charged Batteries
In Summary

• There is NO cure for Heart Failure so the focus must shift to prevention and early intervention

• Device Therapies when used appropriately and employed early enough in the disease process can be life-saving, life-sustaining and life-improving
Contact Information

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References


