Implantable Cardioverter Defibrillators (ICD)

- Primary prevention of sudden cardiac death is indicated for those at greatest risk for SCD but have not had arrhythmias
- Secondary prevention dictates the implantation of ICDs in HF patients who have had life threatening arrhythmias
- Poor CO leads to increase catecholamine release thereby potentiating arrhythmia
Primary Prevention

• Non-ischemic CM
  – EF < or equal to 35%
  – NYHA Class II or III
  – On Optimal Medical Management
• ICD 40 days post MI EF < 35% while on maximized medical therapy

Secondary Prevention

• Current or prior HF
• Reduced EF
• With a history of cardiac arrest, VF, or destabilizing VT

New Appropriate Use Criteria
Heart Rhythm Vol 10 No 4 April 2013

Posted on HRS Website
Cardiac Resynchronization Therapy (CRT)

CRT Coordinated activation of the ventricles and septum
- In association with an optimized AV delay improves hemodynamic performance by forcing the left ventricle to complete contraction and begin relaxation earlier, allowing an increase in ventricular filling time
- Indicated for patients with EF < or equal to 35% with a QRS > or equal to 0.12 seconds

New Recommendations for CRT

- Patients with atrial fibrillation and LVEF \(\leq\) 35% now are indicated for CRT if rate control allows near 100% ventricular pacing
- Indication for CRT in patients with NYHA Class I symptoms, is provided with a recommendation Class IIb (“may be considered”)
- This is limited to patients with relatively severe cardiomyopathy (LVEF \(\leq\) 30%) due to ischemia, LBBB, and QRS duration \(\geq\) 150 msec, but expands the option of CRT to patients who previously would not have been considered candidates
After CRT

• Monitor patients carefully for improved heart function
  – May need less diuretics
• Monitor for non-response

Optimization of Therapy

• Patient education
  – Assessment of understanding
  – Tailoring of teaching methods
  – Inclusion of support system
  – Sensitivity to cultural factors
  – Allowance for repetition
  – Awareness of the community
Health Literacy

- Ability to read, understand, and act on health instructions
- Identify barriers to compliance
  - Time of furosemide and outings
  - Side effects
  - Misconceptions
- Employ teach back
  - “Many of your friends probably have weak hearts, how would you tell them to ……”
- Don’t say “you understand?”
- Utilize a variety of teaching methods
  - Demonstrations
  - Hands-on learning

Education

- Dietary considerations
  - Low sodium diet
  - Protein intake
  - Foods containing potassium
- Pressure stockings
- Activity
- Weight monitoring
- Medications
- Follow up appointment
- What to do if symptoms worsen

Education

- Medication adherence
- Signs and symptoms
- Who do you call
- Get immunized against Flu
- Reduce or eliminate alcohol intake
- Quit smoking
- Sodium restriction
- Exercise recommendation
Education Continued

- Sexual dysfunction
  - Sildenafil and Nitrates
- Sleep Disordered Breathing
  - At rest, heart muscle continues to consume O2 with little reserve therefore relies on oxygenated flow to meet demand
  - Adherence with keeping mask on
  - Be persistent with O2 supply company

Noncompliance or Mistakes > Readmissions

Barriers to Optimization of Therapy

Comorbid conditions can precipitate a heart failure episode so treating these conditions can make patients feel better and prevent worsening of condition.
Treat Comorbid Conditions

- Coronary Artery Disease
- Sleep Disordered Breathing
- Diabetes Mellitus
- Arrhythmias
- Pulmonary embolism
- Chronic Obstructive Pulmonary Disease
- Thyroid dysfunction (both hypo and hyperthyroid dx)
- Hyperlipidemia
- HTN (140/90 when no other disease present)
- Renal Disease
- Anemia
- PAD
- Obesity (BMI < 30)
- Depression
- Infections
  - Pneumonia
  - Viral cardiomyopathy

When All Else Fails

- Maximizing all therapies is essential to ensuring that you expose the right patient to the right device

HFSA 2010 Practice Guideline
Acute HF—Hospital Admission

Hospitalization recommended in the presence of severely decompensated HF
- Hypotension
- Worsening renal failure
- Altered mentation
- Dyspnea at rest
- Hemodynamically significant arrhythmia
  - Including new onset of rapid atrial fibrillation
- Acute coronary syndrome
- Worsened congestion
  - Even without dyspnea
- Signs and symptoms of pulmonary or systemic congestion
  - Even in the absence of weight gain
- Major electrolyte disturbance
- Associated comorbid conditions
  - Pneumonia, pulmonary embolus, diabetic ketoacidosis, symptoms suggestive of TIA or stroke
- Repeated ICD firings
- Previously undiagnosed HF with signs and symptoms of systemic or pulmonary congestion
HFSA 2010 Practice Guideline
Acute HF—Treatment Goals
• Treatment Goals for Patients Admitted for ADHF
  – Improve symptoms, especially congestion and low output symptoms
  – Restore normal oxygenation
  – Optimize volume status
  – Identify etiology
  – Identify and address precipitating factors
  – Optimize chronic oral therapy
  – Minimize side effects
  – Identify patients who might benefit from revascularization or device therapy
  – Identify risk of thromboembolism and need for anticoagulant therapy
  – Educate patients concerning medications and self-assessment of HF
  – Consider and, where possible, initiate a disease management program
Advanced Therapies for ADHF with NYHA Class IV: Hospitalize and Consider PA Catheter Guided Care

- Inotropic Support
- Mechanical Circulatory Support: refractory HF estimated 1 year mortality > 50% with medical therapy
- Transplant: never used as an emergent therapy to treat end-stage HF
- Palliative care and hospice
- Ultra-filtration
- Continuous renal replacement therapy

HFSA 2010 Practice Guideline
Acute HF—Hemodynamic Monitoring

- Invasive hemodynamic monitoring should be considered in a patient:
  - Who is refractory to initial therapy
  - Whose volume status and cardiac filling pressures are unclear
  - Who has clinically significant hypotension (typically SBP < 80 mm Hg) or worsening renal function during therapy
  - Or who is being considered for cardiac transplant and needs assessment of degree and reversibility of pulmonary hypertension
  - Or in whom documentation of an adequate hemodynamic response to the inotropic agent is necessary when chronic outpatient infusion is being considered

Strength of Evidence = C

Inotropic Support

- Continuous Inotropes should be started only after oral medications have been optimized
- Need an end point
- ICDs should be implanted if the patient is going to be discharged on a continuous infusion unless inotrope is used for palliation
- Intermittent infusions NOT recommended
Mechanical Circulatory Support

• Destination Therapy DT
• Longer wait times on transplant list
• Smaller external components
• Longer lasting batteries
• More states allow VAD patients to drive
• Travel
First BiVAD to go Home in the Mid-Atlantic region

Total Artificial Heart

Are you perplexed by low PI or flat wave forms on continuous flow pumps? So is “Shab Dorc”
Pump Thrombosis

Heart Replacement
• Transplant community relies on United Network for Organ Sharing (UNOS) for fair organ sharing

Misconceptions About Transplant
• Someone has to die so I can live
• The center gets to pick who gets the organ
• Donor’s fate is sealed, we hope the family can make a life giving decision in the face of tragedy
• UNOS provides for fair organ sharing
Transplant: Never Used as an Emergent Therapy to Treat End-Stage HF

• Indications:
  – NYHA IV after OMM(2)
  – MVO2 < 14 % or 50 % predicted
  – Reliable psychosocial support
  – Insurance/financial resources to support lifelong immunosuppressive therapy

• Contraindications:
  – Fixed Pulmonary Hypertension
  – Active systemic infection
  – Recent history of Cancer
  – Obese with BMI > 35 – 40 (program specific)
  – Documented history of noncompliance
  – Life limiting disease other than HF
  – End organ disease due to HF/poor perfusion
  – Psychiatric illness that prevents compliance
  – Active substance abuse

Palliative Care: It’s not just Hospice

• Symptom management
  – Pain
  – GI
  – SOB

• Caregiver support

• Follow up

• Supportive cardiology study at Inova: All DT VAD patients are candidates for participation

Case Study

HISTORY

• 63 year old white male, under the care of cardiologist and primary care physician
• Frequent readmissions for decompensated HF/ER visits
• Recently underwent a cardiac catheterization - found to have no evidence of obstructive CAD
• Admits to occasional high dietary sodium intake, several instances within the last week
• Has been drinking more than the recommended 2 liters of fluid a day
• Has not been adherent to medication regimen as determined by his daughter who picks up his prescriptions
SYMPTOMS
• Weight today was up 9 pounds over the last 2 months
• Increasing dyspnea with exertion over the last 2 days as well as abdominal distention and early satiety, easy at rest, mild orthopnea,
• No PND, lightheadedness, or coughing
• Has noticed mild lower extremity edema

DIAGNOSTICS
• BMP included a sodium of 141, potassium of 3.7, BUN of 15, and creatinine of 1.0
• Chest x-ray showed mildly increased pulmonary vasculature
• LVEF of 28% documented via myocardial perfusion within last year
• Echo within last year shows global hypokinesis with elevated left ventricular filling pressures

CURRENT MEDICAL DIAGNOSES
• Hypertension
• Cardiomyopathy Idiopathic
• Atrial Fibrillation
• COPD
• Hyperlipidemia

ALLERGIES
• NKA
MEDICATIONS
- Coumadin 5 mg tablet, Takes 1 tab daily, or as directed
- Digoxin 250 mcg tablet, 1 by mouth daily
- Furosemide 20 mg tablet, 1 by mouth daily
- Lisinopril 10 mg tablet, 1 by mouth daily
- Metoprolol tartrate 100 mg tablet, 1 by mouth twice daily
- Mirtazapine 30 mg tablet, 1/2 tab
- Pravachol 20 mg tablet, 1 by mouth daily

PAST HISTORY
- **Past Medical Illnesses:** Arthritis (osteo), hypertension, hyperlipidemia
- **Past Cardiac Illnesses:** Atrial fibrillation, cardiomyopathy (dilated)
- **Surgical Procedures:** No previous surgical procedures

SOCIAL HISTORY
- **Alcohol Use:** Does not use alcohol
- **Smoking:** Non-smoker
- **Diet:** Low sodium diet and caffeine use-2-3 per day
- **Lifestyle:** Divorced
- **Exercise:** No regular exercise, minimal basic ADL’s
- **Occupation:** Unemployed and on disability
- **Resources:** Unemployed, limited financial resources
- **Social support:** Limited, one daughter living in area who checks on him weekly. Has a weekly Home Health nurse monitoring failure and has a telemonitoring system installed. No close friends
- **Education:** Completed up to 6th grade, diagnosed as functionally illiterate
- **Illicit Drug Use:** Denies substance abuse
- **Residence:** Lives alone
HEART FAILURE CLINIC DATA
• HF Clinic Enrollment Date: 6/25/12
• Etiology: Dilated Cardiomyopathy
• Comorbidities: Atrial Fibrillation, Hypertension, Hyperlipidemia
• Education with Successful Teach back: Needs Reinforcement
• Medication Reconciliation Accurate: Yes

PHYSICAL EXAMINATION
• Blood Pressure: 130/80 sitting, left arm, regular cuff; Pulse: 72/min; Respiration: 16/min.
• Weight: 206.00 lbs.
• Height: 61”
• BMI: 39
• Constitutional: Well developed, well nourished, in no acute distress, 63 year old male arriving ambulatory
• Skin: Warm and dry to touch
• Head: Normocephalic, normal male hair pattern
• ENT: Ears, nose and throat unremarkable
• Neck: No JVD, no bruits, non-tender
• Chest: Diminished breath sounds, fine rales in bases
• Cardiac: Irregularly irregular rhythm with variable 1st heart sound, normal 2nd heart sound, no murmurs, positive S3, no S4
• Abdomen: Abdomen slightly firm, non-tender, moderately obese
• Peripheral Pulse: Pulses full and equal in all extremities
• Extremities & Back: 1+ bilateral calf edema, 1+ bilateral ankle edema
• Psychiatric: Mood appropriate, no difficulties with speech or language
• Neurological: Oriented to time, person and place

QUESTIONS FOR PART 2:

1. Is patient on appropriate medications for symptoms, diagnosis? If not, what medications would be appropriate?
   a. Change beta blocker to long acting, increase ACE dosage
   b. Consider adding aldosterone agonist
   c. Add calcium channel blocker
   d. A & B
1. Is patient on appropriate medications for symptoms, diagnosis? If not, what medications would be appropriate?
   a. Change beta blocker to long acting, increase ACE dosage
   b. Consider adding aldosterone agonist
   c. Add calcium channel blocker
   d. A & B

QUESTIONS FOR PART 2:

2. Which of these are not true about ACE inhibitors:
   a. Recommended for patients with EF < 40%
   b. Should never be used with patients with renal disease
   c. Afterload reduction agent with vasodilatory properties
   d. May cause hyperkalemia due to decreased urinary potassium excretion related to renal insufficiency
QUESTIONS FOR PART 2:

3. The three beta blockers recommended for use in heart failure include:
   a. Carvedilol, bisoprolol, atenolol
   b. Bystolic, carvedilol, metoprolol
   c. Carvedilol, bisoprolol, metoprolol
   d. All are recommended

QUESTIONS FOR PART 2:

4. This patient has not been referred for CRT evaluation. Inclusion for CRT includes:
   a. NYHA functional Class III or ambulatory Class IV HF symptoms in patients who are symptomatic despite optimal recommended medical therapy
   b. LVEF ≤ 35%
   c. QRS duration ≥ 120 ms
   d. N3R
   e. All of the above are required
4. This patient has not been referred for CRT evaluation. Inclusion for CRT includes:
   a. NYHA functional Class III or ambulatory Class IV HF symptoms in patients who are symptomatic despite optimal recommended medical therapy
   b. LVEF < 35%
   c. QRS duration ≥ 120 ms
   d. NSR
   e. All of the above are required