Heart Failure or Heart Success?

Alan Kono, MD
Cardiology
Assistant Professor of Medicine
Dartmouth Hitchcock Medical Center

Dartmouth Community Medical School
Heart Failure
Climate Variation

Hawaii Patient

Northern New England Patient
What is this?

A. Yellow Cowboy hat
B. Arby’s Prototype
C. R2D2 Prototype
D. Go Blue
E. Don’t Know-
   Pick on someone else
Go Blue
The Big House
How many fans does the Big House hold?

A. 43,000
B. 65,000
C. 91,000
D. 110,000
HANOVER, NH

Heart Failure Population
~2000
Dartmouth Memorial Stadium
Michigan Fans
Go Blue
Kono Family Consumption

- 4 Hot Dogs, 2 Italian Sausages with trimmings
- 3 Cheese Nachos  1 Roasted Almonds/Nuts
- 3 Chili Cheese Fries  3 French Fries (salted, ketchup)
- 3 Cheese steaks  2 Pretzels  5 Soft Drinks

- MICHIGAN 41  INDIANA 14  Priceless

- For everything else, there is MasterCard
Go Blue
Food-Salt Consumption on Game Day

• 111,000 fans
  • 3500 calories gain = 1 lb
  • 555,000,000 calories/3 hrs = 288 horsepower
  • Weight gain in Big House ~ 55.5 tons

• 6-10 gms of sodium per fan
• 1700-2700 Kg of Salt
• Salt consumption ~ 75 cubic feet of Salt
OVERVIEW

- Review Cardiac Anatomy and Physiology
- What is Heart Failure
- How do we diagnose Heart Failure
- Treating Heart Failure
- Challenges in the Elderly
Anatomy of the heart

Anterior (front) view

Location of heart within the body
Cardiovascular System

- Blood Flow
- Oxygenation
- Electrical Activity
- Contraction

Veins

Oxygen O2

Arteries
Myocyte

- Contraction
Cardiovascular Diseases

• Coronary Artery Disease
  • Atherosclerosis

• Heart Muscle Disease
  • Hereditary (Hypertrophic, Myopathy)
  • Infections (eg HIV, Rheumatic, Lyme)
  • Hypertension

• Valvular Heart Disease
  • Congenital
  • Acquired (aging, trauma, infection)

• Arrhythmias
  • Conduction abnormalities
  • Fast or Slow Heart rhythms
  • Irregular Heart rhythms
Heart Failure

- “Heart Attack” Myocardial Infarction
- “Cardiac Arrest” Sudden Cardiac Arrest
- “Congestive Heart Failure” Acute Heart Failure
- Chronic Heart Failure
Heart Failure Is One of the Fastest Growing Heart Conditions in the U.S.

- More deaths from heart failure than from all forms of cancer combined
- Over 960,000 hospitalizations per year
- About 550,000 new cases per year
- 1% of population age 50-60
- 10% of population age >80

Heart Failure

- Associated with a guarded prognosis
- High Risk for
  - Acute or Subacute exacerbations
  - Arrhythmias
  - Hospitalizations
  - Death
Dilated Cardiomyopathy
Prognosis related to Etiology


Felker GM NEJM 2000;342:1077
Types of Heart Failure

• **Systolic (or squeezing) heart failure**
  - Decreased pumping function of the heart, which results in fluid back up in the lungs and heart failure or low flow

• **Diastolic (or relaxation) heart failure**
  - Involves a thickened and stiff heart muscle
  - As a result, the heart does not fill with blood properly
  - This results in fluid backup in the lungs and heart failure
A normal heart pumps blood in a smooth and synchronized way.
A heart failure heart has a reduced ability to pump blood.
Risk Factors for Heart Failure

- Coronary Artery Disease
- Prior Myocardial Infarction
- Hypertension
- Valvular heart disease
- Alcoholism

- Diabetes
- Congenital heart defects
- Other:
  - Age
  - Obesity
  - Smoking
  - High or low hematocrit level

CAD=coronary artery disease; LVH=left ventricular hypertrophy.
Causes of Heart Failure

• Heart-related “plumbing” conditions
  • Heart attack
  • Long-term high blood pressure
  • Heart valve problems
Causes of Heart Failure

- Heart-related “plumbing” conditions
  - Heart attack
  - Long-term high blood pressure
  - Heart valve problems

- Other causes
  - Viral infection
  - Heart problems you are born with
  - Family history of heart failure
  - Long-term alcohol abuse
  - Chemotherapy
Who Gets Heart Failure

- Affects men and women equally
- Mortality risk between men and women is similar
Who Gets Heart Failure

- Women with heart failure tend to be older than men with heart failure
- Women with heart failure more often have a history of high blood pressure
Who Gets Heart Failure

- Men with heart failure more often have a history of heart attack and/or blockages in the arteries
Symptoms of Heart Failure

- Shortness of breath
- Chronic lack of energy
- Cough with frothy sputum
- Swelling of feet & legs
- Difficulty sleeping at night due to breathing problems
- Swollen or tender abdomen with loss of appetite
- Increased urination at night
- Confusion and/or impaired memory
How Heart Failure Is Diagnosed

- Medical history is taken to reveal symptoms
- Physical exam is done
How Heart Failure Is Diagnosed

- Medical history is taken to reveal symptoms
- Physical exam is done
- Tests
  - Chest X-ray
  - Blood tests
  - Electrical tracing of heart (Electrocardiogram or “ECG”)
  - Ultrasound of heart (Echocardiogram or “Echo”)
  - X-ray of the inside of blood vessels (Angiogram)
A Key Indicator for Diagnosing Heart Failure

Ejection Fraction (EF)

• Ejection Fraction (EF) is the percentage of blood that is pumped out of your heart during each beat

Normal Heart 50–70% EF

Heart Failure Heart Less than 40% EF
Heart Failure and Sudden Cardiac Arrest

If you have heart failure, and if your EF is low

You are at risk of developing

Sudden Cardiac Arrest (SCA)
Heart Failure and Sudden Cardiac Arrest

Sudden Cardiac Arrest (SCA)

- Your heart suddenly goes into a very fast and chaotic rhythm and stops pumping blood
- Caused by an “electrical” problem in your heart
- SCA is one of the leading causes of death in the U.S. – approximately 450,000 deaths a year
Cardiology
Tools of the Trade

- EKG
- Xray
- Echocardiography
- MRI
- CT scan
- Angiography
Electrocardiogram
ECG
CXR
Echocardiography
Echocardiography
Nuclear Medicine Study: normal.
Cardiac MRI
Transesophageal Echo
64 Slice CT scan

Volume Rendering  No cut

DFOV 22.5 cm
STND Ph:75% (No Filt.)

No Views: 24
Rotation: 15.0 deg.

No VOI

W = 1534  L = -255
Cardiac Catheterization Lab

- X-rays allow visualization of cardiac structures
  - Assists in manipulation of catheters, devices, wires
Angiography
Ventriculogram
DROPSY courting CONSUMPTION

Rowlandson 1810
Classifying Heart Failure

- Heart failure is medically classified according to severity of symptoms
- New York Heart Association (NYHA) developed a commonly used symptom classification system
- Classification helps guide treatment options
Four Classes of Heart Failure

Class I  Class II  Class III  Class IV
Treating Heart Failure

- Heart Failure can’t be cured, but it can be managed
Treating Heart Failure

- Heart Failure can’t be cured, but it can be managed
- Best results require your active participation
Treating Heart Failure

• Heart Failure can’t be cured, but it can be managed
• Best results require your active participation
• Depending on your specific needs and your class, your heart failure treatment plan may include
  • Medications
  • Self-care
  • Surgery
  • Implantable heart devices
Treatments

Class I
- Medications
- Self-care
- Heart devices (for SCA)

Class II
- Medications
- Self-care

Class III
- Medications
- Self-care
- Heart devices
- Surgery

Class IV
- Medications
- Self-care
- Heart devices
- Surgery
- Rare cases: Transplant LVAD
<table>
<thead>
<tr>
<th>Type</th>
<th>What it does</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACE inhibitor</strong> (angiotensin-converting enzyme)</td>
<td>• Expands blood vessels which lowers blood pressure</td>
</tr>
<tr>
<td><strong>ARB</strong> (angiotensin receptor blockers)</td>
<td>• Similar to ACE inhibitor—lowers blood pressure</td>
</tr>
<tr>
<td><strong>Beta-blocker</strong></td>
<td>• Reduces the production of stress hormones and slows the heart rate</td>
</tr>
<tr>
<td><strong>Digoxin</strong></td>
<td>• Slows the heart rate and improves the heart’s pumping function (EF)</td>
</tr>
<tr>
<td><strong>Diuretic</strong></td>
<td>• Filters sodium and excess fluid from the blood to reduce the heart’s workload</td>
</tr>
</tbody>
</table>
Heart Failure Treatments: Self-care

- You can take an active part in your care
  - Take all of your medications regularly as directed
  - Check your weight daily
  - Monitor and track your symptoms
  - Make healthy lifestyle changes
  - Consider your short and long term goals of therapy.
### Lifestyle Changes Your Doctor Might Recommend

<table>
<thead>
<tr>
<th>What</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Eat a low-sodium, low-fat diet</td>
<td>• Sodium is bad for high blood pressure</td>
</tr>
<tr>
<td>• Lose weight</td>
<td>• Extra weight can put a strain on the heart</td>
</tr>
<tr>
<td>• Stay physically active</td>
<td>• Exercise can help reduce stress and blood pressure</td>
</tr>
<tr>
<td>• Reduce or eliminate alcohol and caffeine</td>
<td>• Alcohol and caffeine can weaken an already damaged heart</td>
</tr>
<tr>
<td>• Quit Smoking</td>
<td>• Smoking can damage blood vessels and make the heart beat faster</td>
</tr>
</tbody>
</table>
Heart Failure Treatments: Surgery

Surgery may be an option for some heart failure patients depending on the cause of their disease.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Type of Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Coronary artery disease</td>
<td>• Coronary bypass</td>
</tr>
<tr>
<td>• Leaky heart valves</td>
<td>• Angioplasty &amp; stents</td>
</tr>
<tr>
<td>• Severe heart failure</td>
<td>• Valve repair or replacement</td>
</tr>
<tr>
<td></td>
<td>• Transplant (in rare cases)</td>
</tr>
<tr>
<td></td>
<td>• Ventricular Assist Device</td>
</tr>
</tbody>
</table>
Heart Devices

**Pacemaker**
- Treats a slow heart rate

**Implantable Defibrillator**
- Treats a fast or slow heart rate

**Heart Failure Pacemaker**
- Treats heart pumping function and slow heart rate

**Combination Heart Failure Pacemaker & Defibrillator**
- Combines all three treatments
How does a heart device for heart failure work?

Device Shown:
Combination Heart Failure Pacemaker & Defibrillator
Issues Associated with Heart Failure

Abnormal local wall strain

Healthy

Dilated Cardiomyopathy (DCM)

Longer

Shorter

Relaxed

Courtesy of D. Kass, MD, Johns Hopkins University, Maryland.
Ventricular Dysynchrony
Cardiac Resynchronization Therapy
Advanced Therapies

- Special Surgical Techniques
- Cardiac Transplant ( <age 60 )
- Left Ventricular Assist Devices
Heart Failure in the Elderly

- Multiple Comorbidities affect prognosis
- Many Medications
- Challenging social or financial support
- Poor nutrition
- Competing Goals of Therapy
# Heart Failure
## Middle Age vs Elderly

<table>
<thead>
<tr>
<th></th>
<th>Middle Age</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>&lt;1%</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male&gt;female</td>
<td></td>
</tr>
<tr>
<td>Etiology</td>
<td>CAD</td>
<td></td>
</tr>
<tr>
<td>Clinical features</td>
<td>Typical</td>
<td></td>
</tr>
<tr>
<td>LVEF</td>
<td>Reduced</td>
<td></td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Few</td>
<td></td>
</tr>
<tr>
<td>RCTs</td>
<td>Many</td>
<td></td>
</tr>
<tr>
<td>Therapy</td>
<td>Evidence-based</td>
<td></td>
</tr>
<tr>
<td>Physician</td>
<td>Cardiologist</td>
<td></td>
</tr>
</tbody>
</table>

CAD = coronary artery disease; HTN = hypertension; LVEF = left ventricular ejection fraction; RCTs = randomized controlled trials

Source: Am J Geriatr Cardiol © 2005 Le Jacq Communications, Inc.
Prevalence of noncardiac comorbidities in Medicare beneficiaries with heart failure.
Adapted from J Am Coll Cardiol. 2003;42:1226-1233
What Matters to Heart Failure Patients?

- **Complexity**
  - HBP 70%
  - MI History 55%
  - History CVA 20%
  - Diabetes 45%
  - Arthritis 55%
  - Respiratory 35%
  - 2+ Symptoms 55%
  - 5+ Meds 55%

- **Challenges**
  - Pain 45%
  - ADL Physical 45%
  - Emotional 30%
  - Social Support 30%
  - BMI >30 35%
  - Smoker 50%
  - ETOH Risk 20%
  - Low $ Status 35%

Coutesy of John Wasson, MD, DMS
Schematic Time Course of Heart Failure
Heart Failure Summary

- Heart Failure is common in the elderly
- Heart Failure is nasty
- Treatments can be very effective
- Treatment of Heart Failure in the elderly can be challenging