Case 1

- 65 year old man presents to the emergency department c/o new-onset shortness of breath
- PMH: 50 pack year smoking history; HTN x 30 years, treated with enalapril; no history of MI and negative exercise stress test 3 years ago
- Vital signs: afebrile; BP 150/70; HR 95; RR 24; O2 saturation 94% RA
- What elements of the history and physical exam are helpful in diagnosing the cause of his dyspnea?
Case 2

• 70 year old woman with known HTN-related heart failure (EF 40%) presents to you in clinic for routine follow-up

• She reports increase in dyspnea on exertion over past week: now SOB after ½ block; no chest pain, cough, orthopnea or peripheral edema
  – Meds: furosemide 40mg daily; enalapril 10 mg daily
  – Vital signs: afebrile; BP 110/60; HR 72; RR 14; resting O2 sat 98% RA; weight 174 lbs.

• Is her increasing dyspnea related to heart failure?

Objectives

• Understand heart failure epidemiology and disease burden
• Understand common diagnostic dilemmas and effective testing strategies in heart failure management
• Recognize the benefits of self-care training and structured support for reducing heart failure-related morbidity
Heart Failure- one definition

“the patho-physiological state in which an abnormality of cardiac function is responsible for failure of the heart to pump blood at a rate commensurate with the requirements of the metabolizing tissues, or to do so only from an elevated filling pressure”

Braunwald and Grossman 1992

Heart Failure Epidemiology

• 4.8 million people in U.S. have heart failure
• Leading cause of hospitalization among elderly
• Of those hospitalized, 25% to 50% are re-admitted within 3-6 months;
• Half of all heart failure admissions are preventable
• Good self-care required for effective management
Diagnostic challenges in heart failure

- Does this dyspneic person have heart failure?
- Is this person with heart failure volume overloaded?

### Does this dyspneic person have HF?

<table>
<thead>
<tr>
<th></th>
<th>LR +</th>
<th>LR -</th>
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<tbody>
<tr>
<td>HF history</td>
<td>5.8</td>
<td>0.45</td>
</tr>
<tr>
<td>Orthopnea</td>
<td>2.2</td>
<td>0.65</td>
</tr>
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</table>
Does this dyspneic patient have HF? - BNP

<table>
<thead>
<tr>
<th>BNP (pg/ml)</th>
<th>LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;= 250</td>
<td>4.6</td>
</tr>
<tr>
<td>100-249</td>
<td>2.7</td>
</tr>
<tr>
<td>50-99</td>
<td>1.7</td>
</tr>
<tr>
<td>&lt; 50</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Wang et al JAMA 2005; 294:1944

HF Clinical Prediction Score

- 60 Brazilian patients with systolic HF
- Clinical Congestion Score (0-17)
  - Orthopnea (0-4)
  - Crackles (0-4)
  - JVD (0-4)
  - Peripheral Edema (0-4)
  - S3 (0-1)
- Compared with ECHO-based LA pressure
  - Score = 0: 97% Sens, 25% Spec for LAP ≥ 20 mmHg
  - Score > 3 had RR 4.8 for major cardiac event over 6 month follow-up

Rohde et al Can J Cardiology 2004; 20: 697-
Assessing for volume overload in patients with heart failure

• Use similar symptoms and signs as in evaluation of dyspneic patient
• Assess for changes in weight or symptoms
• Value of change in symptoms depends on “baseline” condition

Assessing for volume overload: how much weight change should prompt action?

• Increasing weight can be an early, pre-symptomatic sign of volume overload
  – Peripheral edema doesn’t develop until 7-10 lbs of weight gain have occurred
• One strategy: call provider (or titrate diuretic) after 3 lbs of weight gain in one day or 5 lbs in one week or if worsening symptoms occur
Accuracy of weight change and BNP for detecting exacerbations

- 77 patients with Class IV HF in Dublin
- 100 scheduled or unscheduled clinic visits
- Clinical assessment (blinded) of stability vs. deterioration
  - 66% of assessed visits were deteriorations
- Weight change $\geq$ 2 Kg: Sens 9%, Spec 97%
- $\Delta$BNP $> 100$ pg/ml: Sens 47%, Spec 77%

Lewin et al Eur J of Heart Failure 2005 7: 953-7

BNP-guided vs. clinically-guided therapy for heart failure

- Compares adjustment of medications based on symptoms / signs vs. adjustment based on symptoms / signs / BNP
- Several small-medium-sized trials -mixed results:
  - Jourdain 2007- 50% reduction in HF events
  - TIME-CHF 2009- no reduction in all-cause hospitalization
- Current evidence does not clearly support BNP-based approach
Common diagnostic errors in assessment of patients with heart failure

- Failure to weigh and/or document changes in weight (providers and patients)
- Concluding volume status normal based on lack of peripheral edema
- Concluding volume status normal based on absence of pulmonary edema on CXR
- Adaptation driving clinical inertia

Difficult dilemmas

- Evaluating heart failure in context of COPD and/or OSA
- Evaluating and treating volume overload in patient with CKD
- Managing heart failure in patients with atrial fibrillation, valve disorders, or coronary heart disease
- Management of vulnerable patients
Heart failure management

Effective Therapies

- ACE inhibitors
- Aldosterone blockade
- Beta-blockers
- Cardiac rehabilitation / exercise
- **Diuretics**
- Device therapies
- **Low-salt diet**
- Statins
- Organized care programs
- Self-care instruction
Vulnerable Populations:
Greater Risk of Adverse Outcomes

- Elderly
- Low income
- Limited social support
- Lack of patient/family knowledge about disease
- Depression
- Lack of transportation
- No access to medications
- English as a second language
- Low literacy

Effective use of diuretics

- Furosemide
  - causes 20-25% fractional excretion of Na
  - 20-160 mg once or twice daily
  - 6 hours in duration
  - Equilibration over 2 weeks
  - Main adverse effects: low K, volume depletion
- Can supplement with thiazide
- Need to consider functional incontinence
Dietary sodium restriction

• Sodium restriction can improve fluid balance and reduce amount of diuretics required to maintain stable volume
• Reducing salt intake is difficult
  – Limited trial data suggest modest reductions with specific counseling
• No role for water restriction except in advanced heart failure with hyponatremia

Riegel et al Circulation 2009; 120: 1141-1163

Effectiveness of organized care and self-care training
Previous Studies on Heart Failure Organized Care Programs

• 29 randomized trials (compared with usual care)
• Three types:
  – Multidisciplinary team care (n = 15)
  – Telephone-based care (n = 10)
  – Self-care training (n = 4)
• All types reduced HF-related hospitalizations
• No clear effect on mortality
• 15 of 18 studies reported cost savings
• No information on the role of participant education or literacy

Components of Successful Heart Failure Management Programs

• Multidisciplinary teams
• Defined follow-up procedures
• Treatment algorithms based on best available evidence
• Information systems for tracking patients
• Patient education for self-care
Meta-analysis: Self-care Training

- 4 trials through 2004
- Number of participants 88-192
- Mean age 71-76
- Follow-up 1 week – 12 months
- Self-care training improves outcomes:
  - HF hospitalizations: RR 0.66 (0.52, 0.83)
  - All hospitalizations: RR 0.73 (0.57, 0.93)

McAlister JACC 2004; 44:810

Recent studies: Sisk trial

- 406 adults in NYC followed for 12 months
  - 78% minority
  - mean age 59
  - 30% low literacy
  - All with systolic HF (EF < 40%)
- Nurse-led self-care training
  - Regular phone follow-up
  - Facilitation of medication changes
- 12 month outcomes:
  - Reduced hospitalization rate (- 0.13 / person-yr)
  - Improved QOL (3.1 points on SF-12; 4.7 on MLHF)
  - No difference in effect by literacy level

Development and testing of a literacy-sensitive self-care training program for patients with HF

DeWalt et al BMC Health Serv Res. 2006 13:30

Our Intervention

- 1-hour individualized education session
  - Education booklet <6th grade level
  - Digital bathroom scale

- Scheduled follow-up phone calls: 6 calls within 3 months and monthly calls x 3 addtl. months

- Easy access to our team (e.g. pharmacists, health educators, physicians)
### Information Recommended by Guidelines

- General topics
- Explanation of heart failure
- Expected symptoms vs. symptoms of worsening heart failure
- Psychological responses
- Self-monitoring with daily weights
- Action plan in case of increased symptoms
- Prognosis
- Advanced directives
- Dietary recommendations
- Sodium restriction
- Fluid restriction
- Alcohol restriction
- Activity and exercise
- Work and leisure activities
- Exercise program
- Sexual activity
- Medications
- Nature of each drug and dosing and side effects
- Coping with a complicated regimen
- Compliance strategies
- Cost issues


### Information We Included

- General topics
- Explanation of heart failure
- Expected symptoms vs. symptoms of worsening heart failure
- Psychological responses
- Self-monitoring with daily weights
- Action plan in case of increased symptoms
- Prognosis
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- Cost issues

*DeWalt et al. Patient Ed Coun. 2004; 55: 78-
Congestive Heart Failure

With congestive heart failure, the heart cannot pump the blood well. As a result, blood doesn’t flow well.

Fluid leaks out of your blood vessels and backs up in the lungs and the legs.

Salt makes it harder for your body to get rid of fluid, you should avoid salt.

Fluid in lungs

Fluid in legs

How Bad Is Your Congestive Heart Failure?

You can tell how well your heart is doing by how you feel and what you can do.

**SWELLING**

- OK – Swelling in ankles or feet
- Call the HFC Clinic (919) 716-3158

**WALKING**

- OK – No trouble with shortness of breath
- Shortness of breath when walking
- Call the HFC Clinic (919) 716-3158

**SLEEPING**

- OK – No problems with sleep
- Call the HFC Clinic (919) 716-3158

Current materials available at: http://www.nchealthliteracy.org/hfselfmanage.html
Randomized Controlled Trial

- UNC Internal Medicine and Cardiology
- Disease management + self-care training vs. usual care + booklet
- Primary Outcome: Hospitalization or death at 12 months

Baseline Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control (n=65)</th>
<th>Intervention (n=64)</th>
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<tbody>
<tr>
<td>Mean Age, years (SD)</td>
<td>62 (10)</td>
<td>63 (10)</td>
</tr>
<tr>
<td>African American, %</td>
<td>55%</td>
<td>56%</td>
</tr>
<tr>
<td>Male, %</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>Education, years</td>
<td>9.8 + 2.8</td>
<td>9.1 + 3.2</td>
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<tr>
<td>Income &lt;15,000/yr, %</td>
<td>68%</td>
<td>69%</td>
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<tr>
<td>Medicaid, %</td>
<td>32%</td>
<td>36%</td>
</tr>
<tr>
<td>Medicare, %</td>
<td>73%</td>
<td>72%</td>
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<tr>
<td>Literacy (S-TOFHLA)</td>
<td></td>
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<tr>
<td>Inadequate, %</td>
<td>40%</td>
<td>45%</td>
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</table>
Improved HF Knowledge, Self-Efficacy, and Self-Care Behavior

<table>
<thead>
<tr>
<th>6 Month Outcome</th>
<th>Control</th>
<th>Intervention</th>
<th>Difference (CI)</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Knowledge change</td>
<td>-2</td>
<td>10</td>
<td>12 (4, 19)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Self-efficacy change</td>
<td>-0.5</td>
<td>1.3</td>
<td>2 (0.5, 3.1)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Daily weight measurement, %</td>
<td>21</td>
<td>88</td>
<td>67 (53, 81)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Reduced Incidence of Hospital Admission or Death

• Unadjusted Incidence Rate Ratio (IRR) = 0.66 [0.38, 1.12]

• Adjusted* IRR = 0.56 [0.32, 0.95]

*Adjusted for baseline HFQOL, B-blocker use, digoxin use, systolic dysfunction, HTN
Adherence to Instructions -- Errors

<table>
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<tr>
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<tbody>
<tr>
<td></td>
<td>Inadequate</td>
<td>Adequate/Marginal</td>
</tr>
<tr>
<td>Weeks 3-7 Mean errors</td>
<td>6.7</td>
<td>3.6</td>
</tr>
<tr>
<td>Weeks 18-22 Mean errors</td>
<td>3.6</td>
<td>4.2</td>
</tr>
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</table>

Lessons Learned

- Easy-to-read materials and scale necessary but not sufficient
- Activated patient seems important
- Frequent reinforcement and encouragement necessary for adherence
Our current trial

- 4 site randomized trial (UNC, Northwestern, SFGH / UCSF, Olive View / UCLA)
- 600 participants to be enrolled by 12/09
- Similar design and eligibility criteria
- “Teach-to-Goal” self-care training vs. single session self-care training
- Main outcome: incidence of hospitalization or death at 1 year

DeWalt et al BMC Health Serv Res. 2009;9:99-

Patient 1

- 65 year old man who presented to ED with new-onset shortness of breath
  - Key Hx items: no fever, no orthopnea or PND; no Hx of HF or COPD; + smoking history, + Hx HTN
  - Key exam findings: BP 150/70; + crackles, no wheezes; neck veins not elevated; no edema
  - CXR: no pulmonary edema, + vascular redistribution, no sign of pneumonia; ECG: NSR, HR 95, no ischemia
  - BNP = 240 ng/pl
- What is the likelihood of heart failure?
- What treatments would you give in ED?
Does this dyspneic person have HF?

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Patient 1

- Pre-test probability about 50%
- Against HF: **no Hx of HF**; absence of orthopnea and JVD; no edema
- For HF: + crackles; + **CXR for vascular redistribution**; + BNP
- Working diagnosis: new onset HF
- Give furosemide 40mg IV
Patient 2

• 70 year old woman with known heart failure who presented in clinic with increased dyspnea; no chest pain, orthopnea or lower extremity edema

• Per her log book: weight increased from 168 to 174; tried to reach her provider but didn’t receive call back

• Exam: no crackles, JVD, S3, or LE edema

• 4 weeks ago: Na 141; K 4.4; Cr 1.0

Patient 2

• Would you:
  – Get BNP?
  – Adjust furosemide?
  – Check electrolytes?
  – Check CXR?

• My approach: increase furosemide to 40 mg twice daily; no blood draw; phone f/u in 3 days; if not better, re-examine, check BNP ± CXR
Any questions?
Thank you!