Phar6122: CV section
Date: 3/21/05

**Topic:** Chronic Heart Failure Cases for Monday’s March 21th lecture.

**Directions:**
This handout includes three chronic heart failure cases of increasing difficulty. In order to use class time efficiently, students may work alone or in groups to prepare answers to the case questions before the March 21st lecture. Students may need to utilize lecture notes from the beginning of semester up to Dr. Miller’s CHF lecture. Students are encouraged to look beyond lecture material and use landmark trials and ACC/AHA guidelines posted on the CV website to support therapeutic recommendations for identified drug therapy problems in each chronic heart failure case. When recommending drug therapy write a complete order (ie, initial dose, goal dose in CHF, route, rate of administration, and duration of therapy) for agents covered in cardiovascular pharmacotherapy.

If students need clarification for a specific case please contact Dr. Burkhardt by email (burk0148@umn.edu).
HF case 1: Patient at risk for Chronic Heart Failure

Objectives
1) List the major therapeutic goals of reducing risk of developing Chronic Heart Failure (CHF) and identify the signs and symptoms of CHF in a patient.

2) Develop a reasonable treatment plan for the pharmacotherapy risk/management of CHF and other cardiovascular disorders based on AHA/ACC guidelines and landmark clinical trials (ie, evidence based medicine).

GENERAL:
A 56 year old white male is in the clinic for a routine checkup of HTN.

HPI:
The patient has a diagnosis of hypertension for the past 3 years and has attempted lifestyle changes with exercise and diet.

PE:
Height: 5’11”
Weight: 72 kg
BMI: 22.1 kg/m²
Blood pressure is 145/93 mmHg and second reading 10 minutes apart is 143/94 mmHg
Heart rate of 72 bpm with regular pulse.

LABORATORY (fasting-current):
Na: 137 mEq/L (136-145 mEq/L)
K: 4.5 mEq/L (3.5-5.0 mEq/L)
Cl: 99 mEq/L (97-107 mEq/L)
CO₂: 26 mEq/L (23-29 mEq/L)
BUN: 15 mg/dL (8-23 mg/dL)
SCr: 1.0 mg/dL (0.5-1.2 mg/dL)
Estimated CrCl: 80 ml/min
Glucose: 89 mg/dL (60-109 mg/dL)
Mg: 1.5 mEq/L (1.2-1.9 mEq/L)
Cholesterol: 209 mg/dL
LDL: 145 mg/dL
HDL: 36 mg/dL
TG: 138 mg/dL

EKG:
NSR (1 year ago)

ALLERGIES:
No Known Drug Allergies

PMH:
Hypertension (3 years)

FH:
Father died of stroke 85 years of age
Mother alive

SH:
Does not smoke
Drinks 3-4 cans of beer a week.

CURRENT MEDICATIONS:
HCTZ 25mg po daily
Lisinopril (Prinivil®) 40mg po daily
Aspirin 81 mg po daily

Case 1 Question
Review patient’s current medications and medical conditions and develop a reasonable treatment plan.

Answers

Medical Condition Review
HTN - The patient is not at blood pressure goal of <140/90 mmHg.
3 HTN risk factors: stage 1 hypertension, dyslipidemia (see below), age >55 years.

Lipids - 3 major CHD risk factors: age >=45 years, on antihypertensive medications, and HDL <40 mg/dL. Estimated 10-year CHD risk: 25%. Patient is considered a CHD risk equivalent with an ATPIII LDL goal of <100 mg/dL or an optional LDL of <70mg/dL. To achieve LDL there will need to be a 32% lowering of current LDL level with atorvastatin 10-80mg, pravastatin 40-80mg, simvastatin 20-80mg, or rosuvastatin 5-40 mg. Start TLC in addition to drug therapy:
- Reduce saturated fat intake <7% of total calories
- Reduce cholesterol to <200 mg per day
- Increase soluble fiber to 10-25 grams per day.

Medication Review
HCTZ - Patient is not at blood pressure goal. 1) may consider increasing HCTZ to 37.5 to 50mg daily or 2) consider adding another hypertensive agent (eg, CCB or beta-blocker).
HCTZ doses >50 mg per day would have a minimal decrease in BP and more electrolyte disturbances (hypokalemia, hyponutremia, hypocalcemia).

Lisinopril - No change. Patient is at maximum daily dose.

Aspirin - No change at this time.
Drug Therapy Problems (bottom line)

*The patient is not at BP goal. Consider increasing HCTZ or adding another antihypertensive agent from a different pharmacologic class (eg, amlodipine or metoprolol).

*Patient has dyslipidemia and requires TLC and lipid lowering intervention with a statin.
HF case 2: Chronic Heart Failure with paroxysmal atrial fibrillation

Objectives
1) List the major therapeutic goals of treating Chronic Heart Failure (CHF) and identify the signs and symptoms of CHF in a patient.

2) Describe NYHA and relate functional classification to “stages” of CHF set forth by AHA/ACC guidelines.

3) Develop a reasonable treatment plan for the pharmacotherapy management of CHF and other cardiovascular disorders based on AHA/ACC guidelines and landmark clinical trials (ie, evidence based medicine).

GENERAL:
A 69 year old white male is seen in the Heart Failure Clinic with complaints of shortness of breath.

HPI: The patient has an increase in shortness of breath in the past 2 weeks with difficulty in catching breath when walking to car one time this week.

PE:
Height: 5’8”
Weight: 83 kg (today), 80kg (1 month ago)
BMI: 27.8 kg/m²
Blood pressure is 125/73 mmHg and second reading 10 minutes apart is 123/74 mmHg
Heart rate of 62 bpm.
Pedal edema +1
EF: 33%
NYHA II

LABORTORY (fasting-current):
Na: 137 mEq/L (136-145 mEq/L)
K: 4.5 mEq/L (3.5-5.0 mEq/L)
Cl: 99 mEq/L (97-107 mEq/L)
CO2: 26 mEq/L (23-29 mEq/L)
BUN: 15 mg/dL (8-23 mg/dL)
SCr: 1.0 mg/dL (0.5-1.2 mg/dL)
Estimated CrCl: 70 ml/min
Glucose: 92 mg/dL (60-109 mg/dL)
Mg: 1.5 mEq/L (1.2-1.9 mEq/L)
INR: 2.1
T₄: 7.0 mcg/mL (5.0-11.0 mcg/mL)
TSH: 1.2 mIU/L (0.5-8.9 mIU/L)
CK: 40 U/L (38-176 u/L)
CK-MB: 0 ng/mL (0-6 ng/mL)
cTnl: undetectable (<0.1 ng/mL)
Cholesterol: 159 mg/dL
LDL: 74 mg/dL
HDL: 52 mg/dL
TG: 128 mg/dL

**CXR (current):**
Lungs clear
Slightly enlarged heart

**EKG (current):**
NSR

**ALLERGIES:**
No Known Drug Allergies

**PMH:**
Hypertension (10 years)
Chronic Heart Failure, left systolic dysfunction (2 years)
Paroxysmal Atrial Fibrillation (1 year)

**FH:**
Mother and Father died of natural causes
Lives alone.

**SH:**
Does not smoke or drink

**CURRENT MEDICATIONS:**
Metoprolol-XL 50mg po daily
Amiodarone 200 mg po daily
enalapril 20mg po daily
warfarin 3 mg po daily

**Case 2 Questions**
1) Assess and work up patient with CHF (rule out AF, AMI, GI, etc… and consider chronic heart failure “stage”).

2) Review patient’s current medications and medical conditions and develop a reasonable treatment plan.

**Answers**
1) Patient appears to be in Stage C chronic heart failure, due to NYHA II (slight limitation in ordinary physical activity of walking to car) and indications of structural heart disease (EF 35% and enlarged heart) with chest x-ray and low EF. Determining if CHF is related problem to shortness of breath is complicated by diagnosis of AF.
The classical signs of AF include shortness of breath on exertion and palpitations. The patient appears clinically stable with normal blood pressure, heart rate, no signs of myocardial ischemia with EKG, CKMB, Troponin levels, and normal thyroid function.

There may be a concern of pulmonary fibrosis (symptoms: cough, fever, malaise) or pulmonary toxicity with the use of amiodarone. However, the patient’s lungs are clear, but peripheral edema and 3kg weight gain in the past month indicates fluid retention possible due to heart failure.

**Medication Condition Review**

**HTN**: Patient is at blood pressure goal (ie, <140/90 mmHg). Two HTN risk factors: history of hypertension, age >55 years.

**Chronic Heart Failure, left systolic dysfunction**: Patient appears to be retaining fluid and adding furosemide to needed reestablish fluid balance. May consider adding digoxin 0.125 mg to prevent morbidity with reduction in risk of hospitalization. The patient fits the Dig Trial criteria.

**Paroxysmal Atrial Fibrillation**: The VRR is <100 bpm and NSR has been maintained by the use of amiodarone.

**Lipids**: Two major CHD risk factors: age >=45 years, on antihypertensive medications. Estimated 10-year CHD risk: 10%. NCEP ATP III LDL goal should be <130 mg/dL, but and optional goal of <100 mg/dL may be considered. The patient’s current LDL is below the optional goal (74 mg/dL). May consider additional TLC dietary changes:

- Reduce saturated fat intake <7% of total calories
- Reduce cholesterol to <200 mg per day
- Increase soluble fiber to 10-25 grams per day.

**Medication Review**

**Metoprolol-XL**: Patient is at blood pressure goal (<140/90 mmHg) and is on this agent for mortality and morbidity reduction based on MERIT-HF. However, the patient is not at goal dose goal of 200 mg per day. Increasing beta-blocker may exacerbate symptom of shortness of breath when a patient is not euvoletic, but consider increasing beta-blocker to goal dose when patient is symptom free and not retaining fluid. However, this may be difficult with patient’s HR at 62 bpm. Monitor HR and hold metoprolol-XL if HR <50 bpm.

**Amiodarone**: Do not change. Patient is in NSR. Continue to monitor for pulmonary fibrosis and thyroid abnormalities an annual basis.

**Enalapril**: No change. Patient is at blood pressure goal (<140/90 mmHg) and also on this agent for mortality and morbidity reduction based on SOLVD trial. The patient is at goal dose goal of 20 mg per day.
Warfarin: Do not change. Chest 2004 guidelines recommend that patient’s with paroxysmal AF at high risk of stroke (ie, severely impaired left ventricular systolic function and/or congestive heart failure) should be anticoagulated with warfarin for a target INR goal of 2.0-3.0.

Drug Therapy Problems (bottom line)
*Start furosemide to reestablish fluid balance and alleviate symptoms of shortness of breath, weight gain, and pedal edema. Restrict fluid intake to 1.5-2L per day and sodium to 2 grams or 1 teaspoon per day. Encourage moderate physical activity, such as walking 30 minutes a day, 3 times a week.

*Consider adding digoxin and follow-up with labs in one week (dig level and serum potassium)

*When patient is stable consider slowly increasing metoprolol-XL to goal dose or highest tolerated dose every two weeks.
HF case 3: Initial diagnosis of Chronic Heart Failure in Post-MI patient

Objectives
1) List the major therapeutic goals of treating Chronic Heart Failure (CHF) and identify the signs and symptoms of CHF in a patient.

2) Describe NYHA and relate functional classification to “stages” of CHF set forth by AHA/ACC guidelines.

3) Develop a reasonable treatment plan for the pharmacotherapy management of CHF and other cardiovascular disorders based on AHA/ACC guidelines and landmark clinical trials (ie, evidence based medicine).

General: FM is a 65 year old white male who is admitted to an emergency room hospital today

CC: "Upset stomach and nauseous feeling with cough"

HPI: 3 month increase in fatigue, shortness of breath, and cough occurring last night and this morning. Last night experienced upset stomach secondary to Big Mac® value meal, took Alka Seltzer and awoke with cough and nauseous feeling.

PE:
Height: 5'5"
Weight: 89 kg
BMI: 32.7 kg/m²
HR: 72 bpm
BP: 135/88 mmHg, with second reading 137/87 mmHg 20 minutes apart.
Signs: Lungs with rales and presence of pulmonary edema on chest x-ray
EF: 28%
NYHA III

Labs (fasting-current):
Na: 137 mEq/L (136-145 mEq/L)
K: 3.7 mEq/L (3.5-5.0 mEq/L)
Cl: 99 mEq/L (97-107 mEq/L)
CO₂: 26 mEq/L (23-29 mEq/L)
BUN: 15 mg/dL (8-23 mg/dL)
SCr: 1.2 mg/dL (0.5-1.2 mg/dL)
Estimated CrCl: 53 ml/min
Glucose: 102 mg/dL (60-109 mg/dL)
Hb A₁c: 8.2% (4.5-8.5%)
Mg: 1.5 mEq/L (1.2-1.9 mEq/L)
CK: 40 U/L (38-176 u/L)
CK-MB: 0 ng/mL (0-6 ng/mL)
cTnI: undetectable        (<0.1 ng/mL)
Cholesterol: 152 mg/dL
LDL: 69 mg/dL
HDL: 49 mg/dL
TG: 168 mg/dL

**CXR (current):** Some fluid and cardiomegaly

**Allergies:** No known drug allergies

**PMH:**
HTN since 1983
Ischemic Heart Disease: MI in 1988
Type 2 DM since 2004 (controlled by diet)

**Social History:**
Does not smoke or drink

**Family History:**
Married with 3 daughters
Father died of natural causes
Mother alive with Type 2 DM

**Meds at this visit:**
HCTZ 50mg po daily
metoprolol 50mg po bid
KCl (one K-Dur 20®) po bid
Furosemide 20 mg po bid
Aspirin 162 mg po daily
Simvastatin 40 mg po daily

**Case 3 questions**

1) Assess and work up patient with CHF (rule out AF, AMI, GI, etc… and consider chronic heart failure “stage”).

2) Review patient’s current medications and medical conditions and develop a reasonable treatment plan.

**Answers**
1) Patient appears to be in Stage B chronic heart failure, due to NYHA II and indications of structural heart disease with chest x-ray and low EF.
2) **Medical Condition Review**

**Hypertension**: Patient not at BP goal for diabetic patient <130/80 mmHg. Consider changing beta-blocker.

**Edema**: Start furosemide to help improve fluid management-but watch the K+ if HCTZ is still continued in patient. Inform the patient of restricted salt intake to 2 grams per day (1 teaspoon table salt) by avoiding foods high in sodium and restrict fluids to 1.5-2 liters per day.

**IHD (post-MI)**: Consider including 0.4mg sl NTG as needed for chest pain for up to 3 doses. Statin therapy is needed in this patient. Statin use is appropriate in post-MI patient and patient is at LDL goal.

**Type 2 DM**: Do a more thorough work up for diabetes and consult on how to improve diet for controlling diabetes. The Hgb A1c is on the high end of normal. The ADA guidelines have a goal of Hgb A1c of <7%. Patient is also obese and exercise at least 3 times per week would be recommended in a heart failure patient with diabetes.

**Low CrCL or possible Chronic Kidney Disease**: Patient with Type 2 DM is at risk for microvascular complications, such as progression of diabetic renal disease. The determination of albuminuria would be justified in the patient to consider the renoprotective effects of ARBs (ie, irbesartan). However, better control of blood pressure with an ACE inhibitor may be more important than specific therapy for prevention of diabetes complications.

**CHF**: Consider daily ACE inhibitor, such as enalapril to a target dose of 20 mg per day or lisinopril 40 mg per day, over HCTZ due to low estimated CrCL indicating chronic kidney disease and CHF diagnosis. If HCTZ is discontinued and ACE-inhibitor and furosemide used the patient recheck serum creatinine and potassium in one week. KCL supplement may need to be changed depending upon potassium levels.

**Medication Review**

**Metoprolol-IR**: Patient is not at BP goal (<130/80 mmHg). Consider discontinuing metoprol-IR and start with a low dose of metoprolol-XL 25 mg po daily and titrate every two weeks to dose goal of 200 mg daily (based on MERIT-HF trial) or until highest tolerated dose or carvedilol 3.125 mg po bid and titrate to dose goal of 25 mg po bid every 2 weeks or until highest tolerated dose (based on COMET trial). Metoprolol-XL and carvedilol have evidence of mortality and morbidity reduction in heart failure and are acceptable choices. Changing the β-blocker in a diabetic patient may require more blood sugar testing to determine impact of therapy on Type 2 DM. A beta-blocker is still a valuable approach in a diabetic patient to reduce morbidity and mortality post-MI.

**HCTZ**: No change at this time, but the patient may need to decrease HCTZ if SBP <110 mmHG or SBP <60 mmHg if another BP lowering agent was added to existing regimen.
There would be a minimal decrease in BP and more electrolyte disturbances (hypokalemia, hyponutremia, hypocalcemia) with doses >50mg per day.

**Furosemide:** This dose may need to be increased due to symptoms and edema in lungs.

**Simvastatin:** Do not change. Patient is at LDL optional goal.

**KCl supplement:** This dose is appropriate as seen by the electrolyte panel and use of furosemide.

**Aspirin:** Dose appropriate, but NSAIDS may affect renal function and lead to serum creatinine elevations. Will need to determine if aspirin use may be contributing to stomach ache and nausea (rule out GI bleed).

**Drug Therapy Problems (bottom line)**

* Increase furosemide 40mg po bid and monitor serum potassium in one week. May need to decrease HCTZ if SBP <110 mmHG or SBP <60 mmHg. Restrict fluid intake to 1.5-2L per day and sodium to 2 grams or 1 teaspoon per day. Encourage moderate physical activity, such as walking 30 minutes a day, 3 times a week.

* Consider starting lisinopril for target dose of 40 mg po daily or enalapril for target dose 20 mg po daily and have BP goal be <130/80 mmHg. May need to decrease HCTZ if SBP <110 mmHG or SBP <60 mmHg. Check serum creatinine in one week.

* D/C metoprolol-IR and start metoprolol-XL 25 mg po daily and titrate every two weeks to dose goal of 200 mg daily (based on MERIT-HF trial for statistically significant reduction in mortality and morbidity) or until highest tolerated dose.

* Consider starting digoxin 0.125mg po daily when patient maintains fluid balance.

* Add sublingual NTG 0.4mg prn for chest pain.