

Heart Failure: A Common Clinical Problem



Andrea MacDougall, BSc, MD, FRCPC; and Erik Paus-Jensen, MD, FRCPC

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Hear failure (HF) is a clinical syndrome that manifests with signs and symptoms of low cardiac output and/or pulmonary/systemic congestion. HF can be due to left ventricular (LV) systolic dysfunction or impaired relaxation and filling. Patients with impaired relaxation and filling in the setting of normal systolic function have been previously labelled as having diastolic HF. As it may be difficult to assess diastolic function, the term HF with preserved systolic function (PSF) is now preferred. HF with PSF is defined as HF with a LV ejection fraction > 40%. It is more common in women, the elderly and hypertensive patients.

HF is common and its incidence is expected to increase as the population ages. The condition carries an annual mortality rate of 5% to 50% and is associated with significant morbidity and cost to the healthcare system. Treatment has resulted in improved quality of life and survival for these patients.

Making the diagnosis

A clinical history and physical examination should be performed on patients suspected of having HF (Table 1).

Initial investigations should include complete blood count, electrolytes, renal function,

Frank's case

Frank, 76, has a history of hypertension. He presents with gradually worsening exertional dyspnea, orthopnea and leg edema.

Examination reveals

- Heart rate: 72 bpm
- BP: 172/94
- Jugular venous pressure (JVP) is 6 cm above the sternal angle
- He has an S4, bibasilar crackles and peripheral edema

Labs are normal. Chest x-ray reveals interstitial edema. ECG shows left ventricular hypertrophy. ECHO shows normal left ventricular systolic function (ejection fraction = 64%) with left ventricular hypertrophy. No valvular abnormalities.

Turn to page 43 to see Frank's follow-up.

liver enzymes, chest x-ray, ECG, TSH, fasting lipids, glucose and a transthoracic ECHO.

Plasma natriuretic peptides (brain natriuretic peptide [BNP], N-terminal prohormone BNP [NT-proBNP]) may be a useful diagnostic tool to help clarify the etiology of dyspnea in patients where the diagnosis is not clear. The release of these peptides is increased in HF. A BNP < 100 pg/mL (NT-proBNP < 300 pg/mL) makes HF very unlikely. BNP > 500 pg/mL (NT-proBNP > 1800 pg/mL) makes HF very likely.

Table 1

Signs and symptoms of heart failure (HF)

Symptoms	Signs
Exertional dyspnea	Lung crackles
Orthopnea	Elevated JVP
Paroxysmal nocturnal dyspnea	Dependent edema
Fatigue	Displaced/diffuse apical impulse
Exercise intolerance	Third and fourth heart sounds
Leg swelling	Murmurs
Weight gain	

My patient has HF—now what?

The patient's functional capacity should be assessed using the New York Heart Association (NYHA) functional classification. This tool is simple to use, universally understood and is a validated measure of HF severity.

It is important to look for the underlying cause and identify any reversible or exacerbating factors. Common causes of HF are listed in Table 2. Patients at risk for ischemic heart disease should undergo testing for reversible ischemia and possible revascularization. If valvular disease is identified, repair/replacement should be considered. First-degree family members should be screened if there is a family history of cardiomyopathy or sudden cardiac death.

Management

Goals of therapy include improving symptoms, decreasing hospitalizations and improving survival. Multidisciplinary heart function clinics and cardiac rehabilitation are excellent resources.

Table 2

Common causes of HF

- Ischemic heart disease*
- Hypertension*
- Idiopathic dilated cardiomyopathy*
- Valvular heart disease*
- Alcohol
- Diabetic cardiomyopathy
- Viral cardiomyopathy (coxsackie virus, HIV)
- Infiltrative (amyloidosis, sarcoidosis)
- Toxins (*i.e.*, anthracyclines)
- Metabolic disorders (hypothyroidism)
- Hypertrophic cardiomyopathy
- Pericardial disease
- Tachycardia-mediated cardiomyopathy
- High output states (hyperthyroidism, anemia, arteriovenous fistula, Paget's disease)
- Nutritional deficiencies
- Obstructive sleep apnea

*Most common causes

Patients with advanced HF may be candidates for implantable cardioverter-defibrillator, cardiac resynchronization therapy, or transplant. Discussion of these therapies is beyond the scope of this article.

Pharmacologic therapies

Medications that have proven survival benefit include ACE inhibitors, ARBs, β -blockers and spironolactone. The three β -blockers with proven survival benefit are bisoprolol, carvedilol, metoprolol XL. Medications that have symptomatic benefit but do not improve survival include diuretics, digoxin and nitrates.

All patients with HF and left ventricular ejection fraction (LVEF) < 40% should be treated

with an ACE inhibitor and β -blocker unless contraindications exist. Vital signs and comorbidities often dictate which drug can be started or titrated first. Patients with advanced HF symptoms should be stabilized before initiation of a β -blocker.

Patients who cannot tolerate ACE inhibitors should be started on an ARB. Spironolactone should be started in those with severe systolic dysfunction (LVEF < 30%) and NYHA III symptoms despite optimal therapy with ACE inhibitors, β -blockers and loop diuretics.

Patients with congestive symptoms should be treated with a loop diuretic which should be tapered to the lowest dose necessary to maintain euvolemia. Patients can be educated to adjust their diuretic dose.

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Digoxin improves morbidity and prevents hospitalizations but has no mortality benefit. It should be considered in patients who have moderate to severe symptoms despite optimal therapy with ACE inhibitors, β -blockers and diuretics. It can be used in sinus rhythm or in patients with atrial fibrillation (AF) who require additional rate control.

Long-acting nitrates can be used to reduce HF symptoms and angina. Long-acting nitrates can be combined with hydralazine for patients who

Frank's case cont'd...

Frank has HF with preserved systolic function. Acutely, he should receive a diuretic to relieve congestive symptoms.

Long-term management involves aggressive control of his hypertension. He may benefit from an ACE inhibitor and/or β -blocker.

He should be screened for ischemic heart disease.

Frequently Asked Questions

How should I use a brain natriuretic peptide (BNP) result?

- BNP and N-terminal prohormone BNP assays have limited availability due to cost. They are becoming more widely available
- BNP results compliment (but do not replace) clinical judgement
- The role of BNP as a prognostic marker in HF is being investigated

are intolerant of both ACE inhibitors and ARBs.

HF management must be individualized. Each drug should be started at a low dose and gradually titrated to reach target dose or the maximal tolerated dose (*e.g.*, double the dose of β -blocker every two to four weeks). Patients should be routinely evaluated for symptomatic signs of bradycardia, hypotension and orthostasis. Other drugs that cause hypotension may need to be tapered or stopped to allow titration of ACE inhibitors and β -blockers.

Dr. MacDougall is a Senior Cardiology Fellow, University of Saskatchewan, Saskatoon, Saskatchewan.


Dr. Paus-Jenssen is a Clinical Assistant Professor, Cardiology, University of Saskatchewan, Saskatoon, Saskatchewan.

Frequently Asked Questions

Is there any helpful non-pharmacologic management?

- Daily weight measurements
- Daily sodium restriction < 2 g
- Fluid restriction to < 2 L q.d.
- Regular exercise for stable patients
- Smoking cessation, alcohol restriction, avoidance of medications that may worsen HF
- Regular vaccinations (influenza yearly, pneumococcal every 6 years)
- Address end-of-life concerns early

Patients taking ACE inhibitors, ARBs and spironolactone are at risk of hyperkalemia and require close follow-up. An increase in the serum creatinine of up to 30% is acceptable following the addition of an ACE inhibitor or ARB. Any acute dehydrating illness can increase this risk and diuretics may need to be tapered or stopped until the patient recovers.

Pharmacotherapy for HF with PSF has been less extensively studied and has fewer proven therapies. Precipitating factors such as hypertension and ischemia should be well-controlled. Diuretics can be used to treat congestive symptoms, but over-diuresing these patients can cause a reduction in preload and cardiac output. AF is often poorly tolerated and a rhythm control strategy may be considered. 

Resources

1. Arnold JM, Liu P, Demers C, et al: Canadian Cardiovascular Society Consensus Conference Recommendations On Heart Failure 2006: Diagnosis And Management. *Can J Cardiol* 2006; 22(1):23-45.
2. Arnold JM, Howlett JG, Dorian P, et al: Canadian Cardiovascular Society Consensus Conference Recommendations On Heart Failure Update 2007: Prevention, Management During Intercurrent Illness Or Acute Decompensation, And Use Of Biomarkers. *Can J Cardiol* 2007; 23(1):21-45.

Frequently Asked Questions

Why is my stable HF patient suddenly worse?

Common reasons for HF exacerbation include:

- Noncompliance with diet and/or medications
- Use of medications that can worsen heart failure (NSAIDs, thiazolidinediones, calcium channel blockers)
- Ischemia
- Arrhythmia
- Hypertension
- Valve dysfunction
- Comorbid illness (anemia, infection, renal failure, pulmonary embolism, etc.)

Take-home message

- Patients at risk for HF need to be identified early
- Determine the etiology and treat reversible causes
- Therapy is individualized and involves a multidisciplinary approach
- Use drugs with proven survival benefit and titrate to target doses
- Titration of drugs should not be limited by asymptomatic hypotension (systolic BP 80 mmHg-90 mmHg) or bradycardia

3. Malcom J, Arnold O, Howlett JG, et al: Canadian Cardiovascular Society Consensus Conference Guidelines On Heart Failure – 2008 Update: Best Practices For The Transition Of Care Of Heart Failure Patients, And The Recognition, Investigation And Treatment Of Cardiomyopathies. *Can J Cardiol* Jan 2008; 24(1):21-40.
4. Hunt SA, Abraham WT, Chin MH, et al: ACC/AHA 2005 Guideline Update For The Diagnosis And Management Of Chronic Heart Failure In The Adult: A Report Of The American College Of Cardiology/American Heart Association Task Force On Practice Guidelines (Writing Committee To Update The 2001 Guidelines For The Evaluation And Management Of Heart Failure): Developed In Collaboration With The American College Of Chest Physicians And The International Society For Heart And Lung Transplantation: Endorsed By The Heart Rhythm Society. *Circulation* 2005; 112(12):e154-235.