

clinical practice guideline  
for outpatient treatment of heart failure



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## limitations

The Clinical Practice Guidelines Committee (CPGC) provides this document for the educational benefit of the practitioners contracted with Fallon Community Health Plan. **This document is a guideline. The synthesis of the enclosed recommendation is not meant to replace any practices based on personal training, clinical judgment, experience or specific aspects of individual patient situations.**

## goals

- Provide effective, efficient and appropriate care to patients with heart failure.
- Decrease variability in the care of the population with heart failure.

## timetable

Date final draft approved by Clinical Practice Guidelines Committee: 6/2000

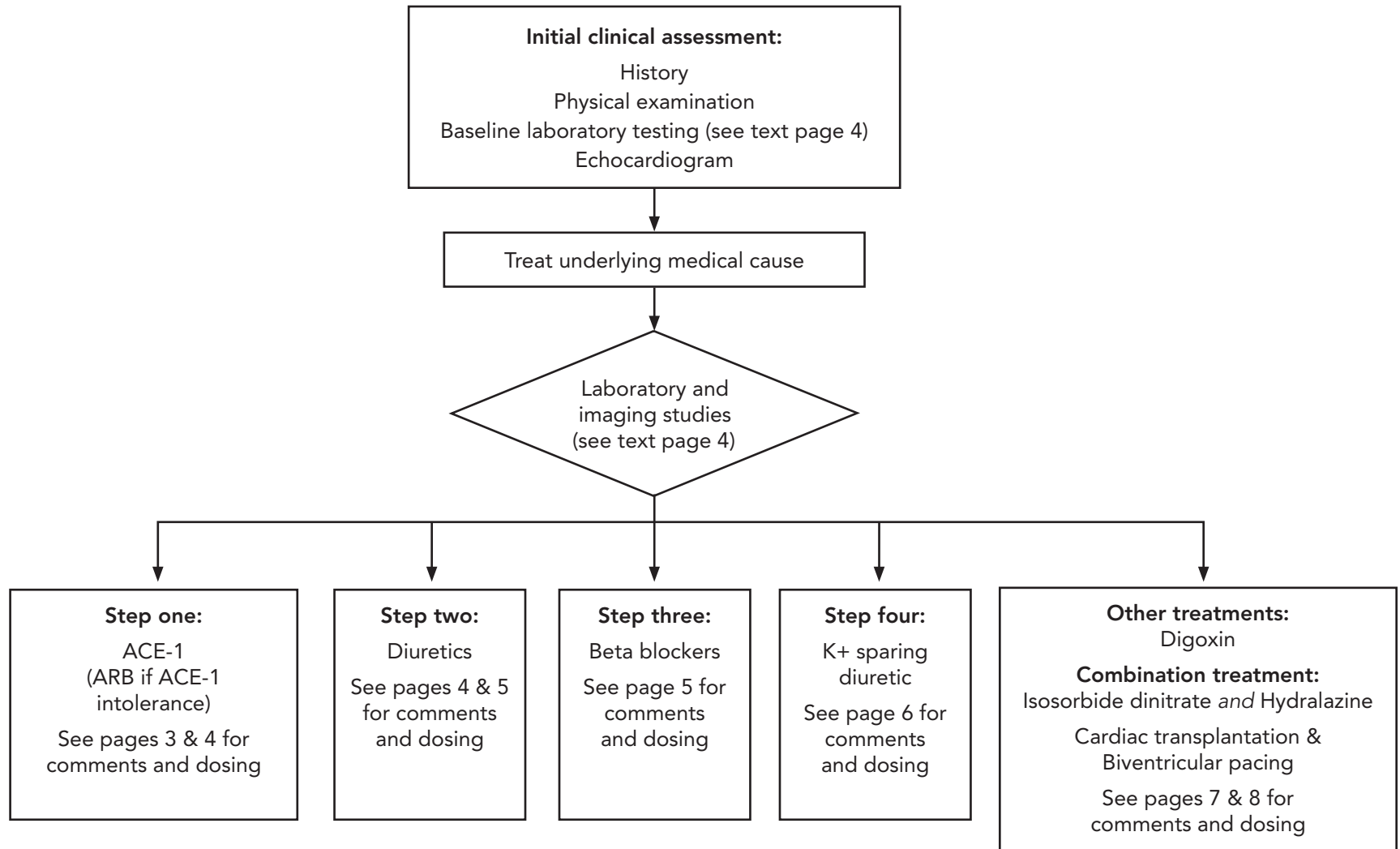
Dissemination to FCHP practitioners: 6/2000

First revision: 12/2002

Second revision: 12/2004

Third revision: 10/2006

algorithm for outpatient treatment of heart failure caused by left ventricular systolic dysfunction



## outpatient treatment of heart failure caused by left ventricular systolic dysfunction

Heart failure caused by left ventricular systolic dysfunction is defined by having an ejection fraction of 40% or lower. There is no published literature to guide pharmacological management of patients with diastolic dysfunction, although these guidelines can be used for those patients as well, with particular emphasis on blood pressure control (targeting a blood pressure of less than 130/85 in accordance with the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure [JNC VII]). All patients with suspected HF should have their ventricular function assessed with echocardiogram, ventriculogram or MUGA scan, in concert with a clinical assessment for possible underlying coronary artery disease, valvular heart disease and infiltrative myocardial disease as indicated by the clinical presentation.

Step one:	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<b>ACE-I</b> (Angiotensin converting enzyme inhibitor; contraindicated in pregnancy)				<b>Baseline:</b> Complete blood count (CBC), serum electrolytes (the American College of Cardiology recommends including calcium and magnesium, urinalysis, HbA1c, blood lipids, renal & hepatic function, chest X-ray, 12 lead EKG, thyroid function tests), creatinine, weight, and BP  <b>Follow-up:</b> Obtain K+, BUN, Cr and BP within one week, in a month, every 6 months, if stable. Repeat monitoring cycle if there is a dosage change.  If K+ > 5.5mEq/L or pre-existing renal insufficiency is present, monitor more closely. Hold ACE-I if creatinine acutely increases more than 1 mg/dl. Re-evaluate volume status, renal perfusion	Attempt to reach target dose of ACE-I before adding diuretic, unless evidence of severe volume overload.  Stop potassium-sparing diuretics when <b>initiating</b> ACE-I, unless history of hypokalemia (< 3.5) Use caution in cases of compromised renal perfusion, pre-existing hyperkalemia, the overdiuresed patient, and hypotension (SBP < 90).  Use NSAIDs cautiously, if at all in patients on ACE-Is.  ACE-I continues to be the agents of choice for blockade of the renin-angiotensin system in heart failure.  Half-life of captopril is prolonged in renal insufficiency. Initiate at lower dose range and monitor more closely.  Patients who experience angioedema should not be given another ACE-I or ARBs.
Lisinopril (Preferred QD agent at FCHP)	2.5–5 mg q.d.	30 mg q.d.	40 mg q.d.		
Captopril (Preferred if multiple daily dosing )	6.25–12.5 mg b.i.d.–t.i.d.	50 mg t.i.d.	100 mg t.i.d.		
Enalapril	2.5 mg b.i.d.	10 mg b.i.d.	20 mg b.i.d.		

Step one (continued):	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<b>ARB</b> (Angiotensin receptor blocker; contraindicated in pregnancy.)  Losartan Valsartan	  12.5 mg q.d. 80 mg q.d.	  25 mg q.d. 160 mg q.d.	  50 mg q.d. 320 mg q.d.		Angiotensin receptor blockers are acceptable treatment for those patients who are unable to tolerate ACE-I because of cough or other side effects, except angioedema.  There is no benefit for combined use of ACE-Is and ARBs.

Step two:	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<b>Diuretics</b> (Can be used as initial agent if there is evidence of volume overload).  <b>Thiazide diuretics</b> (mild heart failure, creatinine $\leq$ 2) <ul style="list-style-type: none"> <li>• Chlorthalidone</li> <li>• Hydrochlorothiazide</li> </ul> <b>Loop diuretics</b> (moderate to severe heart failure) <ul style="list-style-type: none"> <li>• Furosemide</li> <li>• Bumetanide</li> </ul>	  12.5–25 mg q.d. 12.5–25 mg q.d.  20 mg q.d. 0.5 mg q.d.	  as needed as needed  as needed as needed	  50 mg q.d. 50 mg q.d.  320 mg q.d. in divided doses 10mg q.d.	<b>Baseline:</b> Complete blood count (CBC), electrolytes serum creatinine (Cr) lipid profile, fasting blood sugar, magnesium level, and weight.  <b>Follow-up:</b> Obtain electrolytes, BUN, Cr, magnesium level within one week, in a month, then 3 months, if stable. Follow fasting blood sugar and lipid profile in two months.  <b>Daily weights by patients:</b> Instruct patients to call M.D. for > 2–5 lb changes (either direction).  If <b>thiazide</b> diuretics are added to <b>loop</b> diuretics, use extreme care in monitoring volume status, electrolytes, and blood pressure (minimum weekly monitoring)	Avoid overdiuresis, since this can cause hypotension and renal insufficiency and limit dose of ACE-I therapy.  Twice-daily dosing of loop diuretic may limit patient compliance. With very high loop diuretic dosages (furosemide), decreased hearing may occur, particularly in patients with renal insufficiency. While usually reversible, the dose of the loop diuretic should be reduced or discontinued.  Bumetanide may be better absorbed than furosemide in some patients. <b>Cross-sensitivity</b> is rare with bumetanide in patients with furosemide (sulfonamide) allergy.

Step two:	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<p>(Hydrochlorothiazide and metolazone can be added to loop diuretics if patient is unresponsive.)</p> <p>Metolazone</p>	2.5–5 mg q.d.	5 mg q.d.	10 mg q.d.		<p>Hydrochlorothiazide or metolazone can cause severe hypokalemia and marked volume depletion, especially when combined with a loop diuretic.</p> <p>Thiazide diuretics are useful only for patients with creatinine less than 2 mg/dl.</p> <p>Impaired renal function is a risk factor for hyperkalemia during treatment with aldosterone antagonists.</p>

Step three:	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<p><b>Beta-blockers</b></p> <p>Metoprolol</p> <p>Metoprolol XL</p> <p>Bisoprolol (once-daily dosing and cardio-selective)</p> <p>Carvedilol (It is recommended that carvedilol be started <b>only under supervision of a cardiologist.</b>)</p>	<p>12.5 mg b.i.d. p.o.; titrate up to 75–100 mg b.i.d. p.o.</p> <p>25 mg q.d.</p> <p>2.5 mg q.d.</p> <p>3.125 mg b.i.d.</p>	<p>150–200 mg p.o.</p> <p>100 mg q.d.</p> <p>5–10 mg q.d.</p> <p>12.5 mg b.i.d.</p>	<p>200 mg q.d.</p> <p>200 mg q.d.</p> <p>10 mg q.d.</p> <p>25–50 mg b.i.d.</p>	<p><b>Baseline blood pressure:</b> Monitor after a few doses for worsening of heart failure.</p> <p>Monitor blood pressure and symptoms of heart failure weekly until stable.</p> <p>Hypotension and postural hypotension occur during the first 30 days of dosing, corresponding to the up-titration period of carvedilol. During initiation of therapy, blood pressure should be closely monitored.</p>	<p>Carvedilol and metoprolol demonstrated significant and parallel clinical and exercise benefits over 12 months in this heart failure population with no discernible difference between the 2 beta-blockers in the measured parameters.</p> <p>Prior authorization is required for carvedilol in the commercial formulary but not under Medicare Part D.</p>

Step four:	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<p><b>K+ sparing diuretic</b></p> <p><b>Spironolactone</b></p> <p>(The literature (9) suggests that spironolactone at a dose of 12.5–25 mg daily is pharmacologically effective in blocking the aldosterone receptors and decreasing atrial natriuretic peptide concentrations and that serious hyperkalemia occurs most frequently with daily doses of 50 mg or more.)</p>	<p>12.5–25 mg p.o.</p> <p>(In this study (9), spironolactone therapy was initiated at a daily dose of 25 mg, and physicians were given the options of 1) altering the dose to 25 mg every other day if serum potassium concentrations started to rise to a hyperkalemic level or 2) of increasing the dose to 50 mg daily after 8 weeks in patients that had symptoms or signs of worsening heart failure but no evidence of hyperkalemia.)</p>	<p>25 mg p.o.</p>	<p>50 mg p.o.</p>	<p><b>Check</b> BUN, creatinine and electrolytes weekly for 1 month. Then monthly for 3 months, then every 3 months.</p> <p>If K+ rises, every-other-day dosing can be tried.</p> <p>Any combination of an ACE-Is, KCl supplementation, Bactrim, or NSAIDs with spironolactone is more likely to cause hyperkalemia. K levels should be followed extremely closely in that setting, e.g. several times a week shortly after the spironolactone is administered. Also, since the effect of spironolactone may persist for 2–3 days after the drug is discontinued, follow-up labs may be necessary.</p> <p>Serum creatinine concentrations of more than 2.5 mg/dl and serum potassium concentrations of more than 5.0 mmol/L were exclusion criteria in the study.</p>	<p><b>Conclusions:</b> Blockade of aldosterone receptors by spironolactone, in addition to standard therapy, substantially reduces the risk of both morbidity and death among patients with severe heart failure.</p>

Other:	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<p><b>Digoxin</b> (Add if patient symptomatic after optimal management with ACE-Is and diuretics.)</p>	<p>0.125–0.25 mg q.d.</p> <p>Loading dose not necessary for HF.</p> <p>Dose-dependent on lean body weight and renal function. In general, age &gt; 70 and/ or creatinine &gt;1.5, start with 0.125 mg q.d. For creatinine &gt;2.5, start with 0.125 mg q.o.d.</p>	<p>Serum digoxin concentration: 0.7–1.1 mg/ml (slightly lower than if treating atrial fibrillation)</p>	<p>As needed</p>	<p><b>Monitor</b> creatinine, potassium, calcium, and magnesium in a week. Hypokalemia, hypomagnesemia, hypercalcemia can potentiate digoxin toxicity.</p> <p>Monitor for symptoms of toxicity (anorexia, nausea, confusion), Cr, electrolytes in 2–3 weeks; then monitor yearly if stable.</p> <p><b>Follow-up:</b> Obtain digoxin level if:</p> <ol style="list-style-type: none"> <li>1. Renal function changing.</li> <li>2. Interacting drug added.*</li> <li>3. Suspect noncompliance.</li> <li>4. Suspect toxicity.</li> <li>5. Significant change in weight.</li> <li>6. Women have a higher risk of digoxin toxicity and should be considered for a level check within a month of the start date.</li> </ol> <p>* Medications that decrease digoxin clearance: quinidine, verapamil, amiodarone, diltiazem, cyclosporine, triamterene, propafenone, any significant increase in diuretic dose.</p>	<p>Education program needed to alert patients to early GI signs of toxicity.</p> <p>Patients with renal insufficiency may require 3 weeks or greater to reach steady state concentrations.</p> <p>Withdrawal of long-term digoxin therapy may exacerbate HF (1, 2).</p>

Combination:	Initial dose	Target dose	Maximum dose	Monitoring considerations	Comments
<b>Isosorbide dinitrate</b> and <b>Hydralazine</b> (For patients with contraindications or intolerant to ACE-I)	10 mg t.i.d.  10 mg t.i.d.	40 mg t.i.d.  75 mg t.i.d.	80 mg t.i.d.  100 mg t.i.d.	<b>Obtain</b> baseline blood pressure. Monitor blood pressure in one week.  Obtain baseline CBC and ANA titers. Repeat at 6 months or earlier if patient complains of arthralgias, fever, chest pain, or malaise.	Side effects may limit compliance (headaches, palpitations, nasal congestion). Educate patients these effects may disappear with time.  Hydralazine may cause lupus-like syndrome. This is more frequent in slow acetylators. Also, likelihood increases with larger doses and after at least 6 months of continuous therapy.

### Cardiology consultation

Cardiac transplantation and biventricular pacing	<p><b>It is recommended that these invasive interventions should be considered only with cardiology consultation. If the ejection fraction is less than 35%, consider referral to cardiology or electrophysiology for intervention, even if patient is asymptomatic.</b></p> <p>An implantable cardioverter-defibrillator is recommended as secondary prevention to prolong survival in patients with current or prior symptoms of HF and reduced LVEF who have a history of cardiac arrest, ventricular fibrillation, or hemodynamically destabilizing ventricular tachycardia.</p> <p>Implantable cardioverter-defibrillator therapy is recommended as primary prevention to reduce total mortality by a reduction in sudden cardiac death in patients with ischemic heart disease who are: 1) at least 40 days post-MI, 2) have an LVEF less than or equal to 30% while undergoing chronic optimal medical therapy, and 3) have reasonable expectation of survival with a good functional status of more than one year.</p> <p>Implantable cardioverter-defibrillator therapy reduces total mortality by sudden cardiac death in patients with nonischemic cardiomyopathy who have: 1) an LVEF less than or equal to 30%, and 2) have a reasonable expectation of survival with a good functional status of one year.</p>
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## formal disease management programs

Several published studies have documented the efficacy of formal disease management programs as tools to improve patient compliance and clinical outcomes for this high-risk population. Such programs generally include dedicated nurse care managers who maintain regular contact with the patients, often by phone, to form a trusting relationship. A computerized database can then be used to track patient compliance as well as key process measures and medication doses, thereby reducing resource utilization at the same time that functional status measures and key process outcomes are improved.

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