

GUIDELINES & PROTOCOLS

ADVISORY COMMITTEE

Heart Failure Care

Scope

This guideline describes diagnosis and management strategies for adults (19 years and older) with heart failure. It focuses primarily on approaches and systems needed to provide appropriate, evidence-based care. Heart failure is a complex syndrome with many new advances in diagnosis and treatment that are summarized in this guideline.

Improvements in heart failure management which are addressed in this guideline include:

1. Use of diagnostic tools and effective therapies
 - The standard for diagnosing systolic heart failure is the objective determination of the ejection fraction: an ejection fraction of <40% defines systolic heart failure which then requires the initiation of treatment. Ejection fraction can be determined by echocardiogram or radionuclide ventriculogram, but the echocardiogram gives more information about valvular structure and function and is the preferable technique, where available
 - Beta-blockers (β -blockers) should be used to treat systolic heart failure: the initial negative inotropic effect (first month) is later offset by improved cardiac dynamics (after 2-3 months) and reduced mortality
2. Compliance with medications and diet
 - Improved by setting goals of treatment and through patient education
 - Polypharmacy is a concern- match drugs to goals of treatment
3. Treatment of co-morbid conditions
 - Treat other chronic diseases
 - Treat vascular risk factors, especially when diabetes is a co-morbid condition
4. Follow-up
 - Systems designed to ensure follow-up and patient education can improve outcomes

Clinical Highlights

Heart failure is associated with a high rate of hospitalization and short-term mortality, especially in the elderly patient with co-morbid conditions. Early diagnosis and treatment can prevent complications. Minimal recommendations include:

1. treating all patients with systolic heart failure with 2 of the following 3 drug classes: Angiotensin converting enzyme inhibitors (ACE-I) and β -blockers or angiotensin receptor blockers (ARBs) and β -blockers (if ACE-I intolerant) unless otherwise contraindicated (recommendation 2a)
2. supporting the patient to develop an individualized management plan with self-care objectives, including salt restriction, weight monitoring and medication adherence strategies (recommendation 3 and appendices)
3. addressing co-morbid conditions (see guidelines on Hypertension and Diabetes Care)
4. developing effective systems for planned visits and follow-up

RECOMMENDATION 1:

Diagnosis

Heart failure is underdiagnosed in the early stages. Diagnostic accuracy improves where there is a high index of suspicion for a patient with vascular risk factors and by having a consistent approach to diagnosis.

Definition of Heart Failure

Heart failure (HF) is defined by symptoms that are suggestive of cardiac dysfunction and objective evidence of cardiac dysfunction. In cases where there is doubt, response to a therapeutic trial may increase the diagnostic accuracy (see note).

Systolic heart failure is the presence of signs and symptoms of HF with an ejection fraction of less than 40%.

Diastolic heart failure is the presence of signs and symptoms of HF in the absence of systolic dysfunction (Left ventricular ejection fraction, LV-EF>40%).

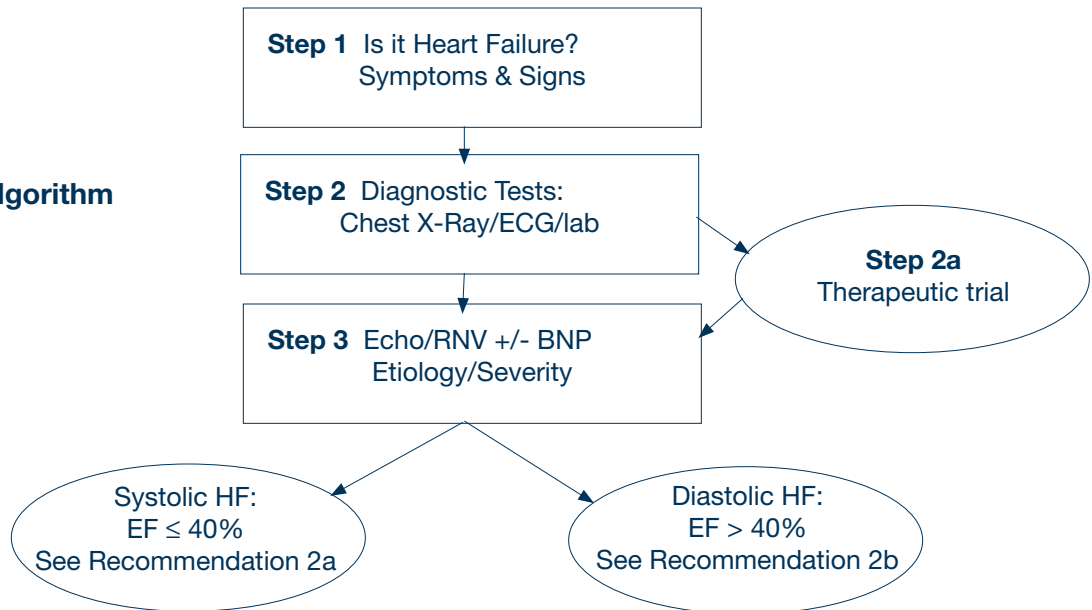
It is important to differentiate systolic from diastolic heart failure as research evidence for treatment is best established for systolic heart failure and for predicting prognosis which is worse for systolic than for diastolic heart failure.

Symptoms: Symptoms of heart failure may include fatigue, shortness of breath, diminished exercise capacity and fluid retention.

Evaluation should include:

- A thorough history and physical exam
- Assessment of a patient’s mobility, ability to solve problems and perform routine and desired activities of self-management and daily living
- Assessment of volume status
- Complete blood count, urinalysis, serum electrolytes, blood urea, serum creatinine/calculated GFR*, fasting blood glucose, AST, albumin and thyroid-stimulating hormone
- 12-lead electrocardiogram and chest radiograph
- Initial 2 dimensional echocardiography with Doppler to assess cardiac function (preferred) or radionuclide ventriculography (RNV-which assesses left ventricular (LV) function, not other parameters of cardiac function)
- Brain natriuretic peptide (BNP) is an emerging test that has shown a high diagnostic predictive value for both systolic and diastolic heart failure. This test is not yet available through the BC laboratory systems and its use will be examined in the BC CHF Collaborative in association with GPAC.

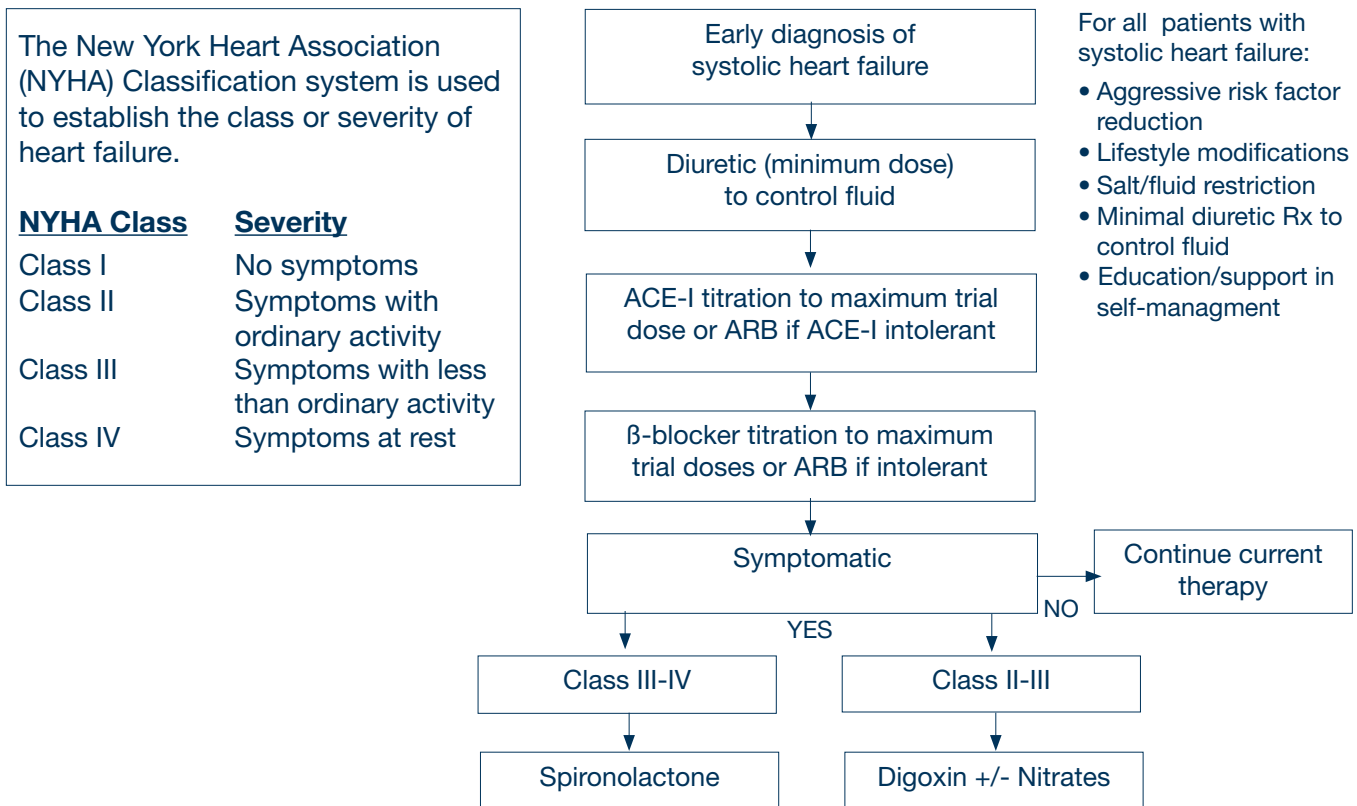
Diagnostic Algorithm



- Evaluation should also include attention to vascular risk factors and co-morbid conditions.
 - * The calculated GFR test is being introduced as a more accurate way of estimating kidney function than serum creatinine and will become the standard method of testing (this will be outlined in more detail in the upcoming guideline on chronic kidney disease).

Note: A therapeutic trial may be considered after Step 2 when symptoms and signs of heart failure are present and initial diagnostic tests have been carried out, but echocardiography or radionuclide ventriculography is not immediately available. However, every effort should be made for a patient suspected of or treated for HF to have an assessment of heart function as soon as possible with echocardiography (or radionuclide ventriculography where echocardiography is not available) to confirm the diagnosis and direct the appropriate therapeutic plan.

RECOMMENDATION 2A: Drug therapy for systolic heart failure (ejection fraction <40%)



Research evidence for treatment of heart failure is best established for systolic heart failure. If a patient has other co-morbid conditions, these will need to be addressed as well.

Notes:

1. All patients with systolic heart failure should be on ACE-I and β-blockers unless contraindications are present (ARBs can substitute if there is intolerance to these drug classes, i.e.: ARBs can be used in combination with ACE-I or with β blockers). This can be achieved through careful titration that can be done as an out-patient and in the GP office in most cases.
2. Concerns about blood pressure may occur as these drugs are titrated upwards – limitations should relate to symptoms of low BP rather than actual BP values (for systolic BP above 80 mm Hg) so persistence with the titration should occur unless such symptoms occur.
3. Concerns about renal function may occur as these drugs are titrated upwards. When there is uncertainty about impaired and/or deteriorating renal function, referral to a nephrologist is encouraged. See Appendices 2 and 4 for more specific direction.

4. Diuretics are used to control fluid but the goal is always to stop the diuretic or use the most minimal dose once the patient has become symptomatic. This is more often achieved after ACE-I and β blockers have been started and titrated to target doses and then the diuretic can be stopped or used at minimum doses. Also, by using the minimal dose of the diuretic, it is more likely that symptomatic hypotension and/or unacceptable increases in serum Cr won't happen with upward titration of the ACE-I or β blockers.
5. Aggressive management of cardiovascular risk factors is recommended to reduce the risk of ischemic heart disease.
6. A new classification system has recently been introduced that emphasizes the evolution and progression of heart failure and that will be clinically useful as it underscores the fact that established risk factors and structural abnormalities are necessary for the development of heart failure, recognizes its progressive nature and superimposes treatment strategies on the fundamentals of preventive efforts.¹⁷ This classification system is outlined below for reference but it has not, as yet, been widely adopted in clinical practice.

Stage A: High risk for HF but no structural abnormality of the heart

Stage B: Structural abnormality but never had symptomatic HF

Stage C: Structural abnormality and current or previous symptoms of HF

Stage D: End-stage symptoms of HF that are refractory to standard treatment

Diuretics

- Beneficial Subsets: NYHA class II-IV with fluid overload (edema, ascites, weight gain)
- Goal/Dose: Usually furosemide, start 20 mg/day and increase/decrease as needed; diuretics can be stopped if fluid overload resolves (see Appendix 1)

ACE Inhibitors

- Beneficial subsets: NYHA Class I-IV
- Goal/Dose: Start low and titrate to maximum trial dose even if symptoms resolve (see Appendix 2)

ACE inhibitors slow disease progression, improve exercise capacity and decrease hospitalisation and mortality. All patients with systolic heart failure should be using ACE inhibitors (or ARBs if ACE intolerant) unless otherwise contraindicated.

β -Blockers

- Beneficial subsets: Stable NYHA Class I-IV
- Goal/Dose: Start at low dose and titrate to maximum trial dose (see Appendix 3)

β -blockers slow disease progression, decrease hospitalisation and mortality and improve quality of life but have little or no effect on objective measures of exercise duration. All patients with systolic heart failure should be on a β -blocker as they are the most recent dramatic advance in medical treatment (ARBs can be substituted if β -blocker intolerant). However, patients may deteriorate clinically over the first month and persistence is necessary. Adjustments may be required in the doses of other medication, including diuretics and ACE-I, at least in the titration phase, to increase the tolerance for β -blockers. In most situations, β -blocker therapy can be managed in a primary care out-patient setting with referral for consultation for unexpected difficulties.

Angiotensin Receptor Blockers

- Beneficial subsets: NYHA Class I-IV
- Goal/Dose: Start low and titrate to maximum trial dose (see Appendix 4)

Angiotensin receptor blockers are not first line agents and are used for ACE-I or β -blocker intolerant patients.

Spirolactone

- Beneficial Subsets: NYHA Class III-IV-moderate to severe heart failure
 - Goal/Dose: 25mg each day (monitor kidney function and serum K); >25 mg is rarely indicated
- Spirolactone decreases mortality and hospitalization and improves symptoms.

Digoxin

- Beneficial Subsets: NYHA Class II-III
- Goal/Dose: 0.125-0.25 mg/day

Digitalis can be used in patients still symptomatic on the other recommended medications and may improve symptoms, exercise tolerance and quality of life. Digoxin therapy has recently been found to be associated with an increased risk of death from any cause amongst women (but not men), with heart failure and decreased LVEF. Therefore, digoxin should be used with caution in this group and consideration should be given to obtaining a digoxin level where toxicity is suspected.

RECOMMENDATION 2B: Drug therapy for diastolic heart failure (ejection fraction >40%)

Pharmacologic management for diastolic heart failure has not been well established through research and treatment is directed to the underlying cause(s). The drugs used will be the same as for systolic heart failure. Treat the underlying/contributing conditions:

- Hypertension (goal is blood pressure below 140/85 mm Hg)
 - Ischemic heart disease
 - Atrial fibrillation
 - Hypertrophic cardiomyopathy (consider referral to specialist)
- Pharmacologic Management – Caution: LV filling pressures are volume dependent so caution is required when using medications, particularly ACE inhibitors and diuretics, to prevent symptomatic hypotension or pre-renal azotemia.

Lifestyle and non-pharmacological management strategies are given in Appendix 5.

RECOMMENDATION 3: Individualized patient self-management plan

Heart failure care depends on the patient's understanding of and participation in optimal care. As a minimum, there should be individualized goal setting, salt restriction, weight monitoring and management adherence strategies (Appendix 5).

To support patient self-management, the physician should:

- **Discuss the importance of self-management for the optimal management of heart failure (and other co-morbid conditions) with the patient and the patient's network of support**
- Define, with the patient, the goals for managing their heart failure
- Work with the patient on the specifics of the plan including monitoring of target symptoms and signs, particularly weight, exercise, sodium intake and use of medications. Instruct the patient on how to use that information for self-management, communicating with the physician and returning for appointments
- Provide resource information and patient reminders, including when to return for appointments
- Discuss advance directives, including the desired level of intervention
- Identify and work collaboratively with a support team including a pharmacist and a community health nurse if available
- Refer the patient for further education and training in risk reduction to Heart Function Clinics, Cardiac Rehabilitation or Risk Reduction Centres, and, where they exist, to the local Chronic Disease Management Program.

Note: Resources and reminders to support patients are attached and are available on the Ministry of Health website: <http://www.healthservices.gov.bc.ca/cdm/patients/chf/index.html>.

RECOMMENDATION 4: Practice management strategies

Management strategies such as registration, recall, and regular review can improve the care of patients with heart failure.

Physicians are encouraged to:

- Identify all patients with heart failure in your practice (some physicians in BC have used a file card system and found this useful)
- Monitor key clinical indicators of heart failure: a flow sheet or another system (e.g. file cards) can be used
- Use recall systems to ensure that patients with heart failure are seen at appropriate intervals
- Review patient records to ensure the goals of care have been met

RECOMMENDATION 5: Ongoing management

Comprehensive heart failure management is based upon setting goals of treatment and monitoring for the effectiveness of management:

1. Define and monitor cardiovascular goals
 - Reverse congestion
 - Control arrhythmia and ischemia
 - Prevent ischemia
 - Prevent emboli
 - Stabilize vital signs (pulse, sit/stand blood pressure, weight)
2. Use current drug and non-drug therapy for heart failure and for cardiovascular and non-cardiovascular co-morbidity
3. Review medications for intended and unintended effects (inappropriate polypharmacy, potential drug interactions, inadvertent aggravation of co-morbid conditions)
4. Stabilize and monitor functional status (endurance, activities of daily living) and prescribe regular aerobic and/or resistive exercises in stable patients through an exercise/cardiac rehab program. (See Appendix 5).
5. Monitor and treat psychosocial consequences (non-compliance, anxiety, depression, social isolation)
6. Immunize with influenza and pneumococcal vaccines
7. Monitor serum biochemistry (electrolytes, blood urea, creatinine) over the short interval if the clinical condition or medication has changed (days to two weeks) and at least every six months when stable. Monitor serum digoxin only if toxicity is suspected or for checking adherence.
8. Monitor the key clinical indicators using a systematic approach (e.g. flow sheet, file cards)
9. Determine how aggressive the approach will be, i.e. from a goal of an advanced cardiac technology and transplantation approach through to a goal of symptom control and palliative approach.
10. Define and re-define the goals of treatment over time with the patient.

RECOMMENDATION 6: Indications for referral to a medical specialist

1. Cause of heart failure unknown
2. Consideration for heart transplantation
3. Angina, candidates for revascularization
4. Refer to a nephrologist when impaired and/or deteriorating kidney function and reason not apparent (See guideline on chronic kidney disease).
5. Serum sodium <132 mmol/L (persistent after water restriction)
6. Severe heart failure-refractory or difficult to control
7. Suspect valve disease as primary cause
8. Arrhythmia-symptomatic
9. EF ≤ 30%

Note: The role of advanced practice nurses in cardiac care is an integral part of specialist support in Heart Failure Clinics where they provide nursing case management for ongoing surveillance and education of patients and family members.

Prior to initiating end of life care:

- Ensure that all active therapeutic options have been explored: maximal medical therapy, biventricular pacing, implantable defibrillator, revascularization surgery
- Ensure that the precipitating factors have been addressed, including residual angina and hypertension as well as adherence to salt and fluid restrictions and to medications plus other contributory medical conditions (cardiac arrhythmias, anemia, infections, thyroid dysfunction).

Once initiating end of life care:

- The goal of therapy is to manage all symptoms (including those of co-morbid conditions, e.g. chronic pain) and address function and quality of life issues
- Symptoms are often related to fluid overload so that diuretic use (one or more), becomes important, limited by symptomatic hypotension and renal impairment (Cr > 250 µmol/L or >30% from baseline); the dose of ACE inhibitor may need to be reduced
- Consider narcotic use with uncontrolled angina and/or home oxygen for severe symptomatic dyspnea
- It is important to ensure that advanced care planning has been carried out, including for financial and health care decisions (e.g. Representation Agreement). Decisions need to be made as to whether and when to pursue hospital admission
- Consider referral to palliative care/hospice teams if available in your community.

Rationale

Heart failure is most often caused by coronary artery disease¹ and/or hypertension and it is a major cause of hospitalization of the elderly in Canada². Most of the people who have impaired cardiac function have not been diagnosed. About 30% of the people who have heart failure but are unaware of it will develop overt heart failure in the subsequent 3 years³. The 1-year mortality rate for all ages for men and women is about 33% and increases to about 50% in patients with 3 or more co-morbid conditions⁴. The 1-year mortality rate can be as high as 61% in more elderly patients with co-morbid conditions⁴.

About 40,000 British Columbians have been diagnosed with heart failure⁵. Most (>90%) of the cases occur in patients over 65. While deaths due to cardiovascular disease have clearly declined during the last decade, there has been little reduction in death rates due to heart failure. In British Columbia in the year 2000/01, there were 7,382 cases of admission to hospital with a primary diagnosis of heart failure with a total of 56,042 days and an average of 7.55 hospital days per case. The total cost of hospitalizations for heart failure as the primary diagnosis was about \$48 million⁵.

Health care may be improved and costs reduced by implementing better management strategies for heart failure in British Columbia. Improvements in team-based coordination and case management with early intervention, improved pharmaceutical management, close follow-up and caregiver and patient education about self-management has resulted in reduced hospital admissions⁶⁻⁹. In one study, the patients in the intervention group had fewer admissions for heart failure (37% vs 53%) and spent fewer days in hospital for heart failure (3.43 vs 7.46 days) than the control group⁹. These studies have largely been based upon the model of nurse clinical care coordination from a heart failure clinic and need to be extended into primary care settings as outlined in this guideline.

Several detailed guidelines for the evaluation and management of heart failure have been published¹⁰⁻¹⁴. Recommendations for patient and caregiver management in this guideline are based on current evidence from randomized controlled trials and published guidelines.

Recent research provides guidance related to worsening renal function and decompensated heart failure.^{15,16} A new system of heart failure classification which includes patients at risk of heart failure has also been proposed.¹⁷ This system has not yet been widely adopted in clinical practice.

References

1. Parmley WW. Pathophysiology of congestive heart failure. Clin Cardiol 1992; 15, (Suppl 1) I-5-I12
2. Health and Welfare Canada. The Changing Face of Heart and Stroke in Canada, 2000, Ottawa. <http://www.hc-sc.gc.ca/hpb/lcdc/bcrdd/hdsc2000>.
3. Hoes AW, Mosterd A, Grobbee DE. An epidemic of heart failure? Recent evidence from Europe. Eur Heart J. 1998;19 (suppl L): L2-L9.
4. Jong P, Vowinkel E, Liu PP, Gong Y, Lu JV et al. Prognosis and determinants of survival in patients newly hospitalized for heart failure. Arch Intern Med 2002;162:1689-94.
5. Province of British Columbia. Ministry of Health Services. Information support data Feb, 2002
6. West JA, Miller NH, Parker KM, Senneca D, Ghandour G, Clark M et al. A comprehensive management system for heart failure improves clinical outcomes and reduces medical resource utilization. Am J Cardiol 1997;79:58-63.
7. Cline CMJ, Israelsson BYA, Willenheimer RB, Broms K, Erhardt LR. Cost-effective management programme for heart failure reduces hospitalization. Heart 1998;80:442-68.
8. McAlister FA, Lawson FME, Teo KK, Armstrong PW. A systematic review of randomized trials of disease management programs in heart failure. Am J Med 2001;110:378-384.
9. Blue L, Lang E, McMurray JJV, Davie AP, McDonagh TA, Murdoch DR et al. Randomised controlled trial of specialist nurse intervention in heart failure. BMJ 2001;323:715-8.
10. Krumholz HM, Baker DW, Ashton CM, Dunbar SB, Friesinger GC, Havranek EP et al. Evaluating Quality of Care for Patients with Heart Failure. Circulation 2000;101:e122-e140.
11. Gombert-Maitland M, Baran D and Fuster V. Treatment of Congestive Heart Failure. Guidelines for the primary care physician and the heart failure specialist. Arch Intern Med. 2001;161:342-352.
12. Hunt SA, Baker DW, Chin MH, Cinquegrandi MP, Feldman AM et al. ACC/AHA Guidelines for the evaluation and management of chronic heart failure in the adult. American College of Cardiology Web site. Available at: http://www.acc.org/clinical/guidelines/failure/hf_index.htm
13. Liu P. The 2001 Canadian cardiovascular society consensus guideline update for the management and prevention of heart failure. Can J Cardiol 2001;17(Suppl E): 5E-24E.
14. Remme WJ and Swedberg K. Guidelines for the diagnosis and treatment of chronic heart failure. European Heart Journal 2001; 22,1527-60.
15. Smith GL, Vaccarino, V, Kosiborod M, Lichtman J, Cheng S, Watnick S et al. Worsening Renal Function: What is a Clinically Meaningful Change During Hospitalization For Heart Failure? J of Cardiac Failure 2003;9(1):13-25
16. Schiff GD, Fung S, Speroff T, McNutt R. Decompensated Heart Failure: Symptoms, Patterns of Onset, and Contributing Factors. Am J Med 2003;114:625-630
17. Jessup M and Brozena S. Medical Progress: Heart Failure. NEJM 2003;348:2007-18

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The principles of the Guidelines and Protocols Advisory Committee are:

- to encourage appropriate responses to common medical situations
- to recommend actions that are sufficient and efficient, neither excessive nor deficient
- to permit exceptions when justified by clinical circumstances.

Appendix 1: Diuretics

- Aim for minimum effective dose to control symptoms of fluid overload (stop if fluid overload resolves)
- Check serum creatinine (S-Cr), sodium (Na⁺) and potassium (K⁺) before initiating and one to two weeks after each dose increment.
- Watch K⁺ carefully when using K⁺ - sparing diuretics (triamterene, amiloride) with an ACE I (K may increase), or when using K⁺ depleting diuretics (furosemide, metolazone, hydrochlorothiazide (K may decrease, goal K⁺ = 4.0-5.5 mmol/l).
- Reduce/hold diuretic if S-Cr increases >30% from baseline.

Drug	Dose Range	Frequency
furosemide ²	20 – 500 mg	od, bid, or prn
metolazone ^{3,4}	2.5 – 10 mg	od, bid, or prn
hydrochlorothiazide ³	12.5 – 50 mg	od, or prn
ethacrynic acid	25 – 100 mg	od, bid, or prn
triamterene ¹	50 – 100 mg	od, bid, or prn
amiloride ¹	5 – 10 mg	od, bid, or prn

LCA – low cost alternatives: these drugs are full benefit or have LCAs.

¹ potassium-sparing

² loop diuretic. Doses > 80 mg / day should be given BID

³ thiazide diuretic – can be used to potentiate loop diuretic

⁴ use with caution. Try test dose 3 times/week. Watch K⁺ and S-Cr

Note: **Spironolactone**. Although a K⁺ sparing diuretic, this drug is now known to exert its main beneficial effects in heart failure on reducing symptoms, hospitalizations and mortality through non-diuretic mechanisms and is now considered separately. The target dose is up to 25 mg OD (> 25 mg rarely used) and close monitoring of K⁺ and Cr is required. Gynecomastia (up to 5% of males) is also a side-effect of note (this side effect can also occur with digoxin, albeit with a lower incidence).

Appendix 2: ACE I comparison in heart failure

Note 1: Aim for maximum trial dose, may need to reduce dose temporarily while introducing β-blockers and then titrate back up again.

Note 2: ACE-I (and ARBs) may cause a deterioration in kidney function, so careful monitoring is required during titration but, in most situations, with dosage adjustments of diuretics and the ACE-I (or ARB dose), these drugs can be used successfully; when there is clinical uncertainty about the underlying cause of kidney impairment or management thereof, a consultation with a nephrologist is suggested.

- Check S-Cr and K⁺ before initiating and 1-2 weeks after each dose increment and then every 3-6 months.
- Symptomatic hypotension or ↑S-Cr > 30% from baseline in clinically volume depleted-first reduce / hold diuretic for 1-2 days (before reducing / holding ACE I).
- If ↑S-Cr > 30% from baseline in euvolemic patients: hold/stop ACE-I, consider hydralazine / nitrate combination.
- If baseline kidney function is <45 ml/min (calculated GFR), do not start ACE I, start hydralazine/nitrate combination and consult a nephrologist.
- Intractable cough or drug-associated rash: stop ACE I, consider ARB or hydralazine/nitrate combination if ARB not tolerated (ARBs may cause renal dysfunction). First ensure that cough is not due to poorly controlled CHF.
- Angioedema may also occur and ARBs may not prevent the angioedema in patients who have it with an ACE-I.

Drug	Initial Dose	Trial Dose*	Maximum Dose
ramipril (Altace®) lca	1.25 mg bid	5 mg bid	10 mg bid
enalapril (Vasotec®)	2.5 mg bid	10 mg bid	20 mg bid
captopril(Capoten®) lca	6.25 mg tid	50 mg tid	150 mg tid
lisinopril (Prinivil®) Zestril®)	2.5 mg od	35 mg od	80 mg od
trandolapril	1 mg od	4 mg od	4 mg od

* Maximum dose used in large CHF trials with clinical endpoints

Quinapril (lca), cilazapril (lca), fosinopril, benazepril, perindopril are available but have not been used in clinical trials.

Appendix 3: β -blocker comparison for heart failure

Aim for maximum trial dose. The dose of other drugs especially diuretics and ACE-I (or ARBs) may have to be adjusted temporarily to accomplish this.

- NYHA Class I-IV heart failure-start only once fluid volume controlled
- Patient should be stable for one week before starting titration
- Not for acute exacerbations of CHF, heart rate should be $> 60/\text{min}$, sysBP $> 85\text{mm Hg}$,
- Not for patients with asthma but can be used for patients with chronic obstructive pulmonary disease (COPD)
- Can be used with patients with peripheral vascular disease or diabetes
- Check potassium, urea, Cr at 3-7 days and 1-2 weeks after each titration
- Symptoms may worsen before they improve- persist with titration-improvement may take 6-12 weeks
- Slower titration schedule can be indicated in some older patients
- Dealing with side effects:

1. Hypotensive effects:

- Take with food
- Stagger dosage of other vasodilating drugs by at least 2 hours
- Give ACE-I at noon and beta-blocker in a.m. and bedtime
- Consider reducing ACE-I during up-titration of β -blocker
- Symptoms of dizziness often resolve within 2-4 weeks of up-titration
- When titrating up, add higher dose at bedtime first, then increase a.m. dose

2. Worsening fluid overload:

- Intensify sodium and fluid restriction
- Increase diuretic
- May have to reduce β -blocker dose until control of volume achieved then retry dose increase

3. Significant bradycardia:

- Reduce or eliminate other drugs that reduce heart rate (digoxin, calcium channel blockers, amiodarone)
- Reduce dose of β -blocker

Drug	Starting dose	Titration	Target dose
carvedilol	3.125mg bid	Increase dose by 50-100% every 2-4 weeks	25mg bid
metoprolol tartrate (lca)	12.5mg bid	Increase dose by 50-100% every 2-4 week	100mg bid (when reached, change to succinate)*
metoprolol succinate	*start once target dose of metoprolol tartrate reached		200 mg od
bisoprolol	1.25 daily	Increase dose by 50 – 100% every 2-4 weeks	10mg daily

Appendix 4 : Angiotensin receptor blockers (ARBs)

- ARBs are not first line drugs but are used for ACE-I or β -blocker intolerance
- Check S-Cr and K⁺ before initiating and 1-2 weeks after each dose increment and then every 3-6 months.
- Symptomatic hypotension or \uparrow S-Cr > 30% from baseline in clinically volume depleted-first reduce / hold diuretic for 1-2 days (before reducing / holding ARB).
- If \uparrow S-Cr > 30% from baseline in euvolemic patients: hold/stop ARB, consider hydralazine / nitrate combination.
- If baseline kidney function is < 45 ml/min (calculated GFR), do not start ARB, start hydralazine/ nitrate combination and consult a nephrologist.
- Angioedema may occur with ARBs as well as with ACE-I.

Drug	Starting Dose (once daily dosing)	Target Dose (once daily dosing)
candesartan	4 mg	32 mg
irbesartan	75 mg	300 mg
losartan	25 mg	100 mg
telmisartan	40 mg	80 mg
valsartan	80 mg	320 mg

Appendix 5: Lifestyle management strategies

Content	Target Population	Initial Recommendation	Goal Recommendation
Sodium intake	<ul style="list-style-type: none"> All HF Patients 	<ul style="list-style-type: none"> Limit high sodium foods Limit processed foods Do not add extra salt 	<ul style="list-style-type: none"> Sodium 2-3 g/day over 3 meals Re-check sodium intake when weight gain experienced
Fluid intake	HF patients with <ul style="list-style-type: none"> Hyponatremia High dose diuretics Severe HF 	<ul style="list-style-type: none"> Limit fluid intake to 6-8 cups/day Include all substances that are frozen (liquid at room temperature) 1 serving of fruit = ½ cup liquid 	<ul style="list-style-type: none"> Adjustment of fluid intake 4-8 cups/day depending on Serum creatinine Daily weight monitoring Na+ (if hyponatremia)
Exercise	<ul style="list-style-type: none"> HF patients with stable heart and stable volume status 	<ul style="list-style-type: none"> Start with every other day Start with minimum 5-10 minutes 2-3 times/day Easy to moderate intensity – able to converse 	<ul style="list-style-type: none"> 10-20 mins 3X/day or 20-30 mins 3-4 times/week Moderate to somewhat hard intensity
Monitoring	<ul style="list-style-type: none"> All HF patients 	<ul style="list-style-type: none"> Daily weight monitoring Report weight gain of 2.5 kg/week Report worsening of symptoms 	<ul style="list-style-type: none"> Daily weight monitoring Assessment/adjustment of fluid/sodium in response to weight gain of 1 kg. Notify MD for weight gain of 2.5kg over 1 week Notify MD for worsening of individual symptoms