Canadian Cardiovascular Society

> Is it Heart Failure and what should I do?

Standard Assessment

Suspect Heart Failure

Risk Factors	Symptoms	Signs	Key Electrocardiographic Findings	Chest X-Ray (CXR)
• Hypertension • Ischemic Heart Disease (IHD) • Valvular Heart Disease • Diabetes mellitus • Heavy alcohol use • Chemotherapy • Family History of HF • Smoking • Hyperlipidemia	• Breathlessness • Fatigue • Leg swelling • Confusion* • Orthopnea • Paroxysmal Nocturnal Dyspnea *especially in the elderly	• Lung crackles • Elevated Jugular Venous Pressure (JVP) • Positive HJR • Peripheral edema • Displaced apex • 3rd heart sound, 4th heart sound (S3, S4) • Heart murmur • Low Blood Pressure (BP) • Heart rate > 100	• Q Waves • Left Ventricular Hypertrophy (LVH) • Left Bundle Branch Block (LBBB) • Tachycardia	• Cardiomegaly • Pulmonary Venous Redistribution • Pulmonary edema • Pleural effusion

If Heart Failure Diagnosis remains in Doubt

B-type Natriuretic Peptide (BNP) or NT-proBNP, if available

- **BNP***
  - < 100 pg/ml, Acute decompensated - HF unlikely
  - > 500 pg/ml, HF likely
- **NT-proBNP***
  - < 300 pg/ml, Acute decompensated - HF unlikely
  - > 900 pg/ml, HF likely (age 50-75)
  - > 1 800 pg/ml, HF likely (age > 75)

*Values correspond to decompensated heart failure and do not apply for diagnosis of stable heart failure.

Echocardiogram (ECHO)

- Decreased Left Ventricular (LV) Ejection Fraction
- Increased LV End-Systolic and End-Diastolic Diameter
- Left Ventricular Hypertrophy
- Wall Motion Abnormalities and diastolic dysfunction
- Increased RV Size and dysfunction
- Valve Dysfunction
- Elevated Pulmonary Arterial Pressures

How Often To Follow	What To Follow	When to Refer
• Acute change in HF symptoms - within 24-48 hrs • After HF hospitalization - within 2 weeks • After HF ER visit - within 2 weeks • After addition of HF medication or increase in dose - if unstable: within 7 days - if stable: within 2 weeks - if asymptomatic: 1 month • Stable on optimized therapy - 3-6 months • Also check electrolytes, BUN creatinine if intercurrent illness likely to affect volume status (such as flu)	• At each visit record clinical data: - HF symptoms as per New York Heart Association (NYHA) classification - New symptoms - Body weight - Heart Rate (HR), sitting and standing BP - JVP, presence of HJR - Peripheral edema - Auscultate heart & chest - Check prescription and non-prescription medications, supplements and naturopathic agents • Periodically based on above, only when there is clinical change that will change treatment: - ECG (especially if new onset chest pain or irregular heart beat, (e.g. AFIB), CXR, ECHO, BNP (if uncertain if increased symptoms due to heart failure). Electrolytes/creatinine within 7-14 days during ACEI/ARB treatment, spironolactone or diuretic change until stable. Otherwise, within 1 to 3 months.	• New onset HF • Recent HF hospitalization • HF associated with: - ischemia/infarction - hypertension - valvular disease - syncope - renal dysfunction - multiple comorbidities • Unknown etiology • Family history of HF • Intolerance to therapies • Poor compliance with treatment regimen

Algorithm for Prevention and Treatment of Clinically Stable Heart Failure

To prevent HF: treat all cardiac RF's, if low LVEF prescribe ACE -I +/-Beta -blocker

If HF symptoms but LVEF > 40 %, treat cause eg Hypertension, Ischemia, consider ACE -I/ARB, Beta-blocker

If HF symptoms and LVEF < 40 %

For all symptomatic patients with systolic HF:
- *Tailored Diuretic*
- *Education on:*
  - *HF syndrome*
  - *Warning S&S*
  - *Self monitoring*
  - *Drug therapy*
  - *Prognosis*

ACEI + BETA-BLOCKER

Intolerance → *Prescribe ARB*

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TITRATE TO TARGET DOSES

Consider nitrate / hydralazine if intolerant to ACEI and ARB

If LVEF < 30 %, consider ICD referral

If QRS > 120 ms, consider CRT referral

If refractory, consider transplant

Clinically Stable → **Continue Rx**

Persistent Symptoms

NYHA Class II-IIIa → **Spironolactone / Eplerenone**, **ARB**

NYHA Class IIIb-IV → **Digoxin**, **Nitrates**, **Increase or combine Diuretics**

Evidence Based Heart Failure Drugs and Doses* (mg) for Patients with Systolic LV Dysfunction

Drug	Start Dose	Target Dose
ACE inhibitors		
Captopril	6.25-12.5 mg TID	25-50 mg TID
Enalapril	1.25-2.5 mg BID	10 mg BID
Lisinopril	2.5-5 mg OD	20-35 mg OD
Perindopril	2-4 mg OD	4-8 mg OD
Ramipril	1.25-2.5 mg BID	5 mg BID
Trandolapril	1-2 mg OD	4 mg OD
Beta-blockers		
Bisoprolol	1.25 mg OD	10 mg OD
Carvedilol	3.125 mg BID	25 mg BID**
Metoprolol CR/XL	12.5-25 mg OD	200 mg OD
ARBs		
Candesartan	4 mg OD	32 mg OD
Valsartan	40 mg BID	160 mg BID
Aldosterone Antagonists		
Spironolactone	12.5 mg OD	50 mg OD
Eplerenone	25 mg OD	50 mg OD
Vasodilatators		
Hydralazine	37.5 mg TID	75 mg TID
Isorbide dinitrate	20 mg TID	40 mgTID

** Drugs and doses may vary and depend upon the clinical scenario. ** 50 mg BID if weight is > 85 kg*

Practical Tips for Diastolic HF (or HF with Normal EF)

- Control volume with minimum effective diuretic dose
- Control resting heart rate to 70 bpm, especially if atrial fibrillation present
- Determine if contributing ischemia and treat if present
- Determine if valvular heart disease present and treat if necessary
- Control of hypertension is critical
- In most cases, an indication for ACE, ARB and/or BB is present
- Usually loop diuretics are needed, renal function may be very volume dependant
- Beta blockers most commonly used, but rate limiting calcium channel blockers (diltiazem or verapamil) may be considered
- Treat cardiac ischemia according to current guidelines
- Be especially vigilant of aortic stenosis and mitral regurgitation
- Patients with atrial fibrillation should be anticoagulated unless there is a contraindication

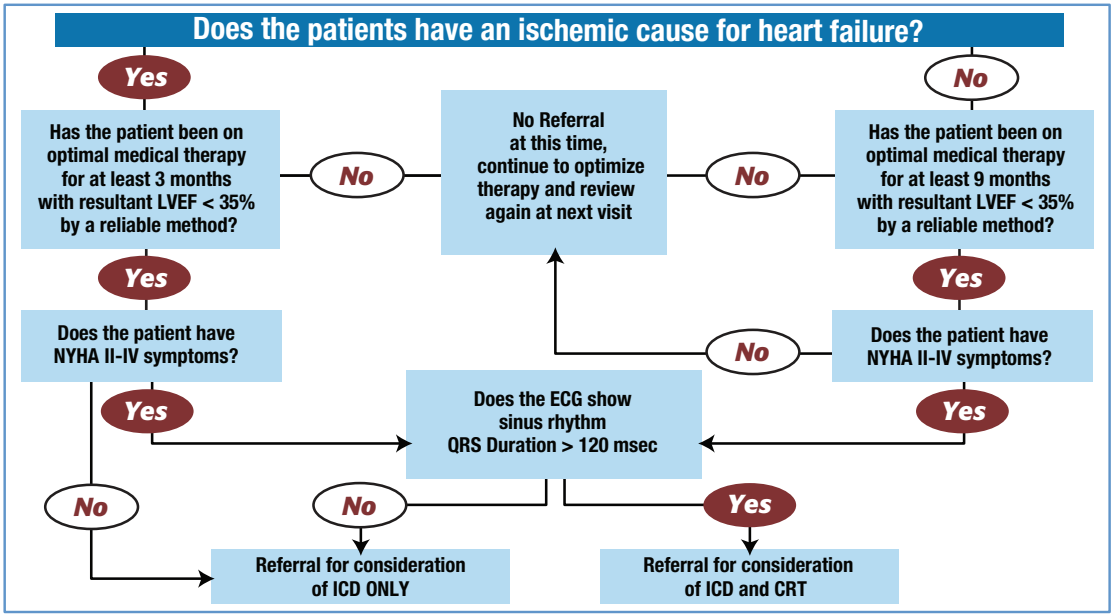
Shortness Of Breath And LVEF >50%

CARDIAC CAUSES	NON-CARDIAC CAUSES

• Heart Failure with Normal Ejection Fraction
• Other Cardiac Entities
  • Coronary artery disease
  • Valvular heart disease
  • Hypertrophic cardiomyopathy
  • Restrictive cardiomyopathy
  • Constrictive pericarditis
  • Intracardiac shunt
	• Lung disease
	• Obesity
	• Deconditioning
	• Anemia
	• Hyperventilation
	• Thyrotoxicosis
	• Pulmonary arterial hypertension
	• Extracardiac shunt

Warning Signs and Symptoms	Lifestyle	Drug and Device Treatment Regimen
• Dyspnea - When flat - During sleep - With less exertion • Fatigue with less exertion • Symptoms at rest • Weight gain > 2 kg in 2 days or 3 kg in 7 days • Lightheaded/faint • Prolonged palpitations • Usual angina pain	• Reduce cardiovascular risk factors - Eliminate added salt, limit to less than 2g per day (1 teaspoon) - Control hypertension - Control Diabetes Mellitus (DM) - Smoking cessation • No need to push oral fluids • Lose weight if significant obesity • Regular physical activity, as tolerated • Weigh daily if fluid retention	• Diuretics, nitrates and digoxin - Improve symptoms • Angiotensin Converting Enzyme Inhibitors /Angiotensin Receptor Blocker, Beta Blocker, spironolactone, epleronone - Improve survival in patients with low LVEF • Combination drug regimen is required • Most require dose adjustments • Most will be used long term • Understand the common side effects • Consider devices with low LVEF or wide QRS

Referral Pathway for Device Therapy in Patients with Chronic Heart Failure



Therapeutic Goals for Patients with ADHF

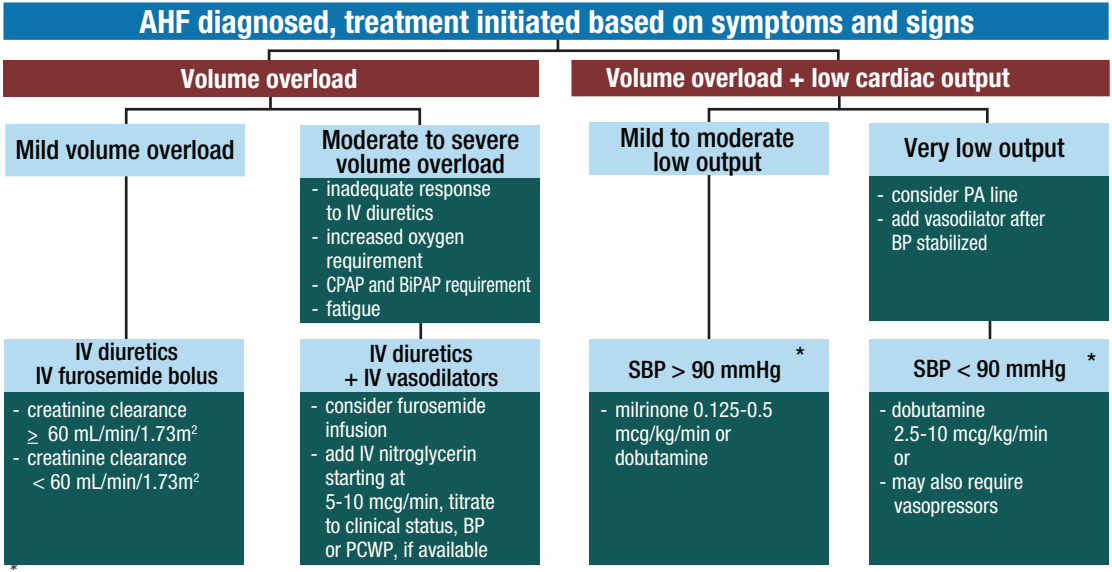
- Understanding the etiology and precipitating factors
- Alleviate presenting symptoms
- Optimize all indicated evidence-based treatment interventions
- Provide patient education
- Establish a transition of care plan and outpatient follow-up

Acute decompensated heart failure standard of care therapies

Drug/ device	First 24hour	During hospitalization	At hospital discharge	Long-term F/U
IV/PO Diuretic	✓	✓	✓	✓
IV Vasodilator	*	*		
IV Inotrope	*	*		
ACEI+	+	✓	✓	
ARB (if ACEI intolerant)	+	+	✓	✓
Aldosterone blocker		+	*	*
Beta Blocker	+	+	✓	✓
Hydralazine/Nitrate				*
Statin		+	*	*
Antiplatelet agents		+	*	*
CRT			*	
ICD			*	
Revascularization/Other				*

✓*indicates all eligible patients; *indicates select indications; +indicates patients on therapy before hospitalization and treatment should be continued in the absence of contraindications. ACEI, Angiotensin-converting enzyme inhibitor; F/U, follow-up; PO, oral.*

Algorithm for Treatment of Acute Heart Failure



* ***Doses may vary.***

NOTE: Refer patients with persistent symptoms of HF or candidates with shock for an opinion by an advanced heart failure team.

Creatinine clearance*	Patient	Initial IV dose†	Maintenance dose
≥ 60 mL/min/1.73m^2	New-onset HF or no maintenance diuretic therapy	Furosemide 20-40 mg 2-3 times daily	Lowest diuretic dose that allows for clinical stability is the ideal dose
	Established HF or chronic oral diuretic therapy	Furosemide bolus equivalent to oral dose	
< 60 mL/min/1.73m^2	New-onset HF or no maintenance diuretic therapy	Furosemide 20-80 mg 2-3 times daily	
	Established HF or chronic oral diuretic therapy	Furosemide bolus equivalent to oral dose	

**Creatinine clearance is calculated from the Cockroft-Gault or Modified Diet in Renal Disease formula. See text for details.*
† Intravenous continuous furosemide at doses of 5 to 20mg/h is also an option.

Practical Tips When Response to Diuretic is Suboptimal

- Reevaluate the need for additional diuresis by assessing volume status
- Restrict NA+/H20 intake (and exercise caution reducing oral intake below 500 ml per 24 hours).
- Review diuretic dosing. Higher bolus doses will be more effective than more frequent lower doses. Diuretic infusions (eg, furosemide 20-40 mg bolus then 5-20 mg/h) can be a useful strategy when other options are not available.
- Add another type of diuretic with different site of action (thiazides, spironolactone). Thiazide diuretics (eg oral metolazone 2.5-5 mg OB/BID or hydrochlorothiazide 25-50 mg) are often given at least 30 minutes before the loop diuretic to enhance diuresis, although this is not required to have an adequate effect.
- Consider hemodynamic assessment and/or positive inotropic agents if clinical evidence of poor perfusion coexists with diuretic resistance.
- Refer for hemodialysis, ultrafiltration, or other renal replacement strategies if diuresis is impeded by renal insufficiency.

Question/query	How to assess	
Have the patients symptoms improved?	• Dyspnea • Overall well-being	• Other symptoms improved (fatigue, orthopnea, paroxysmal nocturnal dyspnea, etc.)
What are the clinical findings compared with baseline?	• Blood pressure • Respiratory rate • Physical examination findings *(especially JVP, S3, rales, lower extremity edema)*	• Heart rate • Oxygen saturation
What are the pertinent laboratory findings?	• Weight and net fluid balance • Creatinine • Potassium • BNP or NT-proBNP	• Hemoglobin • Blood urea nitrogen • Sodium

JVP, Jugular venous pressure. S_3 third heart sound.

Criteria for Discharge

- Presenting symptoms resolved
- Vital signs resolved and stable for > 24 hrs, especially blood pressure & heart rate
- Returned to "dry" weight and stable for > 24 hours
- Inter-current cardiac illness adequately diagnosed and treated
- Inter-current non-cardiac illness adequately diagnosed and treated
- Chronic oral HF Therapy initiated, titrated and optimized (or plan for same)
- Education initiated, understood by patient, continued education planned
- Discharge plan includes clear requirements for labs, office and further testing
- Timely communication to primary care provider and/or specialist physician and/or multi-disciplinary disease management program is essential

Notes

Please visit us at
www.ccsguidelineprograms.ca

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Leadership. Knowledge. Community.