

Congestive Heart Failure

Implementation Tool

WHAT IS CONGESTIVE HEART FAILURE?

Congestive heart failure (CHF) is a term used to describe the heart's inability to pump enough blood to meet the body's needs. Heart failure does not mean that the heart has failed completely, but rather that the heart is not strong enough to meet the body's needs at times of stress or increased activity. The left ventricle normally receives blood from the lungs and pumps blood through the arteries to the brain, internal organs and extremities. When the left ventricle is weak the patient may experience symptoms of low cardiac output: fatigue and dizziness, and symptoms of congestion: shortness of breath on exertion, inability to lay flat and awakening at night-time with shortness of breath. If the CHF becomes severe fluid may leak into the lungs causing "pulmonary edema" and severe respiratory (breathing) difficulties. When the right ventricle fails the patient may also have symptoms of low cardiac output but also experience fluid build-up in the tissues of the body resulting in leg swelling (edema) and congestion of the internal organs.

CAUSES OF CHF

Weakness of the left ventricle can be caused by:

- Longstanding uncontrolled hypertension
- Heart attacks — damage to the heart muscle due to coronary artery disease (blocked arteries)
- Valvular heart disease — longstanding leaking or narrowing of the aortic or mitral valves
- Viral, toxic or metabolic disturbances damaging the heart muscle. Alcohol is the commonest culprit
- Longstanding rapid heart beating (racing) due to some form of arrhythmia
- Congenital abnormalities e.g. ventricular septal defect (a hole between the left and right ventricles)

Weakness of the right ventricle may be caused by:

- Failure of the left ventricle
- High blood pressure within the lungs
- Valvular heart disease — pulmonary valve stenosis (narrowing)/ tricuspid valve leaking
- Right ventricular infarction (heart attack) due to coronary artery disease
- Congenital abnormalities e.g. atrial septal defect (a hole between the left and right atria)
- Disease affecting the sac surrounding the heart (the pericardium) such as fluid accumulation (effusion) or abnormal thickening (constriction)

IS CHF DANGEROUS?

Untreated CHF can lead to severe respiratory difficulties which can be life threatening. Fortunately there are many medications which are effective in treating the symptoms and improving the prognosis of CHF. Lifestyle modifications including proper diet and salt restriction can help reduce or eliminate the symptoms of CHF. It is important for you to recognize the symptoms of heart failure and to alert your physician to any deterioration in your condition. If you act early on, severe heart failure and the need for hospitalization may be avoided.

HEART FAILURE DO'S AND DON'TS

DO:

- Get plenty of rest
- Avoid salt in your diet, at the table and in your canned or processed foods
- Keep as active as you can
- Take all your medicines as directed
- Weigh yourself frequently and keep a weight diary – increasing weight can be an early sign of worsening heart failure
- Report any change in symptoms to your doctor
- Drink alcohol only in moderation or not at all if your doctor directs
- Learn about your condition
- Obtain yearly flu shots
- Control other cardiac risk factors and conditions

DON'T

- Eat a lot of salt (salt leads to fluid retention)
- Drink excessive fluids — in general no more than 6-8 cups of fluid/day
- Smoke
- Drink excessive alcohol
- Skip your medications or adjust them without the direction of your physician
- Take over the counter medications, particularly anti-inflammatory agents, without alerting your physician



DIURETIC 1

Take extra furosemide according to following sliding scale.

Diuretic Dose	Dosing Frequency	Sliding Scale Adjustment
Furosemide 20 mg	AM daily	Extra 20 mg in PM
Furosemide 40 mg	AM daily	Extra 40 mg in PM
Furosemide 80 mg	AM daily	Extra 40 mg in PM. If needed ↑ to extra 80 mg in PM.
Furosemide 20 mg	Twice daily	Extra 20 mg in AM
Furosemide 40 mg	Twice daily	Extra 20 mg in AM
Furosemide 80 mg	Twice daily	Extra 40 mg at noon. If needed ↑ to extra 80 mg at noon.
Cut back to usual diuretic dose as weight, swelling and symptoms permit		

DIURETIC 2

Some times one diuretic medication is insufficient to control fluid overload. A second diuretic is needed. This diuretic is usually taken in low dose and intermittently as required (PRN). Combining diuretics can produce a very potent effect resulting in excess dehydration. Only your physician should make adjustments of these diuretics unless otherwise instructed.

Diuretic Dose	Dosing Frequency	Sliding Scale Adjustment
Hydrochlorothiazide 12.5 mg		
Hydrochlorothiazide 25 mg		
Indapamide 1.25 mg		
Indapamide 2.5 mg		
Indapamide 5 mg		
Metalozone 1.25 mg		
Metalozone 2.5 mg		
Metalozone 5 mg		
Spironolactone 12.5 mg		
Spironolactone 25 mg		
Spironolactone 50 mg		
Dyazide		
Moduret		
Aldactazide 25 mg		

When you are taking several diuretics, it is necessary for your physician to monitor your blood work including sodium, potassium and creatinine (a measure of kidney function). Low blood sodium can lead to confusion and weakness and may require fluid restriction. Low blood potassium may lead to cardiac arrhythmias and may require a potassium replacement diet or a potassium medication. If the serum creatinine rises excessively it may be necessary to reduce your diuretic dose on instruction of your physician. This increase in creatinine does not indicate kidney damage but merely reflects reduced blood flow to the kidney due to over-diuresis. Controlling heart failure is often a balancing act between being too wet and too dry.

GUIDE FOR HEART FAILURE (HF) MANAGEMENT

✓	Approach / Therapy	Recommendations
	Symptoms and signs of HF	Fatigue (low cardiac out-put), SOB, ↑ JVP, rales, S3, edema, radiologic congestion, cardiomegaly. Elevated BNP. CXR to r/o infection, interstitial lung disease and PPH (Primary Pulmonary Hypertension)
	Ejection fraction (echocardiogram, LV gated study, CT angiogram or MRI)	<p>≤ 40% = systolic dysfunction (HFrEF) 40-50% (HFmrEF) = mixed systolic and diastolic dysfunction ≥ 55% (HFpEF) = diastolic dysfunction</p> <p>Treat underlying disorder: HPT / ischaemia / pericardial constriction / restrictive, CM (cardiomyopathy) / infiltrative disorders</p>
	Consider etiology	<p>○ Ischemic-CM ○ HPT-CM ○ Valvular HD-CM (AS/AR/MR) ○ Metabolic: Hyper / hypo thyroidism / hemochromatosis / heochromocytoma ○ Toxins: Alcohol / anthracyclines / cocaine / trastuzumab / amphetamines and other chemotherapy ○ Viral CM ○ Idiopathic Dilated CM</p>
Identify triggers		
	Acute-sudden onset	Ischaemia, arrhythmia, infection, pulmonary embolism, acute valvular pathology, stress (Takosubo CM)
	Chronic-gradual onset	Anemia, thyrotoxicosis, non-compliance, diet, Rx: NSAID, excess β blocker
Treatment		
Correct triggers and precipitants of acute and chronic Heart Failure		
	General measures	<ul style="list-style-type: none"> • Low sodium diet / protein nutrition • Regular exercise / activity • DIC smoking • Control hypertension • Treat and control diabetes • Identify and Rx depression • Treat lipid abnormalities • Tx ischemia: PCI, CABG / Valve Sx
	Symptomatic therapy goals ↓ Symptoms ↑ Quality of Life	<p>Diuretics: titrate to euvolemic state</p> <ul style="list-style-type: none"> • Maintain Ideal Body Weight (dry weight = JVP normal / trace pedal edema) • Furosemide 20 mg - 80 mg OD-BID • HCT / Metalozone for refractory congestion
	Therapy to: <ul style="list-style-type: none"> • Improve prognosis • Prevent progressive LV dysfunction • Reduce hospitalization • Improve functional capacity 	<p>ACE Inhibitors-General Guideline: Start low and titrate to the target dose used in the clinical trials or the MAXIMUM TOLERATED DOSE:</p> <ul style="list-style-type: none"> • Captopril 6.25-50 mg BID-TID • Enalapril 2.5mg-10 mg BID† • Ramipril 2.5 mg-5 mg BID § • Lisinopril 2.5 mg-30-40 mg OD • Trandolapril 1-4 mg OD* • Quinapril 10 mg-40 mg OD* <p>* No large scale HF outcome trials † SoLVD / X-SoLVD § AIRE / AIREX † TRACE Consider ISDN 5-40mg QID+Hydralazine 10-75mg QID for ACE-I / ARB intolerance VHeFT</p>
	ARB's	<p>Angiotensin II receptor antagonists (ARB's)</p> <ul style="list-style-type: none"> • ACE-Inhibitors remain first line therapy • ARB's indicated in ACE-I intolerant patients • (CHARM candesartan 16-32 mg OD) (Val-HeFT / VALIANT valsartan 160 mg BID)
	ARNI 2017 Comprehensive Update of the CCS Guidelines for the Management of Heart Failure Canadian Journal of Cardiology 33 (2017) 1342 -1433	<p> How to initiate ENTRESTO®:</p> <ul style="list-style-type: none"> • ACE I must be discontinued 48 hours before starting ENTRESTO® (skip the weekend ACEi dose – start ENTRESTO® Monday) • Should not be given with any other ARB • Initial dose (start at lowest or middle dose range) <p>DOSE: ENTRESTO® given BID</p> <ol style="list-style-type: none"> 1. Sacubutril 24mg / Valsartan 26 mg 2. Sacubutril 49mg / Valsartan 51 mg 3. Sacubutril 97mg / Valsartan 103 mg <p>Monitor electrolytes / Cr 1 week Monitor BP BNP will go up. Monitor NTproBNP</p>

GUIDE FOR HEART FAILURE (HF) MANAGEMENT

✓	Approach / Therapy	Recommendations
	PARADIGM Shift <ul style="list-style-type: none"> Consider simultaneous parallel initiation of low-dose ARNI / ACEi / ARB, β-blocker, MRA, SGLT2 inhibitor Up-titrate RAAS blocker and β-blocker gradually (over weeks) as HR, BP and symptoms allow Down-titrate Rx or reduce diuretics for hypotension / low CO symptoms 	Sacubitril / Valsartan (ENTRESTO®) PARADIGM Criteria: <ul style="list-style-type: none"> NYHA II/III EF < 35% SBP > 100 GFR > 30 Serum K < 5.2 On maximally tolerated doses of beta blocker and MRA On maximally tolerated doses of ACE I or ARB (ENTRESTO®) Contraindications: <ul style="list-style-type: none"> Concomitant use of ACEi / ARB History of ACE angioedema GFR < 30 mL / min / 1.73m² Serum K > 5.4 mmol/L Symptomatic hypotension Pregnancy Liver disease (Child C)
	Beta Blockers Limit β blocker dose in the elderly: Bisoprolol 5 mg daily (CIBIS-ELD) Carvedilol 12.5 mg BID (COLA II) 	General Guidelines: Add Beta-blocker* to RAAS blocker / diuretic / +/- digoxin in stable Class II-IV CHF / LVEF < 40% (*No outcome data for other beta-blockers) <ul style="list-style-type: none"> Bisoprolol* 1.25 → +10 mg OD (CIBIS II Trial) Carvedilol* 3.125 mg BID → + 25 mg BID (50 mg BID if weight > 85 kg) Metoprolol* 12.5 mg BID → + 75 mg BID (MERIT Trial)
	Aldosterone antagonists Caution: Diabetics / renal disease / elderly / NSAIDs and COX-2 inhibitors 	<ul style="list-style-type: none"> Spironolactone 12.5-25 mg OD added to ACE-inhibitor /diuretic / + / digoxin in stable Class III-IV CHF / LVEF \leq 35% / CR < 220 / K < 5.0 (RALES Trial) Epleronone 25-50 mg OD in post MI HF (heart failure) with LVEF \leq 40% (EPHESUS Trial) or 25 mg every 2nd day to 50 mg daily depending on GFR) in Class II HF with LVEF \leq 35% (EMPHASIS Trial). Follow K / Cr in 3-7 days / \downarrow furosemide to avoid azotemia)
	DIG Trial: 6% \downarrow in all cause hospitalization and 8% \downarrow in HF hospitalization. With Dig level < 0.9 ng/mL – \downarrow 23% in all cause mortality, \downarrow 37% in HF mortality and \downarrow 38% in HF hospitalization	Digoxin for persisting symptoms in NSR (systolic dysfunction) or symptoms and rate control in AFib. Dose: 0.125 mg - 0.25 mg Digoxin used as foundation therapy in major HF Trials (SOLVD 68% on Digoxin; US Carvedilol 90% on digoxin; RALES 72% on Digoxin.) Use ClinCalc.com Digoxin Calculator to predict Digoxin level: https://clincalc.com/Digoxin/
	Ivabradine 2017 Comprehensive Update of the CCS Guidelines for the Management of Heart Failure Canadian Journal of Cardiology 33 (2017) 1342 -1433	Ivabradine 5.0-7.5 mg BID <ul style="list-style-type: none"> Ivabradine be considered in patients with HF_{rEF}, who remain symptomatic despite treatment with appropriate doses of GDMT, with a resting heart rate > 70 beats per minute (bpm), in sinus rhythm, and a previous HF hospitalization within 12 months, for the prevention of cardiovascular death and HF hospitalization. (Strong Recommendation; Moderate-Quality Evidence).
	SGLT2 inhibitors 2020 CCS / CHFS Heart Failure Guidelines - Clinical Trial Update <ul style="list-style-type: none"> SGLT2 Inhibitors ARNI in HF_{rEF} Canadian Journal of Cardiology 36 (2020) 159 -169 	Dapagliflozin 10 mg daily, Empagliflozin 10 mg daily, Canagliflozin 100 or 300 mg daily <ul style="list-style-type: none"> SGLT2 inhibitors, such as empagliflozin, canagliflozin or dapagliflozin, be used for treatment of patients with type 2 diabetes and atherosclerotic cardiovascular disease to reduce the risk of HF hospitalization and death. (Strong Recommendation, High-Quality Evidence). SGLT2 inhibitors, such as dapagliflozin be used in patients with type 2 diabetes aged > 50 years with additional risk factors for atherosclerotic cardiovascular disease to reduce the risk of HHF. (Strong Recommendation, High-Quality Evidence). SGLT2 inhibitors, such as dapagliflozin be used in patients with mild to moderate HF due to reduced LVEF \leq 40%) and concomitant type 2 diabetes, to improve symptoms and quality of life and to reduce the risk of hospitalization and cardiovascular mortality (Strong Recommendation, High-Quality Evidence). SGLT2 inhibitors, such as dapagliflozin be used in patients with mild to moderate HF due to reduced LVEF (\leq 40%) and without concomitant diabetes, to improve symptoms and quality of life and to reduce the risk of hospitalization and cardiovascular mortality (Conditional Recommendation, High-Quality Evidence).
	Anti-coagulant anti-platelet therapy	ASA if CAD (\downarrow dose to \downarrow ACE inhibitor interaction) Coumadin or NOAC for Afib, LV thrombus, \downarrow LVEF \leq 20%, DVT or pulmonary embolism Duration of A/C therapy: Indefinite for Afib /recurring systemic TE or DVT / PE

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Consider Internal Medicine / Cardiology or Heart Failure Clinic referral for initiation / titration of β -blocker. Consider EPS referral for symptomatic sustained or non-sustained ventricular arrhythmia (LVEF 30-40%) or AICD: Prior MI/CAD (LVEF \leq 30% with IVCD \geq 0.12 sec: MADIT II} CHF: (NYHA 11-111 & LVEF < 35% SCD-HeFT) Cardiac Resynchronization Therapy(CRT):(NYHA Class III-IV with reduced ejection fractions; LVEF < 35%; QRS duration \geq 0.13 seconds with LBBB or \geq 0.15 seconds with non-LBBB: MIRACLE / MUSTIC} or both CRT/AICD: (NYHA 111-IV; QRS \geq 0.12:COMPANION). LVAD / Transplant for refractory CHF.

See also How to use a Beta Blocker: www.cvtoolbox.com/downloads/chf/How_to_Use_Beta_Blocker.pdf

GUIDELINES

Canadian Cardiovascular Society: www.ccs.ca/en/guidelines/guidelines-library

ACC/AHA: www.acc.org/guidelines

European Society of Cardiology: www.escardio.org/Guidelines

HEART FAILURE FLOWSHEET

RX	Date ✓						
Weight Kg./lbs.							
NYHA Class ¹							
Subjective Symptoms B,W,NC ²							
HR							
BP (S/D)							
↑ JVP (Y/N) ³							
S3 (Y/N) ³							
Rales (Y/N)							
Edema (Y/N)							
ECG							
CXR (Y/N) Congestion							
K+ (potassium)							
Creatinine							
Digoxin level							
BNP <100 pg / mL							
ACE-i agent / dose							
ARB agent / dose							
ARNI (ENTRESTO®) dose							
β -blocker agent / dose							
Aldactone / Epleronone							
Digoxin dose: Target level: < 0.9 ng/mL (ideally 0.5-0.7)							
Ivabradine dose							
SGLT2 inhibitor agent/dose							
Diuretic ¹ agent / dose							
Diuretic ² agent / dose							
Nitrate agent / dose							
Hydralazine dose							

¹ Class I: No symptoms with ordinary activity / Class II: Symptoms with ordinary activity / Class III: Symptoms with less than ordinary activity / Class IV: Symptoms at rest

² B = better, W = worse, NC = no change

³ Y = present, N = absent