

DIAGNOSTIC RECOMMENDATIONS**History**

Ask about the presence of:

- ★ reduced exercise tolerance;
- ★ shortness of breath: dyspnoea with exertion or at rest, orthopnoea, paroxysmal nocturnal dyspnoea;
- ★ fatigue;
- ★ possible causes or triggers of heart failure: symptoms of angina, rhythm or conduction disturbances; use of negative inotropic drugs, NSAIDs, corticosteroids or thiazolidinediones.

Physical examination

- ★ general: nutritional state, body weight;
- ★ heart rate: frequency (tachycardia or bradycardia?), rhythm (regular or irregular?), quality;
- ★ blood pressure: systolic, diastolic, pulse pressure;
- ★ elevated central venous pressure, peripheral oedema, hepatomegaly, ascites, pulmonary crepitations, muffled sounds over lower lung fields consistent with pleural effusion;
- ★ respiration frequency (tachypnoea?);
- ★ heart: apex beat palpable outside the mid-clavicular line in supine position, or laterally displaced when lying on left side, third heart sound (gallop rhythm), cardiac murmurs indicative of valve abnormalities.

Additional investigations for the presence of heart failure

If heart failure is suspected, record an ECG and determine the (NT-pro)BNP. Further investigation is indicated in the event of an abnormal ECG or elevated (NT-pro)BNP value, in the form of additional laboratory tests, echocardiography and possibly a chest X-ray. The cut-off limits for (NT-pro)BNP differ for acute heart failure (NT-proBNP ≥ 400 pg/mL; BNP ≥ 100 pg/mL) and gradual onset heart failure (NT-proBNP ≥ 125 pg/mL; BNP ≥ 35 pg/mL).

Further diagnostic tests to determine the cause, severity and prognosis

- ★ laboratory tests: CRP, leukocytes with differentiation, Hb, Ht, glucose, sodium, potassium, creatinine and calculated clearance, ALAT, ASAT and gamma-GT, TSH and lipid profile;
- ★ ECG (if not performed yet);
- ★ chest X-ray;
- ★ echocardiography;
- ★ other (exercise ECG or coronary angiography if an ischaemic cause is suspected; spirometry to confirm or rule out asthma/COPD).

Evaluation

- ★ The diagnosis of heart failure is confirmed if the patient has signs and symptoms consistent with heart failure and ultrasound reveals an LVEF $< 45\%$ (*systolic heart failure*) or diastolic dysfunction and conserved LVEF $\geq 45\%$ (*diastolic heart failure*).
- ★ A normal ECG in combination with a normal (NT-pro)BNP makes the diagnosis of heart failure very unlikely.
- ★ If the diagnosis of heart failure cannot be ruled out by an ECG and (NT-pro)BNP, echocardiography should always be performed as a further diagnostic test and to determine the cause of heart failure.

THERAPEUTIC RECOMMENDATIONS**Education and lifestyle interventions**

- ★ Avoid the use of NSAIDs as much as possible.
- ★ Advise daily weighing.
- ★ Give the patient instructions about flexible diuretic therapy.
- ★ Advise in favour of sodium restriction.
- ★ Consider restricting fluids to 1.5 or 2 litres per day in patients with severe heart failure.
- ★ Consider weight reduction in patients with obesity (BMI > 30 kg/m²).
- ★ Advise in favour of the annual influenza vaccination.
- ★ Advise smoking cessation and recommend limiting the consumption of alcohol to 1 or 2 units per day.
- ★ Recommend fitness training for all patients with stable chronic heart failure.
- ★ Advise against a stay at high altitude or in very warm areas for patients with symptoms.
- ★ Patients with NYHA class IV are not fit to drive a vehicle.

Drug treatment

- ★ For a heart failure patient in NYHA class II-IV, start with both a diuretic and an ACE inhibitor and titrate the dose until the patient is clinically stable (no obvious clinical signs of overfilling).
- ★ For clinically stable patients, always add a beta-blocker and titrate the dose of the ACE inhibitor and the beta-blocker gradually towards the target dose or the maximum tolerated dose.
- ★ All patients with systolic heart failure should receive the abovementioned treatment, unless there are contra-indications.
- ★ Add an aldosterone antagonist for patients who continue to experience severe symptoms (NYHA class III-IV) despite adequate adjustment of an ACE inhibitor, diuretic and beta-blocker.
or:
Prescribe an All antagonist as an alternative to an aldosterone antagonist.
- ★ Consider adding digoxin for patients with atrial fibrillation if the ventricular frequency remains > 80 bpm in rest or > 110-120 bpm with exertion despite a beta-blocker.
Consider adding digoxin for patients with sinus rhythm whose symptoms persist despite treatment with an ACE inhibitor, diuretic, beta-blocker and aldosterone antagonist or All antagonist.

Dosage of heart failure medication (initial dose/target dose)

- ★ *ACE inhibitors*: captopril 6.25 mg 3 times a day/50-100 mg 3 times a day; enalapril 2.5 mg 2 times a day/10-20 mg 2 times a day; lisinopril 2.5-5 mg once a day/20-35 mg once a day; ramipril 2.5 mg once a day/5 mg 2 times a day; trandolapril 0.5 mg once a day/4 mg once a day.
- ★ *Diuretics*: furosemide 20-40 mg/40-240 mg; bumetanide 0.5-1.0 mg/1-5 mg; hydrochlorothiazide 25 mg/12.5-100 mg; chlorthalidone 25 mg/12.5-50 mg.
- ★ *Beta-blockers*: bisoprolol 1.25 mg once a day/10 mg once a day; carvedilol 3.125 mg 2 times a day/25-50 mg 2 times a day; metoprolol succinate with delayed release 12.5/25 mg once a day/200 mg once a day; nebivolol 1.25 mg once a day/10 mg once a day.
- ★ *Aldosterone antagonists*: spironolactone 25 mg once a day/25 mg (up to 50 mg once a day for progressive heart failure); eplerenone 25 mg once a day/50 mg once a day.
- ★ *All antagonists*: candesartan 4 or 8 mg once a day/32 mg once a day; valsartan 40 mg 2 times a day/160 mg 2 times a day.

Follow-up

- ★ Check renal function and serum electrolytes at the start of the treatment and 1-2 weeks after the start of the treatment. Renal function and serum electrolytes must be checked at 1, 2, 3 and 6 months after reaching the maintenance dose and every 6 months thereafter. Extra checks of serum potassium if the clearance is 10-50 mL/min. and with use of an aldosterone antagonist.
- ★ Determine blood pressure, heart rate and weight.
- ★ Check stable patients once every 3 months.
- ★ These checks should focus on the patient's exertion capacity and should check for any side effects of the medication.
- ★ If symptoms increase, focus on exacerbating factors such as infections, use of NSAIDs, extra salt or incorrectly applied treatment.

Consultation and referral

- ★ if there is any doubt about the diagnosis of heart failure;
- ★ for performing and interpretation of echocardiography;
- ★ in the event of inadequate improvement on set drug treatment or in the event of sudden deterioration;
- ★ for heart failure as a result of abnormalities that could possibly be corrected;
- ★ in the event of suspected recent myocardial infarction;
- ★ if PCI or CABG is a treatment option for angina pectoris and/or ST-T deviations on the ECG that are consistent with ischaemia;
- ★ for relatively young patients;
- ★ with suspected cardiomyopathy;
- ★ in the case of systolic heart failure where the ejection fraction is < 35 %, in patients whose symptoms persist despite optimum treatment with three medicines (diuretics, ACE inhibitors and beta blockers), to evaluate whether an ICD is an option;
- ★ in the case of systolic heart failure in patients whose symptoms persist despite optimum treatment with four medicines (diuretics, ACE inhibitors and beta blockers and aldosterone antagonists or AII antagonists) and a widened QRS complex (> 120 msec), to evaluate whether cardiac resynchronisation therapy (CRT) is an option.

ACUTE HEART FAILURE**Background**

Acute heart failure is associated with a rapid onset or rapid increase in symptoms. Causes include: ischaemia (including an acute myocardial infarction), cardiac arrhythmias, valve dysfunction, pericardial conditions, increased filling pressures or increased peripheral resistance.

DIAGNOSTIC RECOMMENDATIONS**Physical examination**

- ★ general impression and evaluation of the peripheral circulation and skin temperature;
- ★ heart rate: usually tachycardic and “thready” due to (nor)adrenalin;
- ★ blood pressure: low blood pressure is the most threatening;
- ★ auscultation of the heart: murmurs and a third or fourth heart sound;
- ★ auscultation of the lungs: bilateral basal crepitations, rhonchi and pulmonary wheezing. Muffling and barely audible or absent breath sounds basally (consistent with pleural effusion) can also be present, particularly with an acute exacerbation of chronic heart failure;
- ★ central venous pressure is elevated.

THERAPEUTIC RECOMMENDATIONS**Drug treatment**

- ★ *Loop diuretics*: for moderate fluid retention give furosemide 20-40 mg or bumetanide 0.5-1 mg oral or i.v.; for severe fluid retention give furosemide up to 100 mg i.v. or bumetanide up to 4 mg oral or i.v.
- ★ *Vasodilators*: in the absence of symptomatic hypotension, a systolic blood pressure < 90 mmHg or severe obstructive valve conditions. Sub-lingual administration can be effective in the home situation. Administer 0.8-1.6 mg nitroglycerin every three minutes until the symptoms have improved sufficiently or the blood pressure drops to < 90 mmHg.
- ★ *Oxygen*: is recommended for hypoxemic patients. Administer 5-20 L/min. and aim for an oxygen saturation > 95 % (> 90 % in COPD patients). Caution is advised in patients with severe COPD as this can result in hypercapnea and 2 L/min. should be administered.
- ★ *Morphine*: can be administered for agitation, dyspnoea, anxiety or chest pains. Administration of 2.5 – 5 mg i.v. can be repeated as often as necessary. Caution is advised in patients with hypotension, bradycardia, second or third degree AV block or CO₂ retention.

Referral

The patient is referred if treatment does not provide adequate results, in the event of inadequate care options or if a myocardial infarction is suspected as the cause or another (invasively) treatable cause of acute heart failure is suspected.