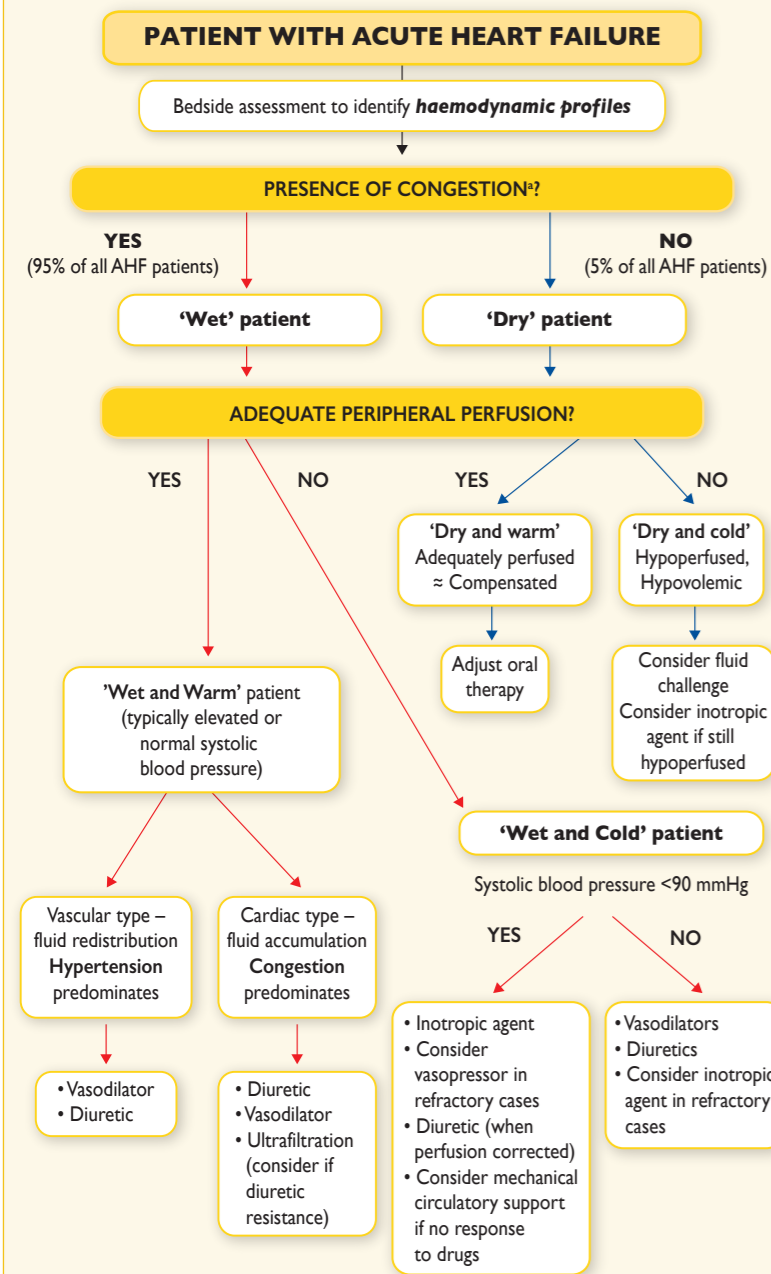


Management of patients with acute heart failure based on clinical profile during an early phase



³Symptoms/signs of congestion: orthopnoea, paroxysmal nocturnal dyspnoea, breathlessness, bi-basilar rales, an abnormal blood pressure response to the Valsalva maneuver (left-sided); symptoms of gut congestion, jugular venous distension, hepatojugular reflux, hepatomegaly, ascites, and peripheral oedema (right-sided).

An ICD implantation is indicated in HF patients who either have recovered from a ventricular arrhythmia causing haemodynamic instability or in those with symptomatic HF, LVEF $\leq 35\%$ (despite at least 3 months of OMT), provided they are expected to survive substantially longer than 1 year with good functional status, in order to reduce the risk of sudden death and all-cause mortality. ICD implantation is not recommended within 40 days of an MI as implantation at this time does not improve prognosis.

Cardiac resynchronization therapy is indicated in symptomatic patients with HF, LVEF $\leq 35\%$ (despite at least 3 months of OMT), in sinus rhythm with a QRS duration ≥ 130 msec and LBBB QRS morphology, in order to improve symptoms and reduce morbidity and mortality. CRT is contra-indicated in patients with a QRS duration < 130 msec.

Patients potentially eligible for implantation of a left ventricular assist device

Patients with > 2 months of severe symptoms despite optimal medical and device therapy and more than one of the following:

- LVEF $< 25\%$ and, if measured, peak $\text{VO}_2 < 12$ mL/kg/min.
- ≥ 3 HF hospitalizations in previous 12 months without an obvious precipitating cause.
- Dependence on i.v. inotropic therapy.
- Progressive end-organ dysfunction (worsening renal and/or hepatic function) due to reduced perfusion and not to inadequate ventricular filling pressure (PCWP ≥ 20 mmHg and SBP $\leq 80-90$ mmHg or CI ≤ 2 L/min/m²).
- Absence of severe right ventricular dysfunction together with severe tricuspid regurgitation.

Characteristics and components of management programmes for patients with heart failure

Characteristics	Should employ a multidisciplinary approach (cardiologists, primary care physicians, nurses, pharmacists, physiotherapists, dieticians, social workers, surgeons, psychologists, etc.).
	Should target high-risk symptomatic patients.
	Should include competent and professionally educated staff.
Components	Optimized medical and device management.
	Adequate patient education, with special emphasis on adherence and self-care.
	Patient involvement in symptom monitoring and flexible diuretic use.
	Follow-up after discharge (regular clinic and/or home-based visits; possibly telephone support or remote monitoring).
	Increased access to healthcare (through in-person follow-up and by telephone contact; possibly through remote monitoring).
	Facilitated access to care during episodes of decompensation.
	Assessment of (and appropriate intervention in response to) an unexplained change in weight, nutritional status, functional status, quality of life, or laboratory findings.
	Access to advanced treatment options.
	Provision of psychosocial support to patients and family and/or caregivers.

Key components of palliative care service in patients with heart failure

- Focus on improving or maintaining the quality of life of a patient and his/her family as well as possible until he/she dies.
- Frequent assessment of symptoms (including dyspnoea and pain) resulting from advanced heart failure and other co-morbidities and focus on symptom relief.
- Access for the patient and his/her family to psychological support and spiritual care according to need.
- Advanced care planning, taking account of preferences for place of death and resuscitation (which may include deactivating devices, such as pacemaker and/or implantable cardioverter defibrillator).

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References: Adapted from the 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure (European Heart Journal 2016;37:2019-200).

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Heart Failure is a clinical syndrome characterized by typical symptoms (e.g. breathlessness, ankle swelling and fatigue) that may be accompanied by signs (e.g. elevated jugular venous pressure, pulmonary crackles and peripheral oedema) caused by a structural and/or functional cardiac abnormality, resulting in a reduced cardiac output and/ or elevated intracardiac pressures at rest or during stress.

The current definition of HF restricts itself to stages at which clinical symptoms are apparent. Before clinical symptoms become apparent, patients can present with asymptomatic structural or functional cardiac abnormalities [systolic or diastolic left ventricular (LV) dysfunction], which are precursors of HF. Recognition of these precursors is important because they are related to poor outcomes, and starting treatment at the precursor stage may reduce mortality in patients with asymptomatic systolic LV dysfunction.

Demonstration of an underlying cardiac cause is central to the diagnosis of HF. This is usually a myocardial abnormality causing systolic and/or diastolic ventricular dysfunction. However, abnormalities of the valves, pericardium, endocardium, heart rhythm and conduction can also cause HF (and more than one abnormality is often present). Identification of the underlying cardiac problem is crucial for therapeutic reasons, as the precise pathology determines the specific treatment used (e.g. valve repair or replacement for valvular disease, specific pharmacological therapy for HF with reduced EF, reduction of heart rate in tachycardiomyopathy, etc).

Definition of heart failure with preserved (HFpEF), mid-range (HFmrEF) and reduced ejection fraction (HFrEF)

Type of HF		HFrEF	HFmrEF	HFpEF
CRITERIA	1	Symptoms ± Signs ^a	Symptoms ± Signs ^a	Symptoms ± Signs ^a
	2	LVEF <40%	LVEF 40–49%	LVEF ≥50%
	3		1. Elevated levels of natriuretic peptides ^b ; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction ^c .	1. Elevated levels of natriuretic peptides ^b ; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction ^c .

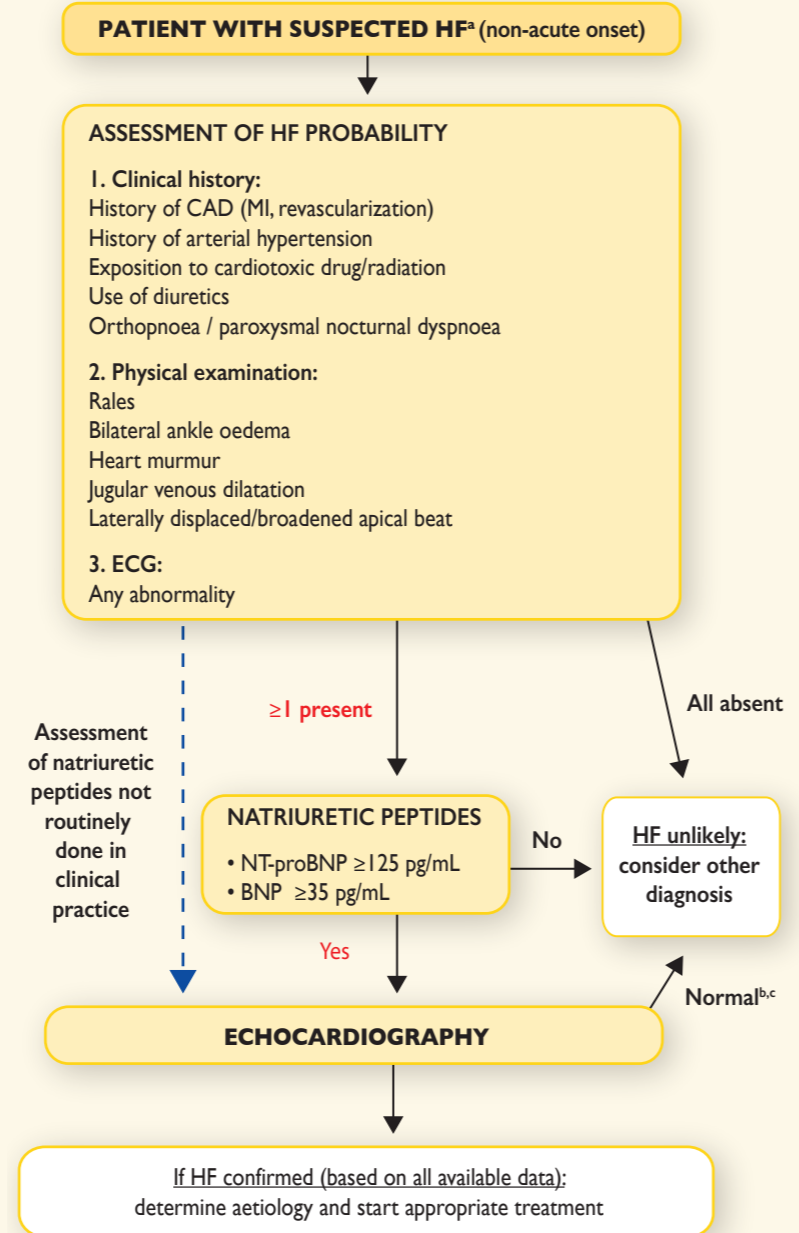
BNP = B-type natriuretic peptide; HF = heart failure; HFmrEF = heart failure with mid-range ejection fraction; HFpEF = heart failure with preserved ejection fraction; HFrEF = heart failure with reduced ejection fraction; LAE = left atrial enlargement; LVEF = left ventricular ejection fraction; LVH = left ventricular hypertrophy; NT-proBNP = N-terminal pro-B type natriuretic peptide.

^aSigns may not be present in the early stages of HF (especially in HFpEF) and in patients treated with diuretics.

^bBNP >35 pg/ml and/or NT-proBNP >125 pg/ml.

^cFor details see Section 4.3.2 in the main document (2016 ESC Guidelines for the diagnosis and treatment of acute & chronic heart failure (European Heart Journal 2016;37:2019-200)).

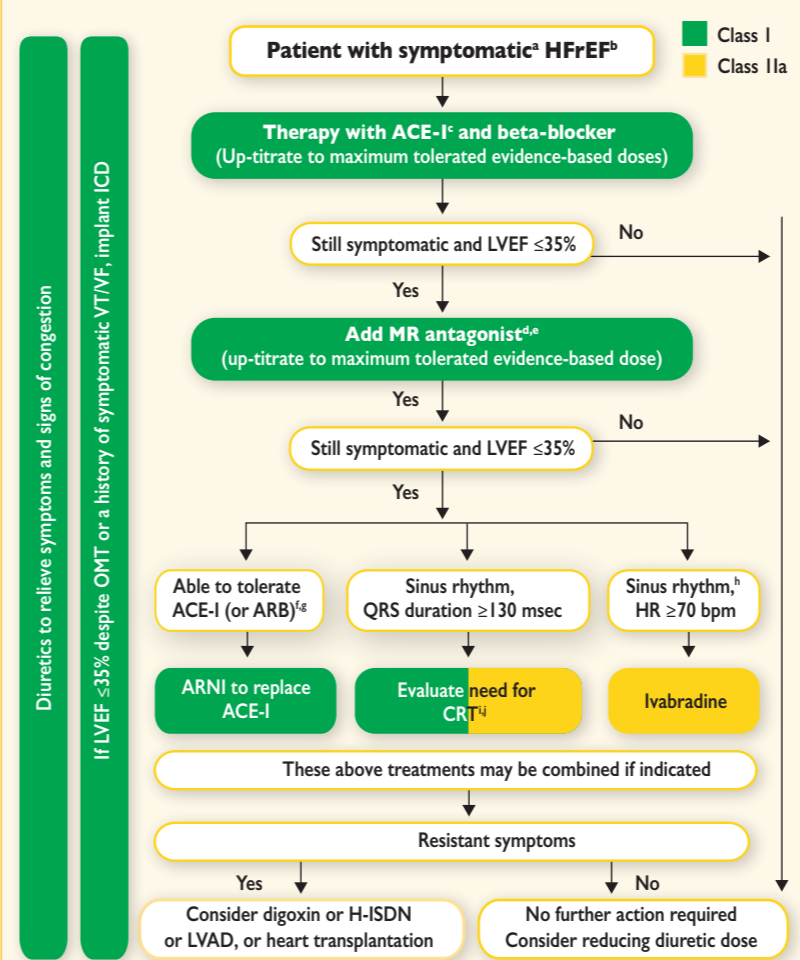
Diagnostic algorithm for a diagnosis of heart failure of non-acute onset



BNP = B-type natriuretic peptide; CAD = coronary artery disease; HF = heart failure; MI = myocardial infarction; NT-proBNP = N-terminal pro-B type natriuretic peptide. ^aPatient reporting symptoms typical of HF (see Table 1).

^bNormal ventricular and atrial volumes and function. ^cConsider other causes of elevated natriuretic peptides.

Therapeutic algorithm for a patient with symptomatic heart failure with reduced ejection fraction



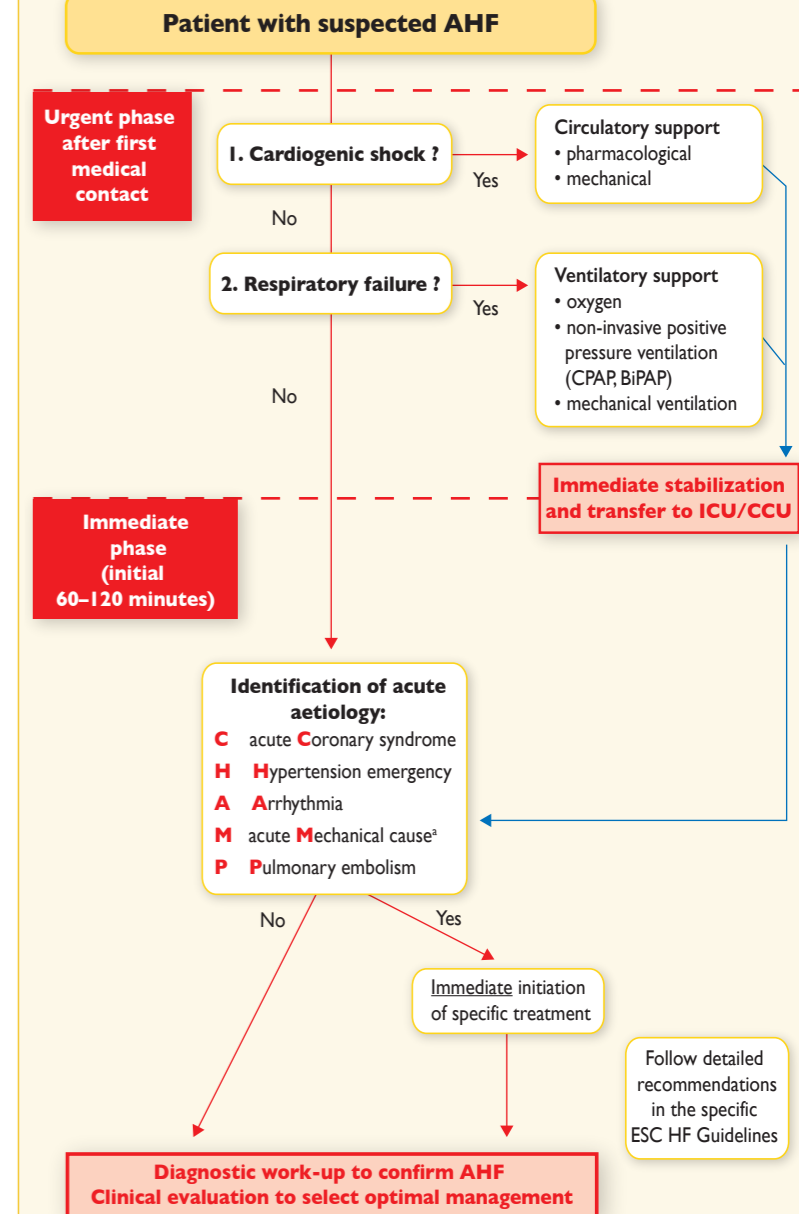
Green indicates a class I recommendation; yellow indicates a class IIa recommendation. ACE-I = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; ARNI = angiotensin receptor neprilysin inhibitor; BNP = B-type natriuretic peptide; CRT = cardiac resynchronization therapy; HF = heart failure; HFrEF = heart failure with reduced ejection fraction; H-ISDN = hydralazine and isosorbide dinitrate; HR = heart rate; ICD = implantable cardioverter defibrillator; LBBB = left bundle branch block; LVAD = left ventricular assist device; LVEF = left ventricular ejection fraction; MR = mineralocorticoid receptor; NT-proBNP = N-terminal pro-B type natriuretic peptide; NYHA = New York Heart Association; OMT = optimal medical therapy; VT = ventricular tachycardia.

^aSymptomatic = NYHA Class II-IV. ^bHFrEF = LVEF <40%. ^cIf ACE inhibitor not tolerated/contraindicated, use ARB. ^dIf MR antagonist not tolerated/contraindicated, use ARB. ^eWith a hospital admission for HF within the last 6 months or with elevated natriuretic peptides (BNP >250 pg/ml or NT-proBNP >500 pg/ml in men and 750 pg/ml in women).

^fWith an elevated plasma natriuretic peptide level (BNP ≥150 pg/mL or plasma NT-proBNP ≥600 pg/mL, or if HF hospitalization within recent 12 months plasma BNP ≥100 pg/mL or plasma NT-proBNP ≥400 pg/mL). ^gIn doses equivalent to enalapril 10 mg b.i.d. ^hWith a hospital admission for HF within the previous year. ⁱCRT is recommended if QRS ≥130 msec and LBBB (in sinus rhythm). ^jCRT should/may be considered if QRS ≥130 msec with non-LBBB (in a sinus rhythm) or for patients in AF provided a strategy to ensure bi-ventricular capture in place (individualized decision).

For further details, see Sections 7 and 8 and corresponding web pages in the main document.

Initial management of a patient with acute heart failure



ACS = acute coronary syndrome; AHF = acute heart failure; Bi-PAP = bilevel positive airway pressure; CCU = coronary care unit; CPAP = continuous positive airway pressure; ESC = European Society of Cardiology; ICU = intensive care unit.

^aAcute mechanical cause: myocardial rupture complicating acute coronary syndrome (free wall rupture, ventricular septal defect, acute mitral regurgitation), chest trauma or cardiac intervention, acute native or prosthetic valve incompetence secondary to endocarditis, aortic dissection or thrombosis.