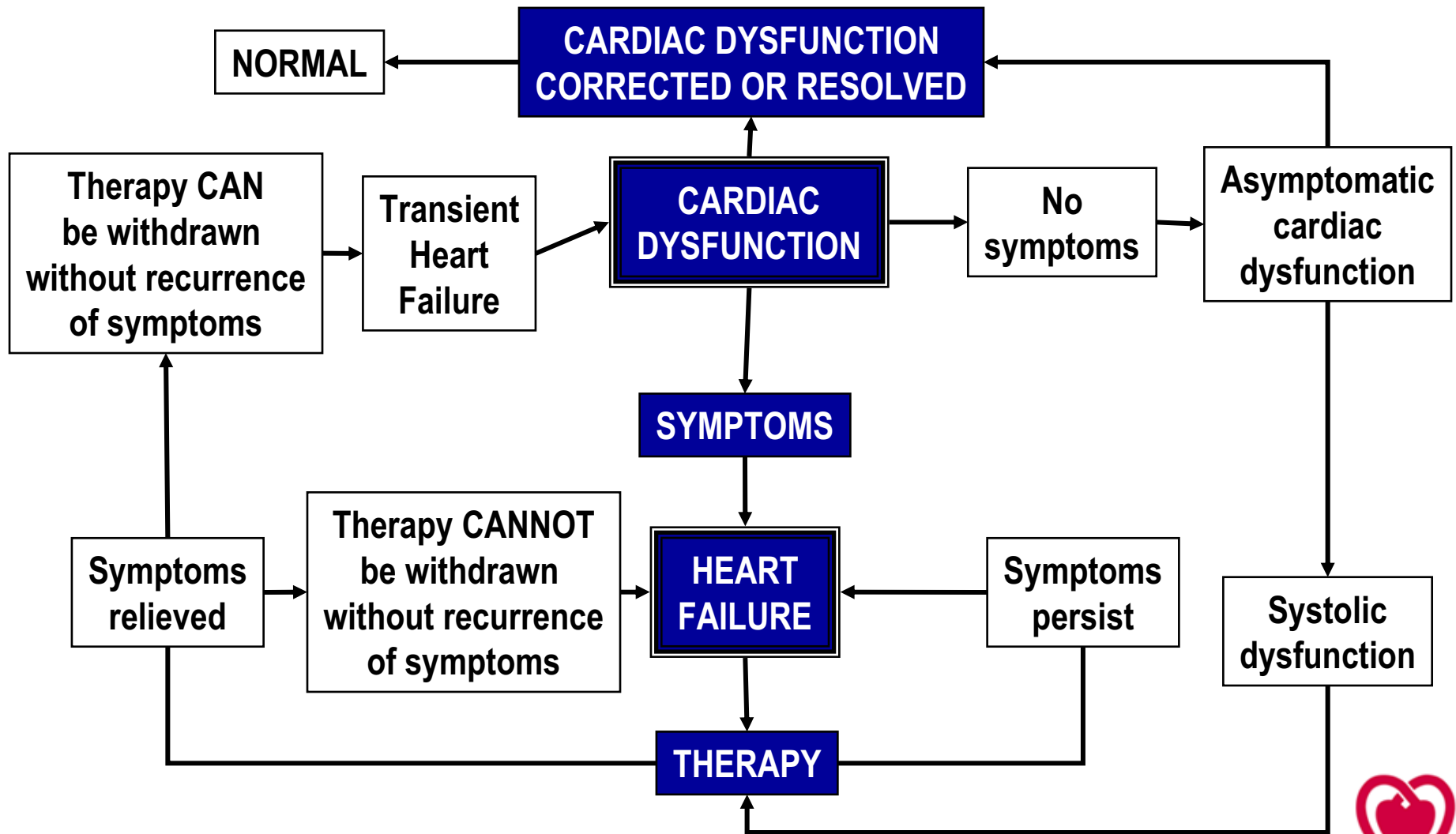


# Relationship between cardiac dysfunction, HF and HF rendered asymptomatic



# Diagnosis

- According to the Working Group in Heart Failure, Heart Failure is a syndrome where the diagnosis has the following essential components:
- A combination of:
  - Symptoms, typically breathlessness or fatigue
  - Cardiac dysfunction documented at rest
- The diagnosis is supported by:
  - Response to treatment directed towards heart failure

## Establish diagnosis

### Assessments in all cases

	Necessary	Supports	Opposes
• History with symptoms	+++		If absent
• Objective evidence	+++		If absent
• Response to treatment		++	

## Tests for Diagnosis

Test	Necessary	Supports	Opposes
• Electrocardiogram	++		If normal
• Echocardiography	+++		If normal
• Chest x-ray		If congestion	If normal
• Blood count		If normal	
• Blood chemistry		If normal	

## Additional Tests for Diagnosis

### Test

Necessary

Supports

Opposes

Exercise test

If normal

Natriuretic peptide

If elevated

If normal

Cardiac cath.

If normal

## Test to Exclude Alternatives

- Chest x-ray (Lung disease)
- Pulmonary function
- Blood chemistry (Renal and hepatic disease)
- Blood count (Anaemia)
- Exercise tolerance (if impaired)

# Electrocardiography

- A normal ECG suggests that the diagnosis of heart failure should be carefully reviewed.
- The predictive value of a normal ECG to exclude LV systolic dysfunction exceeds 90%

## Chest X-ray

- A high predictive value of X-ray findings is only achieved by interpreting them in the context of clinical findings and ECG anomalies.
- It is useful to detect cardiac enlargement and pulmonary congestion
- In chronic heart failure, increased cardiac size and pulmonary venous congestion are useful indicators of abnormal cardiac function with decreased ejection fraction and/or increased LV filling pressure
- However, cardiomegaly is frequently absent in acute heart failure and in cases with diastolic dysfunction



## Pulmonary function tests

- Measurements of lung function are of little value in diagnosing chronic heart failure.
- However, they are useful in excluding respiratory causes of breathlessness

# Exercise testing

- In clinical practice exercise testing is of limited value for the diagnosis of heart failure.
- However, a normal maximal exercise test, in a patient not receiving heart failure treatment, excludes heart failure as a diagnosis

## Invasive investigation

- Invasive investigation is generally not required to establish the presence of chronic heart failure, but may be important in elucidating the cause or to obtain prognostic information

# Echocardiography

- As objective evidence of cardiac dysfunction at rest is mandatory for the diagnosis of heart failure, echocardiography is the preferred method for this documentation
- The most important parameter for identifying patients with systolic cardiac dysfunction and those with preserved systolic function is the LV ejection fraction
- When the diagnosis of heart failure is confirmed, echocardiography is also helpful in determining its aetiology

# Natriuretic Peptides

- These peptides may be most useful clinically as a “rule out” test due to a consistent and very high negative predictive values
- Especially in primary care patients suspected of having heart failure can be selected for further investigation by echocardiography or other tests of cardiac function on the basis of having an elevated plasma concentration of a natriuretic peptide
- In those in whom the concentrations are normal, other causes of dyspnoea and associated symptoms should be considered
- The added value of natriuretic peptides in this situation has yet to be determined

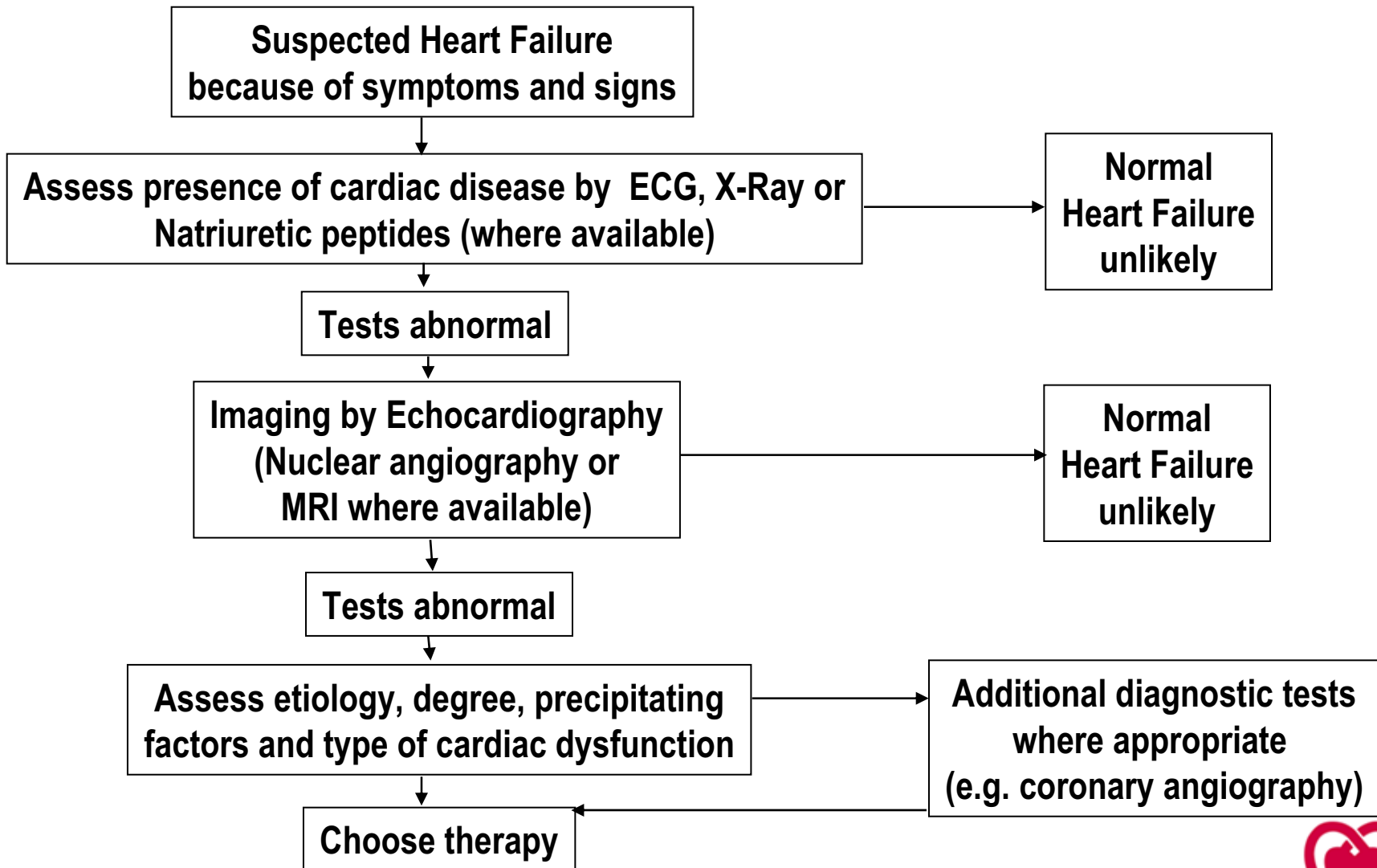
# Natriuretic Peptides

- High levels of natriuretic peptides identify those at greatest risk of future serious cardiovascular events including death
- There is also recent evidence that adjusting heart failure therapy in order to reduce natriuretic peptides levels in individual patients may improve outcome

## Other neuroendocrine evaluations

- Other tests of neuroendocrine evaluation are not recommended for diagnostic or prognostic purposes

# Algorithm for Diagnosis of Chronic HF





# Management Outline

**Establish that patient has heart failure**

**Identify presenting symptom**

**Assess severity of limitation**

**Determine etiology**

**Exclude or confirm concomitant diseases**

**Predict prognosis**

**Choose therapy**

**Monitor progress**

# Guidelines Treatment - Contents

- General advice and measures
- Exercise and exercise training
- Pharmacological therapy
- Surgery and devices
- Special subsections (elderly, diastolic CHF)
- Care management programmes

# General Measures and Advice

## *Patient and family education*

- explain heart failure
- symptoms –what therapy does
- self-weighing
- exercise vs rest

## General measures and advice

- Diet-salt intake and fluid restriction
- Smoking-cessation
- Alcohol-moderate intake permitted
- Obesity-weight reduction
- Abnormal weight loss
- Travelling
- Sexual activity-counselling, reassurance patients/partner
- Vaccinations-influenza, pneumococcal

# General measures and advice

## Drug counselling :

- Self-management (diuretics)
- Desired effects and side effects
- Duration treatment before effects become apparent
- Need for slow up-titration
- Interaction with other drugs

## Ace-inhibitors

- ACE inhibitors are recommended as first-line therapy in patients with a reduced LV systolic function (LVEF<40-45%) (Level A)
- In the absence of fluid retention ACE inhibitors should be given first, in the presence of fluid retention together with diuretics (Level B)
- ACE inhibitors should be up-titrated to the dosages shown to be effective in large trials .
- They should not be titrated based on symptomatic improvement

# The recommended procedure for starting an ACE inhibitor

1. Review the dose of diuretics
2. Avoid excessive diuresis before treatment.
3. Start with a low dose and build up to maintenance dosages
4. If renal function deteriorates substantially, stop treatment.
5. Avoid potassium-sparing diuretics during initiation of therapy.
6. Avoid non-steroidal anti-inflammatory drugs (NSAIDs).
7. Check blood pressure, renal function and electrolytes 1-2 weeks after each dose increment, at 3 months and subsequently at 6 monthly intervals (Level C)

## Beta-blockade in Heart Failure

- Beta-blocking agents are recommended for the treatment of all patients with stable mild, moderate and severe heart failure from ischemic and non-ischemic origin... on standard treatment including ACE inhibition and diuretics (level A)
- Beta-blocking agents are recommended in patients with LV dysfunction with/without heart failure post-MI for survival benefit (level B)



## Initiation and uptitration of beta-blockade in heart failure

- Patients should be on a background therapy of ACE inhibition and diuretics
- Stable condition
- Titrate slowly and carefully from low initial dose to target doses used in large RCT
- Patients may initially worsen or experience adverse effects (hypotension) – monitor and adapt other therapy first before changing dose beta-blocker.
- Consider PDE inhibitor when positive inotropic support is needed

# Spironolactone in Heart Failure

Aldosterone antagonism is recommended in advanced heart failure (NYHA III and IV) in addition to ACE inhibition to improve survival and morbidity (level B)

# Administration and Dosing Considerations with Spironolactone

- To consider when a patient is in advanced CHF despite standard therapy
- Check serum potassium ( $<5\text{mmol/L}$ ) and creatinine ( $<250\mu\text{mol/L}$ )
- Add 25 mg spironolactone daily and check potassium and creatinine after 4-6 days
- If potassium  $>5-5.5\text{mmol/L}$  - reduce dose by 50%, stop if persists
- If after 1 month if symptoms are still severe-increase to 50 mg daily and check potassium and creatinine after 1 week

## Loop Diuretics, Thiazides and Metolazone

- Diuretics are essential when fluid load is present and manifest as pulmonary congestion and pulmonary oedema (level A)
- The reduction of left ventricular filling pressures result in rapid improvement of dyspnea and improved exercise tolerance (level B)

## Potassium-sparing Diuretics

- Potassium-sparing diuretics should only be prescribed if persisting hypokalemia despite ACE inhibitor therapy in mild heart failure (NYHA III) and ACE inhibition + low-dose spironolactone in NYHA III/IV (level C)
- Potassium supplements are less effective in this situation
- Monitor creatinine and potassium every 5-7 days until stable values

## Angiotensin Receptor Blockers (ARB)

- ARBs could be considered in patients who do not tolerate ACE inhibitors (level C)
- It has not been proven that they are as effective as ACE inhibitors in mortality reduction (level B)
- In addition to ACE inhibition ARBs improve symptoms and reduce hospitalisations for heart failure (level B)
- The addition of ARBs to ACE inhibition and beta-blockade cannot be recommended at present-needs further investigation (level C)

## Digitalis Glycosides

- Cardiac glycosides are recommended in atrial fibrillation and symptomatic CHF... in order to improve cardiac function and symptoms... (level B)
- A combination of digitalis and beta-blockade appears superior to either agent alone (level C)
- In sinus rhythm digoxin may improve the clinical status in persisting heart failure symptoms due to LV systolic dysfunction (level B).

# Vasodilators

- Vasodilators may be used as adjunctive therapy in heart failure for the relief of angina or acute dyspnoea (nitrates) or concomitant hypertension (DHP calcium antagonists)
- ARBs better choice than nitrates/hydralazine when intolerance to ACE inhibitors (level B)
- Alpha-blockers are not recommended for heart failure (level B)
- DHP calcium antagonists have no effect on survival in CHF due to LV systolic dysfunction (level A)



# Positive Inotropes

- Inotropic agents are commonly used to limit severe episodes of CHF or as a bridge to transplantation (level C).  
Use of dobutamine insufficiently documented - prognosis unclear. Higher incidence of treatment - related complications with milrinone.
- Prolonged or repeated oral therapy with available agents (cAMP dependent) increases mortality (level A)
- Short-term levosimendan (calcium sensitiser) appears to be safer than dobutamine. Its long term effect on mortality needs to be confirmed (level C)

# Antiarrhythmics in Heart Failure

- In general there is no indication for the use of anti-arrhythmics in CHF.
- Specific indications: atrial fibrillation, non-sustained or sustained VT
- Class I agents should be avoided (level C)
- Beta-blockers reduce sudden death in CHF (level A)
- Amiodarone is effective against most common supra- and ventricular arrhythmias (level B), but routine administration in CHF is not justified (level B)
- There is no specifically defined role for ICD in CHF (level C), but it improves survival in cardiac arrest or sustained VT associated with LV dysfunction (level A)

## Antiarrhythmics in heart failure (cont'd)

- Amiodarone is effective against most common supra- and ventricular arrhythmias (level B), but routine administration in CHF is not justified (level B)
- There is no specifically defined role for ICD in CHF (level C), but it improves survival in cardiac arrest or sustained VT associated with LV dysfunction (level A)

# Anti-thrombotic Therapy

- Little evidence that anti-thrombotic therapy modifies the risk of death or vascular events other than in atrial fibrillation where anticoagulants are firmly indicated (level C)
- Lack of evidence to support anti-thrombotic agents in sinus rhythm
- There is controversy about the role of a potential interaction between aspirin and ACE inhibitors

# Pacemakers

- Pacemakers have had no specific role other than conventional bradycardia indication. When needed, AV-synchronous pacing should be preferred
- Resynchronization therapy using bi-ventricular pacing may improve symptoms and sub-maximal exercise capacity (level B) but the effect on mortality and morbidity is as yet unknown

# Surgery for Heart Failure

- No controlled data to support revascularisation in general. In individuals with heart failure due to ischemic cardiomyopathy revascularisation may lead to improvement of symptoms (level C)
- Mitral valve surgery in advanced heart failure and severe MI may improve symptoms (level C)
- Cardiomyoplasty not recommended (level C)
- Partial left ventriculotomy (Batista) not recommended (level C)

# Choice of Pharmacological Therapy




	<b>ACE inhibitor</b>	<b>Diuretic</b>	<b>Beta-blocker</b>	<b>Aldosterone antagonist</b>
<b>Asymptomatic LVdysfunction</b>	<b>Indicated</b>	<b>Not indicated</b>	<b>Post-MI</b>	<b>Not indicated</b>
<b>Symptomatic heart failure (NYHAII)</b>	<b>Indicated</b>	<b>Indicated if fluid retention</b>	<b>Indicated</b>	<b>Not indicated</b>
<b>Worsening heart failure (NYHA III)</b>	<b>Indicated</b>	<b>Indicated (combination of diuretics)</b>	<b>Indicated (under specialist care)</b>	<b>Indicated</b>
<b>End-stage heart failure (NYHA IV)</b>	<b>Indicated</b>	<b>Indicated (combination of diuretics)</b>	<b>Indicated (under specialist care)</b>	<b>Indicated</b>

# Choice of Pharmacological Therapy

	<b>ARB</b>	<b>Digitalis glycoside</b>	<b>Vasodilator</b>	<b>Potassium-sparing diuretic</b>
<b>Asymptomatic LVdysfunction</b>	<b>Not indicated</b>	<b>Atrial fibrillation</b>	<b>Not indicated</b>	<b>Not indicated</b>
<b>Symptomatic heart failure (NYHA II)</b>	<b>If ACE inhibitors or beta-blockers not tolerated</b>	<b>For symptoms in sinus rhythm</b>	<b>If ACE inhibitors and ARB's not tolerated</b>	<b>If persisting hypokalemia</b>
<b>Worsening heart failure (NYHA III)</b>	<b>If ACE inhibitors or beta-blockers not tolerated</b>	<b>For symptoms in sinus rhythm</b>	<b>If ACE inhibitors and ARB's not tolerated</b>	<b>If persisting hypokalemia</b>
<b>End-stage heart failure (NYHA IV)</b>	<b>If ACE inhibitors or beta-blockers not tolerated</b>	<b>Possibly for symptoms in sinus rhythm</b>	<b>If ACE inhibitors and ARB's not tolerated</b>	<b>If persisting hypokalemia</b>



# Pharmacological Therapy of Heart Failure due to Systolic Left Ventricular Dysfunction

	For Symptoms	For Survival/Morbidity <i>mandatory therapy</i>	For Symptoms if Intolerant to ACE inhibitor or Beta-blocker
NYHA I	reduce / stop diuretic 	continue ACE inhibitor –add beta-blocker if post-MI	
NYHA II	+/- diuretic depending on fluid retention	ACE inhibitor as first-line treatment  add beta-blocker	ARB if ACE inhibitor intolerant or ACE inhibitor + ARB if beta- blocker intolerant
NYHA III	+ diuretics + digitalis If still symptomatic + nitrates/hydralazine if tolerated	ACEinhibitor and beta- blocker add spironolactone 	ARB if ACE inhibitor intolerant  or ACE inhibitor +ARB if beta- blocker intolerant
NYHA IV	+ diuretics +digitalis + nitrates/hydralazine + temporary inotropic support	continue ACE inhibitor beta-blocker spironolactone	ARB if ACE inhibitor intolerant  or ACE inhibitor +ARB if beta-blocker intolerant

## Conclusions

- Heart failure is a very serious condition
- Diagnosis of CHF is based on objective evidence of cardiac dysfunction
- Echocardiography is recommended when heart failure is suspected
- Low plasma concentrations of natriuretic peptides make CHF unlikely
- These tests may help to the diagnosis and monitoring of CHF

## Conclusions (cont'd)

- Symptoms as well as prognosis can be improved by appropriate therapy.
- Symptom management may include several agents where diuretics are essential to control fluid retention.
- ACE-inhibitors and beta-blockers are very well documented and should be considered in all patients as survival is improved.
- Dose levels should be titrated as in clinical trials

# Task Force

## *Members of the Task Force*

**Co-chairmen: Willem J. Remme , Karl Swedberg .(If not stated otherwise representing WG on Heart Failure):**

**John Cleland, Hull;**

**A. W. Hoes, Utrecht (GeneralPractice);**

**Attilio Gavazzi, Bergamo (WG Myocardial and Pericardial diseases);**

**Henry Dargie, Glasgow;**

**Helmut Drexler, Hannover;**

**Ferenc Follath, Zurich (European Federation of Internal Medicine);**

**A. Haverich, Hannover (WG on Cardiovascular Surgery);**

**Tina Jaarsma, Den Haag (WG on Cardiovascular Nursing);**

**Jerczy Korewicki, Warzaw;**

**Michel Komajda, Paris;**

**Cecilia Linde, Stockholm (WG on Pacing);**

**Jose Lopez-Sendon, Madrid;**

**Luc Piérard, Liège (WG on Echocardiography);**

**Markku Nieminen, Helsinki;**

**Samuel Lévy, Marseille (WG on Arrhythmia);**

**Luigi Tavazzi, Pavia;**

**Pavlos Toutouzas, Athens.**

## Working Schedule

- Task Force appointed by the Committee for Practice Guidelines and Policy Conferences of the European Society of Cardiology (ESC).
- First meeting ESC 1999.
- Draft circulated among the Nucleus of the Working Group on Heart Failure, other Working Groups, and several experts in the field of heart failure.
- It was updated based on comments received. It was then sent to the Committee and after their input the document was approved for publication.
- Accepted May 3, published EHJ September 2001
- Available on ESC Web site [www.escardio.org](http://www.escardio.org)

# Guidelines for Heart Failure Treatment based on Level of Evidence

- Level A: at least 2 randomised trials supporting recommendation
- Level B: at least one randomised trial or meta-analysis, supporting recommendation
- Level C: consensus opinion of experts based upon trial evidence and clinical experience

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# Algorithm for Diagnosis of Chronic HF

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