HOW TO PREVENT CARDIAC DECOMPENSATION

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CONFLICT OF INTEREST DISCLOSURE

I have no potential conflict of interest to report
• Heart failure (HF) and geriatric age
• Decompensated HF (DHF)
  • Definition
  • Causes
  • Predisposing - precipitating factors
  • Prevention
• DHF – association with Geriatric Syndromes
• Comprehensive Geriatric Assessment and Cardiogeriatric care
• THM
HEART FAILURE AND GERIATRIC AGE

Differences from younger patients:

- Physiological changes
  - Decreased reserves
- Atypical presentation of diseases
  - Atypical subtle symptoms
- Comorbidities
- Geriatric syndromes

- Different type of HF predominant (HFrEF)
  - (Diastolic HF)
- Difficult diagnosis
- Different clinical characteristics
- Worse prognosis

2016 ESC Guidelines
Upadhya et al. Journal of Molecular and Cellular Cardiology 2015;83:73--87
Komadja et al. Eur Heart J 2007;28:1310--8
2012 ESC Guidelines. Eur Heart J 2012;33
• Incidence of HF increases with age
• Prevalence of HF and LV dysfunction increases steeply with age
• Prevalence of HF with a preserved EF (HFpEF) increases with age
  • The estimated prevalence of diastolic dysfunction among patients with HF
    Age <50: 15%
    Age 50-70: 33%
    Age >70: 50%

J Am Coll Cardiol 1995; 26:1565
The Rotterdam Study. Eur Heart J 2004; 25:1614
Am Heart J 2002; 143:412
J Am Coll Cardiol 2003; 41:217
HFpEF in Geriatric Age

• Predominant type of HF
• 567 patients, ≥80 years:
  • Isolated diastolic dysfunction: 51.3%
  • Systolic dysfunction (EF ≤50%): 5.8%

Vaes et al. Int J Cardiol 2012;155:134
Upadhya et al. Journal of Molecular and Cellular Cardiology 2015;83:73
HEART FAILURE AND GERIATRIC AGE

Differences from younger patients:

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  - Decreased reserves
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Upadhya et al. Journal of Molecular and Cellular Cardiology 2015;83:73--87
Komadja et al. Eur Heart J 2007;28:1310--8
2012 ESC Guidelines. Eur Heart J 2012;33
2016 ESC guidelines
Clinical manifestations of decompensation is atypical in geriatric age

- Subtle
- Weakness/exhaustion
- Somnolence
- Delirium
- Falls
- Decline in oral intake
- Decline in general condition
HEART FAILURE AND GERIATRIC AGE

Differences from younger patients:

- Physiological changes
  Decreased reserves

- Atypical presentation of diseases
  Atypical subtle symptoms

- Comorbidities

- Geriatric syndromes

- Different type of HF
  (HFpEF)
  (Diastolic HF)

- Difficult diagnosis

- Different clinical characteristics

- Worse prognosis

Upadhya et al. Journal of Molecular and Cellular Cardiology 2015;83:73–87
2012 ESC Guidelines. Eur Heart J 2012;33
2016 ESC guidelines
• Multiple comorbidities complicate the management
• Closer monitoring is required
  • Higher risk of side effects
  • High risk of drug--drug interactions
  • Higher prevalence of nonadherence to treatment

Increased rate of decompensation
Increased rate of hospitalisations
Increased rate of mortality

Hamada et al, Geriatr Gerontol Int 2017
Sargento et al. Curr Heart Fail Rep 2014
Komajda et al. Eur Heart J 2007;28:1310
• The outcome for older HF patients depends on
  • Disease severity
  • Non-cardiac comorbidities associated with worse clinical outcome
    These comorbidities effect functioning, qol, selfcare, adherence
    • Hypertension
    • DM
    • Renal disease
    • Chronic obstructive pulmonary diseases
    • Geriatric syndromes
      • Cognitive dysfunction
      • Depressive disorders
      • Malnutrition
      • Frailty
  • Psychological factors, social environmental factors

Hamada et al, Geriatr Gerontol Int 2017
Sargento et al. Curr Heart Fail Rep 2014
Vicious cycle

Chronic HF

Cognitive decline
Functional decline
Depressive symptoms
Weight loss
Malnutrition
Frailty

Worsen HF
Increase decompensation
Worsen prognosis
A Major Pitfall : Evidence based medicine?

• Most RCTs in HF exclude patients with comorbidities/ frailty/ very old
• Difficult to carry out evidence based therapies in older patients
• Difficult to apply guidelines to older patients

Diagnosis of HF

**PATIENT WITH SUSPECTED HF**
(non-acute onset)

**ASSESSMENT OF HF PROBABILITY**

1. **Clinical history:**
   - History of CAD (MI, revascularization)
   - History of arterial hypertension
   - Exposition to cardiotoxic drug / radiation
   - Use of diuretics
   - Orthopnoea / paroxysmal nocturnal dyspnoea

2. **Physical examination:**
   - Rales
   - Bilateral ankle oedema
   - Heart murmur
   - Jugular venous dilatation
   - Laterally displaced/broadened apical beat

3. **ECG:**
   - Any abnormality

**NATRIURETIC PEPTIDES**

- NT-proBNP ≥ 125 pg/mL
- BNP ≥ 35 pg/mL

**ECHOCARDIOGRAPHY**

- All absent
- ≥ 1 present
- No
- Normal

- HF unlikely: Consider other diagnosis

If HF confirmed (based on all available data):
- determine aetiology and start appropriate treatment

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ESC 2016

[Link to guidelines](w.escardio.org/guidelines)
### Heart failure with preserved, mid-range and reduced EF

<table>
<thead>
<tr>
<th>Type of HF</th>
<th>HFrEF</th>
<th>HFmrEF</th>
<th>HFP EF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Symptoms ± Signs(^2)</td>
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</tr>
<tr>
<td>2</td>
<td>LVEF &lt; 40%</td>
<td>LVEF 40 – 49%</td>
<td>LVEF ≥ 50%</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>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 (for details see Section 4.3.2).</td>
<td>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 (for details see Section 4.3.2).</td>
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</table>

The only category with evidence based medicine is HF rEF

www.escardio.org/guidelines

ESC 2016
• 2013 by an American College of Cardiology/American Heart Association (ACC/AHA) task force
  • Stage A – At high risk for HF but without structural heart disease or symptoms of HF
  • Stage B – Structural heart disease but without signs or symptoms of HF
  • Stage C – Structural heart disease with prior or current symptoms of HF
  • Stage D – Refractory HF requiring specialized interventions
Cardiac Decompensation

• Decompansated heart failure (DHF)
  • Acute
  • Chronic

• Predisposing factors + precipitant factors = cardiac decompensation
Predisposant Factors

Atypical presentation of diseases
Atypical subtle symptoms

Comorbidities

Physiological changes
Decreased reserves

Polypharmacy

Precipitant factors

Geriatric syndromes

Nonadherence to treatment
ADHF – Acute Decompensated Heart Failure

Definition

• Common and potentially fatal cause of acute respiratory distress
• Generally associated with rapid accumulation of fluid within the lung's interstitial and alveolar spaces
• Presentation:
  • Cardiogenic pulmonary edema (the result of acutely elevated cardiac filling pressures)
  • Dyspnea without pulmonary edema (elevated left ventricular filling pressures)
  • Acute cardiogenic shock, severe hypotension
  • Respiratory failure
  • Dyspnea, Cough, Fatigue, Peripheral edema which rapidly become more severe, Chest discomfort
  • Atypical presentation in older age

ADHF - Causes

LV systolic or diastolic dysfunction ± additional cardiac pathology

Cardiogenic pulmonary edema
- Cardiac pathology:
  - CAD (acute coronary syndrome)
  - Valve abnormality
- Elevated pulmonary capillary wedge pressure in the absence of heart disease
  - Primary fluid overload (eg, excessive fluid and sodium intake, due to nonadherence, blood transfusion, iv fluid, TPN...)
  - Severe hypertension (particularly renovascular hypertension)
  - Severe renal disease

Non-Cardiogenic pulmonary edema
- Permeability due to
  - ARDS: major cause
  - Pulmonary embolism
  - Reperfusion pulmonary edema
  - Re-expansion pulmonary edema
  - High altitude
  - Neurogenic pulmonary edema
  - Drugs: opiate overdose, salicylate toxicity*
  - Transfusion-related acute lung injury
  - Viral infections
  - Pulmonary veno-occlusive disease
In the large majority of patients who present with ADHF
- A prior history of episodes of decompensation exists

While approaching the episode of ADHF
- Information regarding the precipitating factors
- Workup for HF, the elements of successful therapy for prior episodes
- Appropriate longterm treatment
- Important to prevent decompensation especially in older adults as it is associated with higher rates of mortality
PREDISPOSING FACTORS

- **Systolic dysfunction**
  - CAD
  - HT
  - Valvular heart disease
  - Idiopathic dilated cardiomyopathy
  - Cardiotoxic agents (eg, anthracyclines)
  - Metabolic disorders (eg, hypothyroidism)
  - Viral myocarditis (eg, Coxsackie B virus or echovirus infection).

- **Diastolic dysfunction**
  - LV hypertrophy
  - Hypertrophic and restrictive cardiomyopathies
  - Acutely with ischemia and acute hypertensive crisis
  - Primary intrinsic abnormalities of LV diastolic function
  - Volume overload (as in renal failure)
  - Increased afterload (as in hypertensive crisis)
  - Tachycardia (eg, AF with rapid ventricular response)
PREDISPOSING FACTOR (cont.)

- **Left ventricular outflow obstruction**
  - Critical aortic stenosis (including supravalvular and subvalvular stenosis),
  - Hypertrophic cardiomyopathy and/or severe systemic hypertension.

- **Mitral stenosis**

- **Renovascular hypertension**
  - Association between recurrent pulmonary edema and renovascular hypertension
  - Flash pulmonary edema more common in patients with bilateral renal artery stenosis
  - Limited evidence is available on the efficacy of revascularization to prevent decompensation

PRECIPITATING FACTORS

1. Adherence and care issues**
2. Cardiac
3. Noncardiac

2013 American College of Cardiology/AHA Heart Failure Guideline
J Card Fail 2010; 16:e1
Eur Heart J 2008; 29:2388
Circulation 2009; 119:e391
Can J Cardiol 2006; 22:23
J Am Coll Cardiol 2009; 53:254
1. Adherence and care issues:
   • Especially important in geriatric age
   • Geriatric syndromes affect adherence:
     • Functionality
     • Cognitive function
     • Mood
     • Frailty
     • Socio-economical factors
1. **Adherence and care issues:**
   - Dietary noncompliance (*fluid and sodium restriction*)
   - Nonadherence to medications
   - Volume overload (by patient or iatrogenic)
   - Significant drug interactions and side effects
Precipitating Factors - 2

2. Cardiac
   • Myocardial infarction, myocardial ischemia
   • Arrhythmia with hemodynamic consequences
     • Atrial fibrillation
     • Other arrhythmias (sinus tachycardia, atrial flutter, other supraventricular tachycardias, ventricular tachycardia)
   • Valvular disease (eg, acute or progressive aortic/ mitral regurgitation)
   • Acute LA outflow obstruction: LA tumors (eg, myxoma), thrombosis of a prosthetic valve
   • Progression of underlying cardiac dysfunction
   • Stress-induced (takotsubo) cardiomyopathy
   • Cardiotoxic agents: alcohol, cocaine, chemotherapy drugs
   • Right ventricular pacing, which produces dyssynchrony (VVI pacing)
Precipitating Factors - 3

3. Noncardiac

- Fluid overload (oral fluid, excessive salt intake, iv fluid, TPN administration, transfusion...)
- Severe hypertension – HT crisis (eg, uncontrolled HT, cessation of drugs)
- Renal failure
- Pulmonary emboli
- Infection (eg, respiratory infections, urinary tract infection...)
- Endocrine abnormalities (eg, uncontrolled diabetes, hypo- hyperthyroidism...)
- Anemia
- Fever
Tests for Detecting Precipitating Factors

- Laboratory data
  - Anemia
  - Infection
  - Renal function
  - Hypoalbuminemia*

- Electrocardiogram
  - Predisposing or precipitating factors: LV hypertrophy, LA abnormalities, myocardial ischemia or infarction, AF

- Echocardiography*
  - Diagnosis and classification
  - Predisposing factors

- Coronary angiography
  - Acute coronary syndrome precipitating ADHF, ECG, cardiac troponin testing, CAG

J Card Fail 2010; 16:e1;  Eur Heart J 2008; 29:2388
Circulation 2009; 119:e391;  Can J Cardiol 2006; 22:23
• **Hypoalbuminemia** alone is **not** a cause of pulmonary edema.
  • unless there is a concurrent rise in left atrial and pulmonary capillary pressures
  • **In older patients** with HFpEF
    • hypoalbuminemia due to age, malnutrition, or sepsis may lower colloid osmotic pressure and **facilitate the onset of pulmonary edema**
    • In decompensated HF hypoalbuminemia is an independent predictor of in-hospital and post-discharge mortality

Hypoalbuminemia in elderly patients with acute diastolic heart failure.
  J Am Coll Cardiol 2003; 42:712
  Am Heart J 2010; 160:1149
  J Card Fail 2014; 20:350
Drug induced cardiac decompensation

• General principles for avoiding drug induced decompensation
  1) Be aware of the mechanisms by which drugs can cause cardiac decompensation
  2) Identify drug interactions among prescribed and nonprescribed medications, vitamins, supplements, remedies...
  3) Keep in mind that drug absorption, distribution, and clearance can be altered with age and also with congestive heart failure as a result of gut edema, hepatic congestion, renal insufficiency
General principles for avoiding drug-induced worsening of heart failure

1) **Mechanisms** by which drugs can exacerbate HF

   - Sodium retention
   - Negative inotropic effect
   - Direct cardiotoxicity
2) Identify drug interaction

- Common HF drugs often affected by pharmacokinetic drug interactions (via CYP 2D6 metabolism)
  - Digoxin
  - Amiodarone
  - Warfarin
  - Beta-blockers

- Pharmacodynamic interactions in HF
  - ACEI/ARB/spironolactone combinations: hyperkalemia
  - Digoxin toxicity with hypokalemia
  - Additive QTc prolongation with QTc prolonging drugs, and electrolyte disturbances
3) **Altered drug absorption, distribution, and clearance**

- Warfarin dose requirement is generally much lower in an acute exacerbation.
- Digoxin clearance may decrease during acute HF exacerbation.
- Volume of distribution tends to decrease for certain HF drugs (e.g., digoxin) as HF advances as well as with aging or renal failure.
  
  Lower load and maintenance dosing may be required.
- Monitoring HF management involving frequent assessment and adjustment of several drugs with similar pharmacodynamic effects.
Drugs to avoid or use with caution in HF

- Glucocorticoids
- NSAID
- Aspirin
- Drugs that may cause hyperkalemia
- Trimethoprim/sulfamethoxazole
- Antidepressants
- Oral antidiabetic agents
  - Thiazolidinediones
  - Metformin

- Phosphodiesterase inhibitors
  - PDE-3 inhibitors
  - PDE-4 inhibitor
  - PDE-5 inhibitors
- Antiarrhythmic agents
- Chemotherapy agents
- Androgens
- Sodium-containing preparations
- Antihistamines
- Theophylline
- TNF-alpha inhibitors
- "Natural" remedies and supplements
<table>
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<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
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<tr>
<td><strong>Thiazolidinediones (glitazones)</strong> are not recommended in patients with HF, as they increase the risk of HF worsening and HF hospitalization.</td>
<td>III</td>
<td>A</td>
</tr>
<tr>
<td><strong>NSAIDs or COX-2 inhibitors</strong> are not recommended in patients with HF, as they increase the risk of HF worsening and HF hospitalization.</td>
<td>III</td>
<td>B</td>
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<tr>
<td><strong>Diltiazem or verapamil</strong> are not recommended in patients with HFrEF, as they increase the risk of HF worsening and HF hospitalization.</td>
<td>III</td>
<td>C</td>
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<tr>
<td>The addition of an <strong>ARB</strong> (or renin inhibitor) to the combination of an <strong>ACE-I and an MRA</strong> is not recommended in patients with HF, because of the increased risk of renal dysfunction and hyperkalaemia.</td>
<td>III</td>
<td>C</td>
</tr>
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</table>
• Antiinflammatory medications:
  • Glucocorticoids:
    • Sodium retention
  • NSAID:
    • Sodium retention, peripheral vasoconstriction, blunted response to diuretics and ACEIs, increased risk of renal dysfunction

increased risk of first occurrence or exacerbation of heart failure (HF)
increased mortality
• Cardiovascular medications
  • Calcium channel blockers
    • Verapamil, short acting nifedipine, diltiazem
    • Exacerbate HF by negative inotropic effects in patients with HF with reduced ejection fraction (HFrEF)
    • Vasoselective calcium channel blocker amlodipine, felodipine are safe
  • Beta blockers**
    • Negative inotropic effects
  • Antiarrhythmic drugs:
    • Class I And Class III (ibutilide, sotalol) antiarrhythmic agents
    • Negative inotropic activity
    • Possible proarrhythmic effect
    • The further reduction in left ventricular function can also impair the elimination of these drugs
    • HF is a risk factor for torsades de pointes in patients receiving the class III agents ibutilide, sotalol, and dofetilide
    • Amiodarone is generally considered to be less proarrhythmic than other antiarrhythmic agents
  • Minoxidil
    • Sodium retention

Circulation 2013; 128:e240
• Oral antidiabetic medications
  • Thiazolidinediones
    • Sodium retention

• Sodium-containing preparations
  • Sodium bicarbonate and preparation for colonoscopy etc.(Fleet PhosPho soda)

Exacerbate HF
• **Phosphodiesterase inhibitors**
  
  • **PDE-3 inhibitors: Cilostazol**
  • increased mortality compared with placebo
  • While it is not established that cilostazol impacts mortality in patients with HF, the FDA regards HF of any severity as a contraindication to the use of cilostazol
  
  • **PDE-4 inhibitor: Anagrelide**
  • fluid retention, and less commonly HF with or without development of cardiomyopathy, has been reported with its use, although controlled data are lacking. It may also cause high-output HF. Anagrelide use should be avoided in patients with HF.
  
  • **PDE-5 inhibitor: sildenafil, vardenafil, and tadalafil**
• **Antidepressants**
  • TCAD
  • Negative inotropic, proarrhythmic effects may cause cardiac decompensation

• **Antimicrobials**
  • Trimethoprim-sulfamethoxazole
    • An elevated risk of hyperkalemia, acute kidney injury
    • Increased risk of sudden death
  • Itroconazole
    • Negative inotropic

BMJ 2014; 349:g6196
Can J Psychiatry 2006; 51:923
• Chemotherapy agents
  • Cardiotoxic chemotherapeutic agents should be avoided in patients with HF
  • Anthracyclines, high-dose cyclophosphamide, trastuzumab, and bevacizumab

• Androgens
  • Testosteron patch
  • Edema, HF, HT, LV hypertrophy, sudden death
  • The 2010 Endocrine Society guidelines on testosterone therapy for men with androgen deficiency recommended against testosterone therapy in patients with uncontrolled or poorly controlled HF
• **Antihistamines**
  • Second generation antihistamines (*terfenadine and astemizole*)
  • Long QT syndrome
  • Fexofenadine, cetirizine is safe

• **Theophylline**
  • Narrow therapeutic index
  • Tachycardia and atrial arrhythmias esp. among patients with heart disease.
  • Avoid / dose reduction / monitor
• **TNF-alpha inhibitors**
  • New onset or worsening of pre-existing HF
  • Avoid in older people with HF as a class
  • Esp. infliximab

• **Nonprescribed dietary supplements, alternative treatments, natural remedies**
  • Thought to be benign by some patients
  • Some may pose health risks
  • Drug interactions
WHAT TO DO TO AVOID DRUG INDUCED DECOMPENSATION

• **Educate** the patient about their medication
  - Educate the patient about possible drug interaction with prescribed or nonprescribed agents
  - Give the information about the drugs and alternative treatments that should be avoided

• **Consult a clinical pharmacist** when necessary

• **Interdisciplinary geriatric medicine team**
Evidence based data limited for geriatric age

No specific data to prevent decompensation in older adults

In HFpEF no evidence for benefit of treatment for mortality, QOL, exercise capacity

Comorbidities
- Physiological changes
- Frailty
- Nutritional status
- Functionality
- Disability

Polypharmacy

Geriatric syndromes

Atypical presentation of precipitating factors
INITIAL EVALUATION FOR HF
History, Physical exam, ECG, Chest X-ray, Echo Lab (CBC, renal fxn, electrolytes, Alb, TSH, glucose, NT-proBNP, arterial blood gas, troponin)

COMPREHENSIVE GERIATRIC ASSESSMENT

comprehensive outpatient disease management approach to optimizing HF treatment

J Am Coll Cardiol 2013
EurJ Heart Fail 2015
Crit Pathw Cardiol 2015
JACC 2016
J Geriatr Cardiol. 2013
PREVENT DECOMPENSATION

- Prevention of heart failure (HF) requires early detection and preventing precipitating factors
- Optimal treatment for HF
- Prevent acute coronary syndrome
  - Modify cardiovascular risk factors: dm, ht, hl, obesity, exercise
  - Quit smoking
  - Use statin for patients at high risk of CAD
- Regulate hypertension:
  - Don’t forget about “J curve”

- Prevent left ventricular hypertrophy
  - Use of ACE-I in patients with asymptomatic left ventricular dysfunction /stable CAD
  - Use of beta-blockers in those with asymptomatic left ventricular dysfunction and a history of myocardial infarction

- Optimal nutritional status
  - no obesity no malnutrition
- Healthy lifestyle habits on HF risk
  - normal body weight
  - not smoking
  - regular exercise
  - Mediterranean diet

ESC 2016
Treatment Algorithm for HFrEF
MEDICATIONS

• Higher outpatient diuretic doses associated with fewer hospitalizations
• Survival And Ventricular Enlargement (SAVE) trial
  • ACEinh reduced hospitalisation to 14%
• Randomized Aldactone Evaluation Study (RALES) trial
  • Spironolactone reduced hospitalisation and CV event by 30% in NYHA Class 4 <35%EF recieving loop diuretic and ACEI
• Metoprolol CR/XL Randomized Intervention Trial in Congestive Heart Failure (MERIT-HF)
  Carvedilol Post-Infarct Survival Control in LV Dysfunction (CAPRICORN)
  Cardiac Insufficiency Bisoprolol Study II (CIBIS-II).
  • Bblocker. reduction in all-cause hospital admissions and HF hospitalizations by 6% for each
• Angiotensin-neprilysin inhibition (valsartan+sacubutril. Paradigm-HF trial)
  • Reduce CV and all-cause mortality and reduce hospitalizations for HF as compared to ACEI
• SHIFT trial
  • Ivabradine showed reduction in hospitalization for worsening HF, hospitalizations for decompensated HF
  • Failed to show mortality reduction

ESC 2016
Swedberg et al, Lancet 2010
JJV McMurray, NEJM 2014
DEVICES

• Biventricular pacing
• Cardiac-resynchronization therapy (CRT) + in addition to ICD*

reduce hospitalisations
# Implantable cardioverter-defibrillator in patients with heart failure

## Recommendations

### Secondary prevention
An ICD is recommended to reduce the risk of sudden death and all-cause mortality in patients who have recovered from a ventricular arrhythmia causing haemodynamic instability, and who are expected to survive for >1 year with good functional status.

### Primary prevention
An ICD is recommended to reduce the risk of sudden death and all-cause mortality in patients with symptomatic HF (NYHA Class II–III), and an LVEF ≤35% despite >3 months of OMT, provided they are expected to survive substantially longer than one year with good functional status, and they have:
- IHD (unless they have had an MI in the prior 40 days – see below).
- DCM.

ICD implantation is not recommended within 40 days of an MI as implantation at this time does not improve prognosis.

ICD therapy is not recommended in patients in NYHA Class IV with severe symptoms refractory to pharmacological therapy unless they are candidates for CRT, a ventricular assist device, or cardiac transplantation.

Patients should be carefully evaluated by an experienced cardiologist before generator replacement, because management goals and the patient’s needs and clinical status may have changed.

A wearable ICD may be considered for patients with HF who are at risk of sudden cardiac death for a limited period or as a bridge to an implanted device.

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<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary prevention</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>Primary prevention</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>ICD implantation is not recommended within 40 days of an MI</td>
<td>III</td>
<td>A</td>
</tr>
<tr>
<td>ICD therapy is not recommended in patients in NYHA Class IV</td>
<td>III</td>
<td>C</td>
</tr>
<tr>
<td>Patients should be carefully evaluated</td>
<td>IIa</td>
<td>B</td>
</tr>
<tr>
<td>A wearable ICD may be considered</td>
<td>IIb</td>
<td>C</td>
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## Recommendations for cardiac resynchronization therapy implantation in patients with heart failure

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Level&lt;sup&gt;b&lt;/sup&gt;</th>
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<tr>
<td>CRT is recommended for symptomatic patients with HF in sinus rhythm with a QRS duration $\geq$ 150 msec and LBBB QRS morphology and with LVEF $\leq$ 35% despite OMT in order to improve symptoms and reduce morbidity and mortality.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>CRT should be considered for symptomatic patients with HF in sinus rhythm with a QRS duration $\geq$ 150 msec and non-LBBB QRS morphology and with LVEF $\leq$ 35% despite OMT in order to improve symptoms and reduce morbidity and mortality.</td>
<td>IIa</td>
<td>B</td>
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<tr>
<td>CRT is recommended for symptomatic patients with HF in sinus rhythm with a QRS duration of 130-149 msec and LBBB QRS morphology and with LVEF $\leq$ 35% despite OMT in order to improve symptoms and reduce morbidity and mortality.</td>
<td>I</td>
<td>B</td>
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<td>CRT may be considered for symptomatic patients with HF in sinus rhythm with a QRS duration of 130-149 msec and non-LBBB QRS morphology and with LVEF $\leq$ 35% despite OMT in order to improve symptoms and reduce morbidity and mortality.</td>
<td>IIb</td>
<td>B</td>
</tr>
<tr>
<td>CRT should be considered for patients with LVEF $\leq$ 35% in NYHA Class III-IVc despite OMT in order to improve symptoms and reduce morbidity and mortality, if they are in AF and have a QRS duration $\geq$ 130 msec provided a strategy to ensure bi-ventricular capture is in place or the patient is expected to return to sinus rhythm.</td>
<td>IIa</td>
<td>B</td>
</tr>
</tbody>
</table>

<sup>a</sup>Class: I = strong recommendation, II* = moderate recommendation, II* = weak recommendation  
<sup>b</sup>Level: A = high quality of evidence, B = moderate quality of evidence, C = low quality of evidence

www.escardio.org/guidelines
CARDIOGERIATRIC CARE

Geriatric Patients
- Geriatric Syndromes
  - Cognitive Impairment
  - Sensory Disorder
  - Polypharmacy
  - Medication intolerance
  - Frailty
  - Falls
  - Incontinence
  - Physical Disability

Cardio-Geriatric Care
- Costs/Burden
  - Direct Medical Costs
  - Indirect Costs
  - Lost Opportunities
  - Caregiver Burden
- Survival
- Outcomes Relevant to an Individual Patient
- Quality of Life
  - Symptoms
  - Physical Function
  - Mental
  - Emotional
  - Social

CHF Patients
- CHF Multimorbidies
  - Hypertension
  - Ischemic Heart Disease
  - Hyperlipidemia
  - Anemia
  - Diabetes

Canadian Journal of Cardiology 2016
Frailty  HF
Frailty and HF

• In HF the prevalence of frailty is higher than in the general elderly population
• Frailty and functional dependence are prognostic factors in older patients with HF
• Frailty is an independent predictor of
  • Early disability
  • Higher risk of visits to the emergency department and hospitalization
  • Short term and long-term mortality in ADHF
  • Readmission in ADHF

Martín-Sánchez et al. Am J Cardiol 2017;120:1151–1157
Eur J Heart Fail 2016;18:869–875

Martín-Sánchez et al. *Am J Cardiol* 2017;120:1151–1157

• Frailty & HF link:
  • Common pathologic pathways
    • Inflammation, metabolic disturbances, oxidative stress...
  • Higher levels of B-type natriuretic peptide in frailty
  • Increased risk for social help in frailty: decrease compliance
  • Frail patients vulnerable for AE of medications: decreased adherence

• Should frailty be included in risk stratification instruments?

Plasma brain natriuretic peptide level in older outpatients with heart failure is associated with physical frailty, especially with the slowness domain. *J Geriatr Cardiol* 2016;13:608–614

Malnutrition ↔ HF
• Malnutrition and HF
  • Malnutrition associated with poor outcomes in HF (MNA, CONUT score, GNRI)
  • Poor survival
  • Increased cardiovascular and all cause mortality
  • First HF hospitalization in asymptomatic HF patients aged >70 years

• JCARE-CARD study*
  • lower BMI independently associated with all-cause mortality and cardiac mortality in patients with HF

Circ J 2010; 74: 2605–2611
J Cardiol 2013; 62: 307–313
Circ J 2013; 77:2318–2326
Circ J 2013; 77: 705–711
Curr Heart Fail Rep 2014; 11: 220–226
Improvement of nutritional status at an early stage of HF is important for preventing decompensation improving prognosis.
Heart failure (HF) patients are reported to have twice the risk of having cognitive deficits compared to the general population.

The severity of cognitive impairment correlates positively with the degree of CHF.
DEMENTIA AND HF
• Poor selfcare
• Poor medication adherence
• Communication problems
  inability to cope with other medical problems

Worsening and Progression of HF

Increased hospital readmissions

intestinal edema, changes of intestinal bacterial colonization
changes in absorption, hence, efficacy of medications

Progression of cognitive dysfunction

Other Geriatric Syndromes and HF

• Depression
  • predicts hospitalization and mortality rate
  • poor medication adherence in CHF
  • Poor adherence to life style modifications

• Functional decline
  • Poor adherence too medications

• Incontinence
  • Cessation of diuretics
HF – Older Adults Trials

• Majority older patients hospitalised for cardiac decompenasation show at least one geriatric syndrome on admission

• Geriatric syndromes are associated with poorer inhospital and postdischarge functional and clinical outcomes in HF

• Dementia and disability are especially associated with poor outcome in oldest old

Heart 2011;97:1602–1606
• Retrospective analyses of >80 years of age ADHF
• Identify predictive factors for decompensation
  • lower prescription rate of beta-blockers at discharge
  • Moderate – severe malnutrition (CONUT score ≥5)
  • Hypertension

Hamada et al, Geriatr Gerontol Int 2017
<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONUT score ≥ 5</td>
<td>4.960</td>
<td>1.250–19.700</td>
<td>0.023</td>
</tr>
<tr>
<td>Beta-blocker</td>
<td>0.261</td>
<td>0.071–0.964</td>
<td>0.044</td>
</tr>
<tr>
<td>Hypertension</td>
<td>8.090</td>
<td>1.480–44.400</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Logistic regression analysis for rehospitalization within 1 year for worsening HF or cardiac death after discharge. CONUT, controlling nutritional status.
• Observational trials*
  • Betablockers had a beneficial effect on outcome for older patients with HF

• The European Heart Failure Survey, and Hamaguchi et al.:
  • Guideline-based standard medications for HF was less frequent in older patients
  • Underuse and underdose of recommended drugs for HF in older patients is a pitfall

• The SENIORS study**
  • Beta-blockers reduced mortality and morbidity in HF patients aged ≥70**
  • Beta-blocker use is associated with good outcome in older patients

*Arch Intern Med 2008; 168 (22): 2422–2428
*Arch Intern Med 2008; 168 (22): 2415–2421
Eur Heart J 2009; 30:478–486
### Recommended Adult Immunization Schedule—United States, 2016

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 1. Recommended immunization schedule for adults aged 19 years or older, by vaccine and age group

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>AGE GROUP</th>
<th>19-21 years</th>
<th>22-64 years</th>
<th>27-49 years</th>
<th>50-59 years</th>
<th>60-64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td></td>
<td>1 dose annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td></td>
<td>Substitute Tdap for Td once, then Td booster every 10 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
<td>2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female*</td>
<td></td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male*</td>
<td></td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster*</td>
<td></td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)*</td>
<td></td>
<td>1 or 2 doses depending on indication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)*</td>
<td></td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pneumococcal 23-valent polysaccharide (PPSV23)*</td>
<td></td>
<td>1 or 2 doses depending on indication</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A*</td>
<td></td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B*</td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MenPSY)*</td>
<td></td>
<td>1 or more doses depending on indication</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal B (MenB)*</td>
<td></td>
<td>2 doses depending on vaccine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae type b (Hib)*</td>
<td></td>
<td>1 or 3 doses depending on indication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Covered by the Vaccine Injury Compensation Program

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at [www.vaers.hhs.gov](http://www.vaers.hhs.gov) or by telephone, 800-822-7967.

Information on how to file a Vaccine Injury Compensation Program claim is available at [www.hrsa.gov/vaccinecompensation](http://www.hrsa.gov/vaccinecompensation) or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, NW, Washington, DC 20005; telephone, 202-357-6400.

Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at [www.cdc.gov/vaccines](http://www.cdc.gov/vaccines) or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 8:00 a.m.–8:00 p.m. Eastern Time, Monday–Friday, excluding holidays.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention’s (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG), and American College of Nurse-Midwives (ACNM).
THM

• Cardiologic assessment
• CGA
• Interdisciplinary geriatric medicine team, Cardiogeriatric care
• Appropriate HF treatment, adherence to medications, life style modifications, devices where necessary
• Predisposing and precipitating factors, preventive medicine
THANK YOU FOR YOUR ATTENTION...
LCZ 696: Angiotensin Receptor Neprilysin Inhibitor

Natriuretic Peptide System

- pro-BNP
- BNP
- NT-pro BNP
- Neprilysin
- Inactive fragments
- Vasodilation
  - ↓ blood pressure
  - ↓ sympathetic tone
  - ↓ aldosterone levels
  - ↓ fibrosis
  - ↓ hypertrophy
  - Natriuresis/Diuresis

Heart Failure

- LCZ696

Renin Angiotensin System

- Angiotensinogen (liver secretion)
- Angiotensin I
- Angiotensin II
- AT₁ receptor
- Vasoconstriction
  - ↑ blood pressure
  - ↑ sympathetic tone
  - ↑ aldosterone
  - ↑ fibrosis
  - ↑ hypertrophy

AHU377
LBQ657 Valsartan
PARADIGM HF
Cardiovascular death / Heart Failure hospitalisation

HR = 0.80 (0.73-0.87)
P = 0.0000002
Number needed to treat = 21

JMV McMurray et al, NEJM 2014 online
Angiotensin receptor neprilysin inhibitor (Sacubitril/Valsartan)

- **LCZ 696 is indicated in patients with:**
  - ambulatory, symptomatic HFrEF
  - LVEF ≤35%
  - elevated plasma NP levels (BNP ≥150 pg/mL or NT-proBNP ≥600 pg/mL)
  - estimated GFR (eGFR) ≥30 mL/min/1.73 m² of body surface area
  - who are able to tolerate treatment with enalapril (at least 10 mg b.i.d.)

- **Side effects:**
  - symptomatic hypotension.
  - risk of angioedema (ACEI should be withheld for at least 36 h before initiating LCZ696).
Ivabradine is indicated in patients with:
- symptomatic HFrEF and LVEF ≤35%
- in sinus rhythm and with a heart rate ≥70 bpm
- who had been hospitalized for HF within the previous 12 months.

The European Medicines Agency (EMA) approved ivabradine for use in Europe in patients with HFrEF with LVEF ≤35% and in sinus rhythm with a resting heart rate ≥75 bpm, because in this group ivabradine conferred a survival benefit.

Main side effects: bradycardia, blurred vision
SHIFT
CV death / HF hospitalization

$p<0.0001$

Placebo
-18%

Ivabradine