

**New practice guidelines of the European Society of
Cardiology**
SubTitle: Main Session The ESC
Committee for Practice Guidelines

Management acute heart failure

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Nieminen M, Böhm M, Drexler H, Filippatos GS, Jondeau G, Hasin Y, Lopez-Sendon J, Mebazaa A, Metra M, Rhodes A, Swedberg K. Acute Heart Failure Guidelines. Eur Heart J 2005; 26:384-416

M.S.Nieminen, Div of Cardiology, Helsinki

For Task Force on ESC Guidelines on Acute Heart Failure

1



Goals of Treatment of Acute Heart Failure

**Improvement of symptoms
Clinical stabilization**

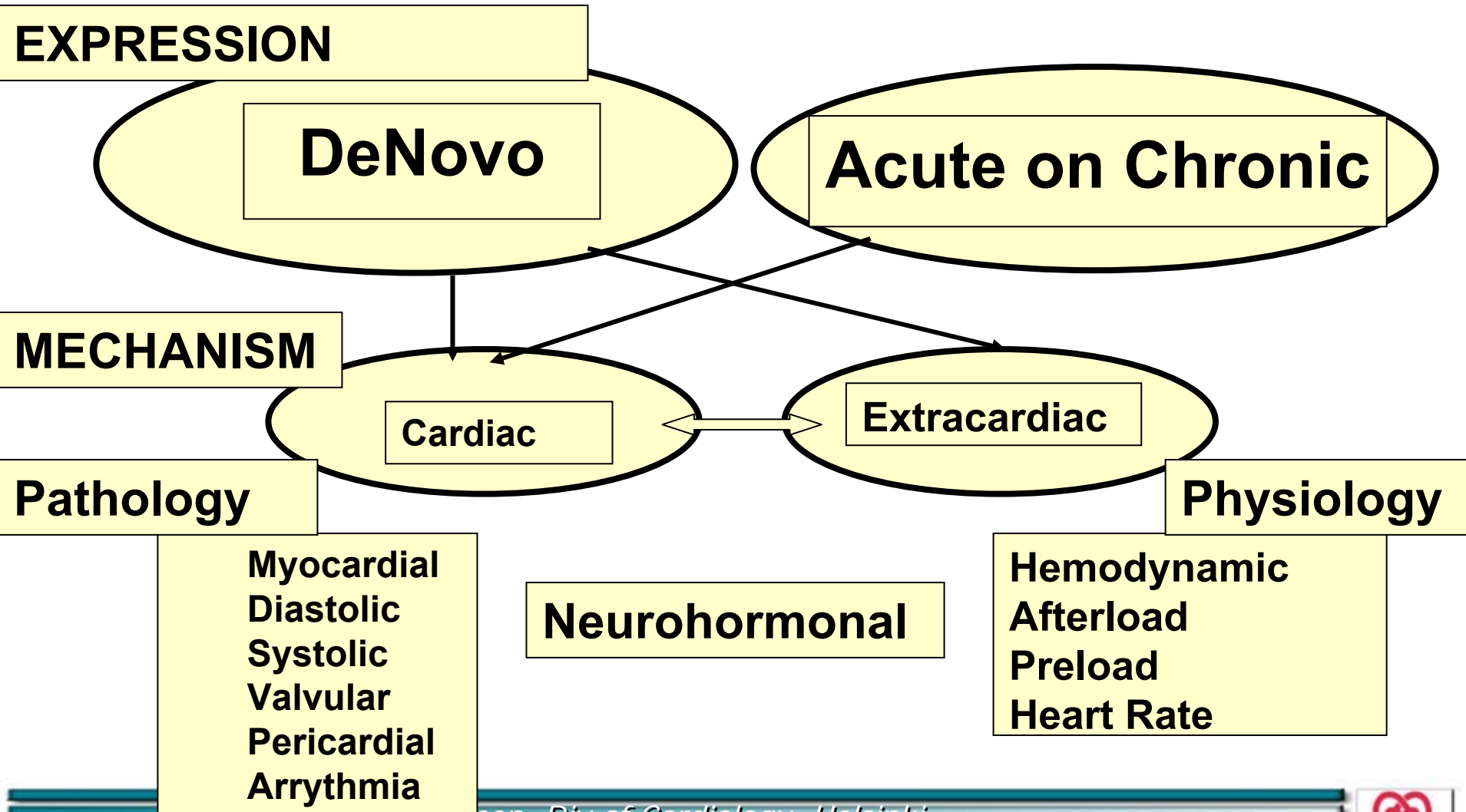
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**Avoidance /
limitation of
myocardial
damage**

Favorable effects
on long-term
prognosis

ACUTE HEART FAILURE AS A SYNDROME

TYPE and presentation OF ACUTE HEART FAILURE

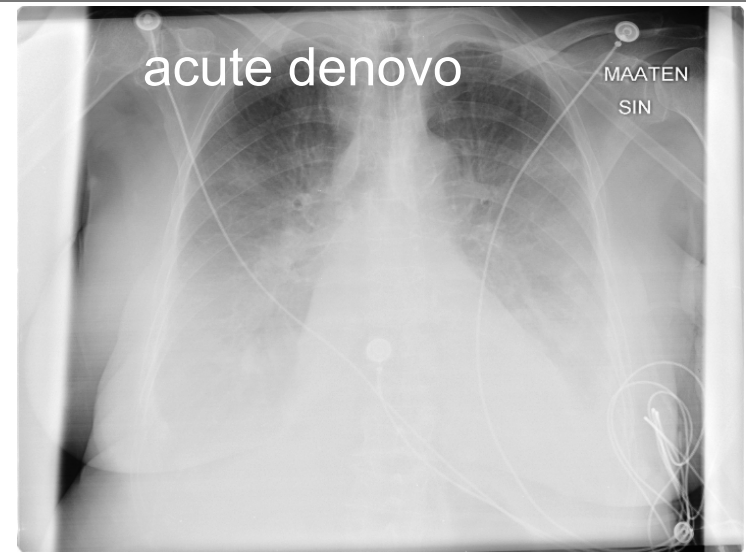


ACUTE HEART FAILURE PATIENT



In chronic decompensated HF circulatory system adapted

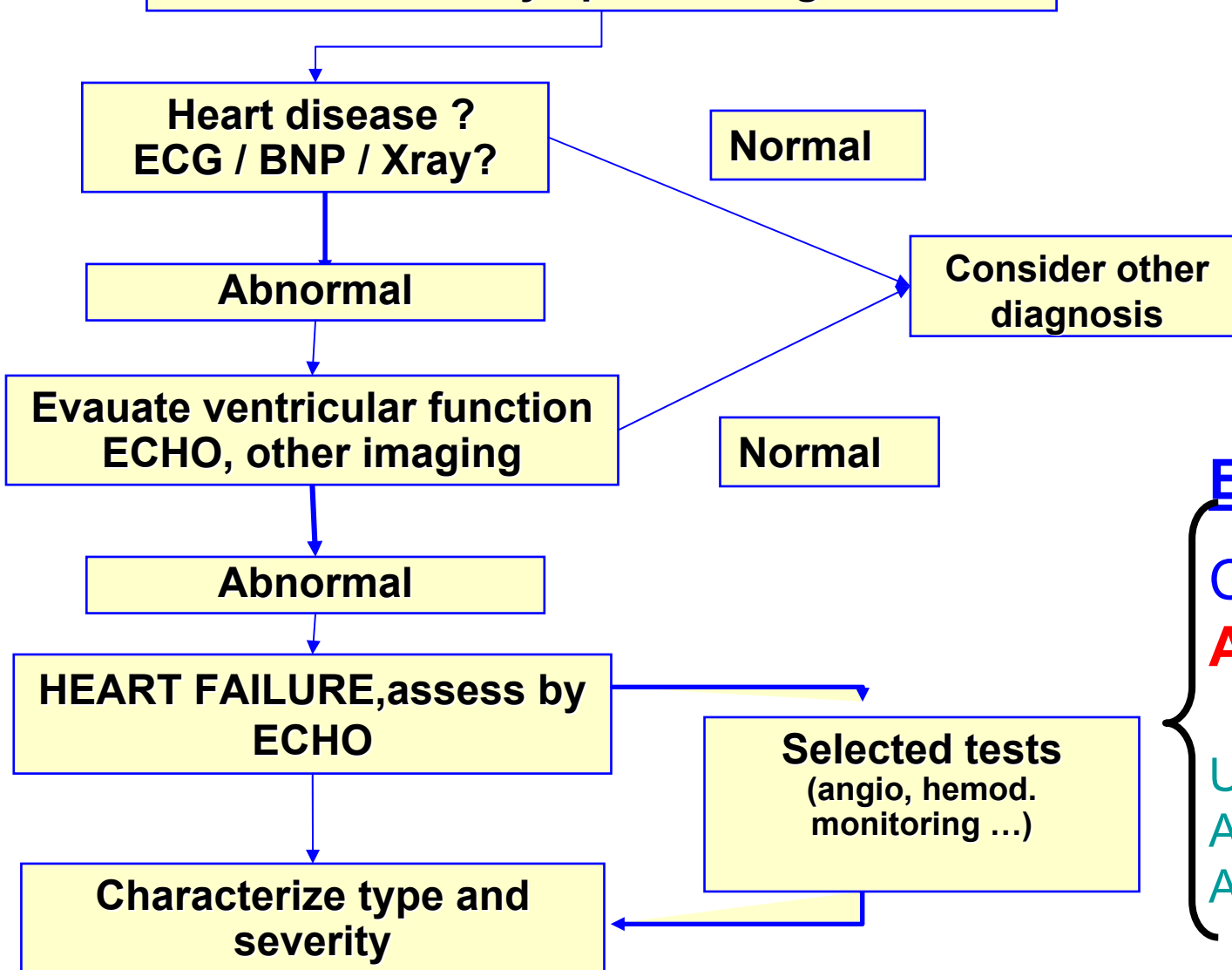
- responses more subtle
- easier to monitor clinically



In AHF hemodynamic regulation is strained and responses more abrupt

- no adaptation
- high sympathetic tone

Suspected Acute Heart Failure Assess Symptoms & signs



EH-HFII 2005:

CHD 60% in all
ACS 31.4

UAP 8,4
ACS STMI 12,4
ACS non STMI 10,6

TREATMENT ALGORITHM OF AHF

Treatment of Etiology

Treatment algorithm

Diagnosis
Individual acute therapy
After stabilization:
Bbl, ACEi, ie

Resuscitation

BLS, ALS, (O2)

Pain: analgesia

SPO2<95

yes

FiO2, CPAP

HR, arrythmia

yes

Pacing, arrythia med.

mBP>60-70

yes

Vasodil. /diuretic

Adequate preload

no

Fluid challenge

PAC

Adequate CO
Reversal of metab acidosis
SVO2>65

Inotropes, IABP

10. Medical Treatment of AHF

1. Morphine

2. Anticoagulation

3. Vasodilators

4. ACE inhibitors

5. Diuretics

6. Beta-blocking agents

7. Inotropic agents

Acute Heart Failure ESC Guidelines, Eur Heart J 2005; 26:384

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7



Morphine

- Indication
 - Early stages of AHF treatment, especially when associated with restlessness and dyspnea
- Effects
 - Venodilation & mild arterial vasodilation
 - ↓ heart rate
- Dosing
 - 3 mg boluses, which can be repeated

➤ **Class of recommendation IIb**

➤ **Level of evidence B**

Lee G et al, Am J Med, 1976

Acute Heart Failure ESC Guidelines, Eur Heart J 2005; 26:384

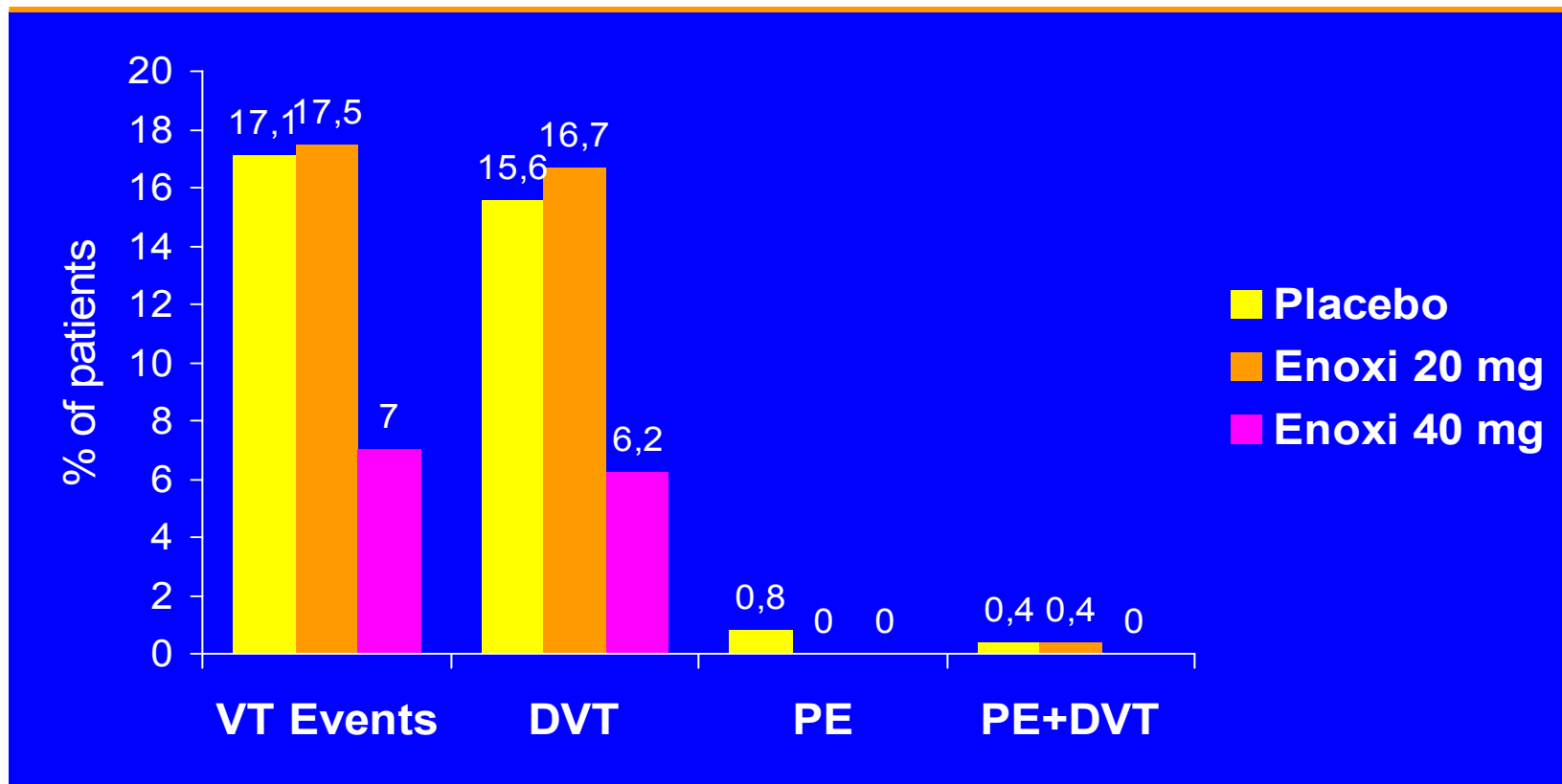
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Anticoagulation

- **Indication**
 - Well established in ACS or AFib, with or without AHF
 - Less evidence in AHF
- **Effects: *few studies!***
 - Enoxaparine s.c. vs placebo in acutely ill pts*
 - No clinical improvement
 - Less DVT
 - No studies of LMWH vs unfractionated heparin
- **Administration**
 - Careful monitoring of coagulation system
 - If Creatinine Clearance < 30 mL/min LMWH
 - Contraindicated or
 - Used with extreme care with anti-Factor Xa level monitoring * ie. Samama, M. M. et al. N Engl J Med 1999;341:793-800
Acute Heart Failure ESC Guidelines, Eur Heart J 2005; 26:384

Incidence of Venous Thromboembolic Events at 1-110 days



VT = Venous thromboembolic events
 DVT = deep vein thrombosis
 PE = pulmonary embolism

Enoxaparin 40 mg vs placebo, RR(95%CI)
 VT events, 0.41 (0.25-0.68), $p < 0.001$
 DVT 0.40 (0.23-0.69), $p < 0.001$

Samama, M. M. et al. N Engl J Med 1999;341:793-800

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Table VI Indications and dosing of vasodilators in AHF***
Class I recommendation, Level of evidence B

Vasodilator	Indication	Dosing	Main side effects	Other
Nitrates, 5-mononitrate	AHF, when BP is adequate	Start 20ug/min, increase up to 200ug/min	Hypotension Headache	Tolerance on continuous use
Isosorbide-dinitrate	AHF, when BP is adequate	Start with 1mg/h, >up to 10ug/h	Hypotension Headache	Tolerance on continuous use
Nitroprusside	Hypertensive crisis, Cardiogenic shock with inotropes	0,3 – 5ug/kg/min	Hypotension Isocyanate toxicity	Light sensitive
Nesiritide* Limited sales approval in ESC countries	ADHF	Bolus 2mcg/kg + infusion 0,015-0,03ug/kg/min	Hypotension	

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recommended after
stabilization**
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Diuretics: Practical Use

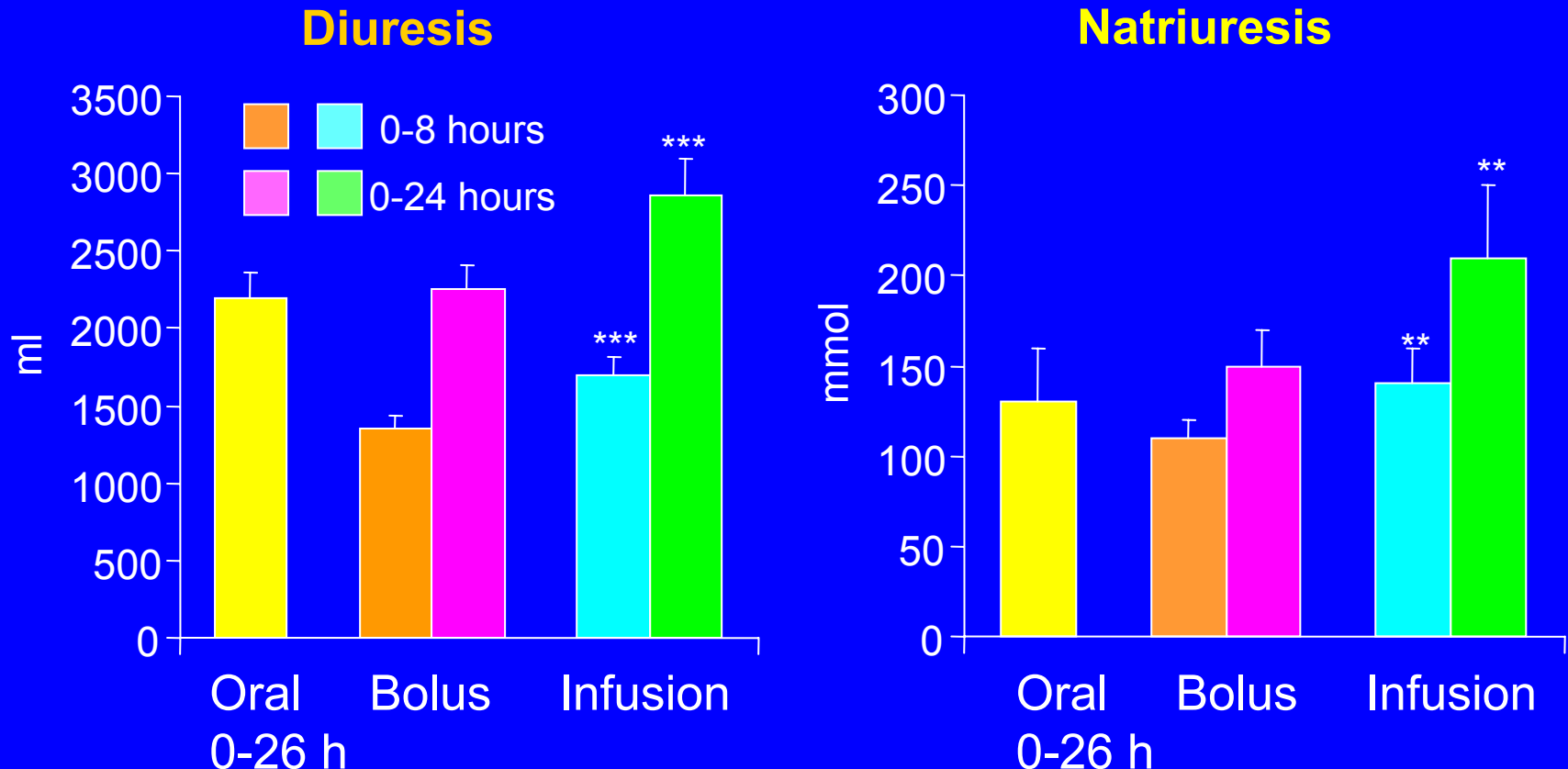
Class IIb, level of evidence C

- **Prefer i.v. loop diuretics (furosemide, ie.)**
 - **Therapy can be safely initiated before hospital admission**
- **Start with individualized doses according to clinical conditions**
 - **Furosemide, 20-40 to 40-100 mg boluses and/or with infusion at 5-40 mg/h**
- **Titrate according to clinical response and follow-up**
- **Thiazides & spironolactone can be combined**
 - **Combinations are more effective and with fewer side effects than increasing diuretic dose**
- **Dobutamine, dopamine and/or nitrates can be used in combination in severe heart failure**

Acute Heart Failure ESC Guidelines, Eur Heart J 2005; 26:384

Diuretic Efficacy of Bolus Injection versus Continuous Furosemide Infusion in Severe HF

Dormans et al., JACC 1996;28:376



Infusion: 20% of the total dose as a bolus followed by an 8 hours
i.v. infusion at the rate of 10% of the total dose per hour

Beta-blocking Agents: Indications

- AHF considered a contraindication for beta-blockade
 - No study of beta-blocking therapy targeted at improving AHF
 - Patients with $>$ basal pulmonary rales or hypotension excluded from BB trials in AMI
- **In AMI, beta-blockers \downarrow infarct size, arrhythmias and painGreater \downarrow mortality & morbidity in pts with pulmonary congestion**
- **Intravenous BBLs should be considered in pts with:**
 - **Ischemic chest pain resistant to opiates**
 - **Recurrent ischemia**
 - **Hypertension**
 - **Tachycardia**
 - **Tachyarrhythmias**

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Beta-blocking Agents: Practical Use

- Use cautiously in patients with overt AHF and $>$ basal pulmonary rales
 - Consider i.v. metoprolol if
 - Ongoing ischemia
 - Tachycardia
 - Class IIb recommendation, level of evidence C
- Patients with AMI who stabilize after AHF
 - Start early beta-blocker Rx
 - Class IIa recommendation, level of evidence B
- Patients with chronic HF
 - Start after AHF stabilization (usually $>$ 4 days)
 - Class I recommendation, level of evidence A

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Inotropic Agents: Indications

- Peripheral hypoperfusion
 - Hypotension, ↓ renal function
- With or without congestion or pulmonary edema
- Refractory to diuretics & vasodilators at optimal doses
- **Class IIa recommendation, level of evidence C**
- Their use is potentially harmful (Optime, First, Lido)
 - ↑ MVO_2 / ↑ Ca loading
- Should be used with caution

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Table XII Administration of positive inotropic agents

	Bolus	Infusion rate
Dobutamine	No	2 to 20-40 $\mu\text{g}/\text{kg}/\text{min}$ ($\beta+$)
Dopamine	No	<3 $\mu\text{g}/\text{kg}/\text{min}$: renal effect ($\delta+$) 3-5 $\mu\text{g}/\text{kg}/\text{min}$: I + >5 $\mu\text{g}/\text{kg}/\text{min}$: , I + , vasoprr ($\alpha+$)
Milrinone	25-75 $\mu\text{g}/\text{kg}/\text{min}$ over 10-20 min	0.375-0.75 $\mu\text{g}/\text{kg}/\text{min}$
Enoximone	0.25-0.75 $\mu\text{g}/\text{kg}$	1.25-7.5 $\mu\text{g}/\text{kg}/\text{min}$
Levosimendan	12 $\mu\text{g}/\text{kg}/\text{min}$ * over 10 min	0.1 $\mu\text{g}/\text{kg}/\text{min}$ which can be decreased to 0.05 or increased to 2 $\mu\text{g}/\text{kg}/\text{min}$
Epinephrine Norepinephrine		0,2 –1.0 $\mu\text{g}/\text{kg}/\text{min}$

* current recommended dosing, in unstable heart failure initiation of therapy without bolus is recommended

AHF with Systolic Dysfunction

Oxygen, CPAP
Furosemide ± Vasodilator
Clinical evaluation (leading to mechanistic therapy)

SBP > 100 mmHg

Vasodilator
(NTG, SNP, BNP)

Good response
Oral therapy
Furosemide, ACEi

SBP 85 -100 mmHg

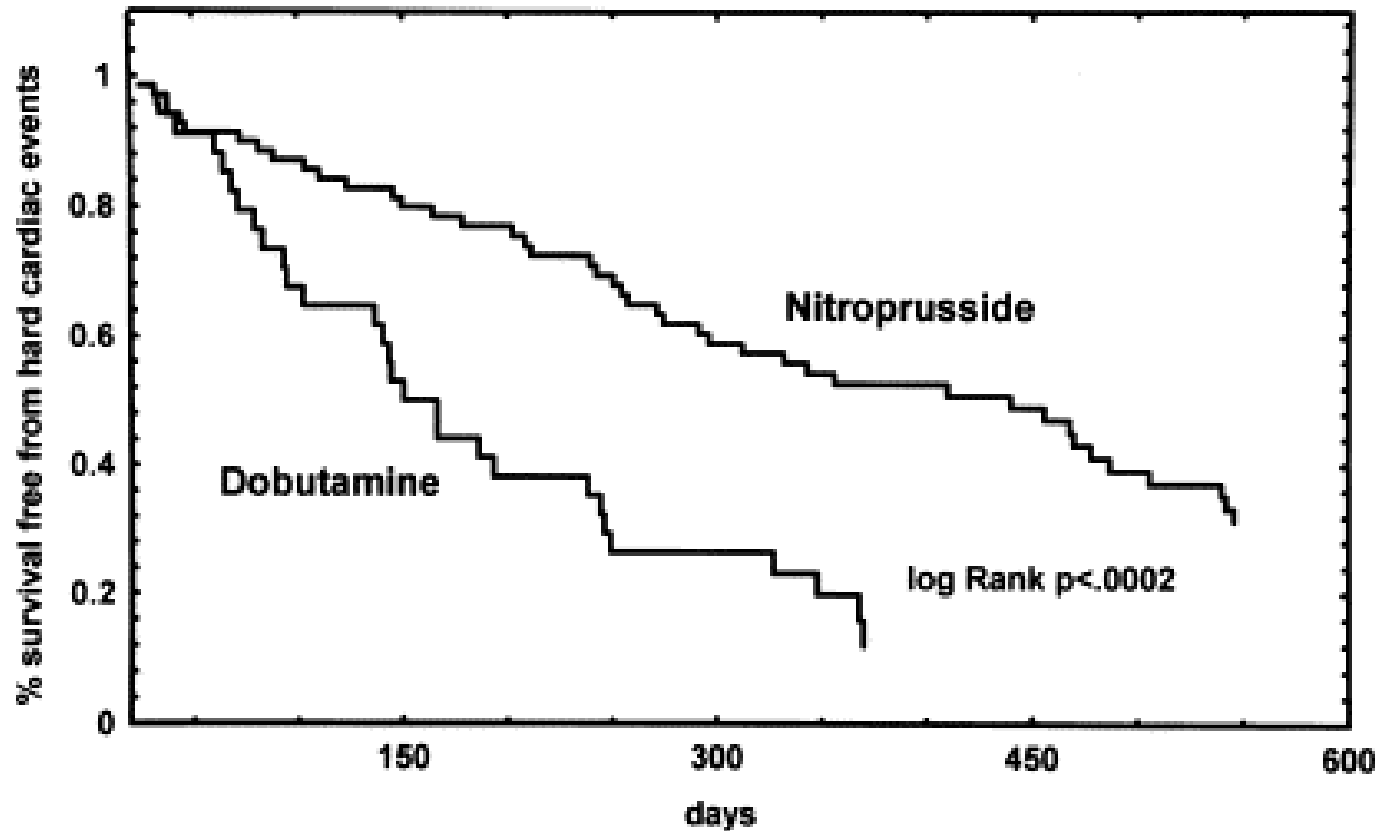
Vasodilator and/or inotropic
(dobutamine, PDEi,
levosimendan)

SBP < 85 mmHg

Volume loading ?
Inotrope and/or
DA >5 µg/kg/min
and/or NE

No response
Reconsider mechanistic therapy
Inotropic agents

Chronic infusion of dobutamine and nitroprusside in patients with end-stage heart failure awaiting heart transplantation: safety and clinical outcome



Capomolla et al, *Eur J Heart Fail.* 2001;3(5):601-10

Practical Use of PDEi

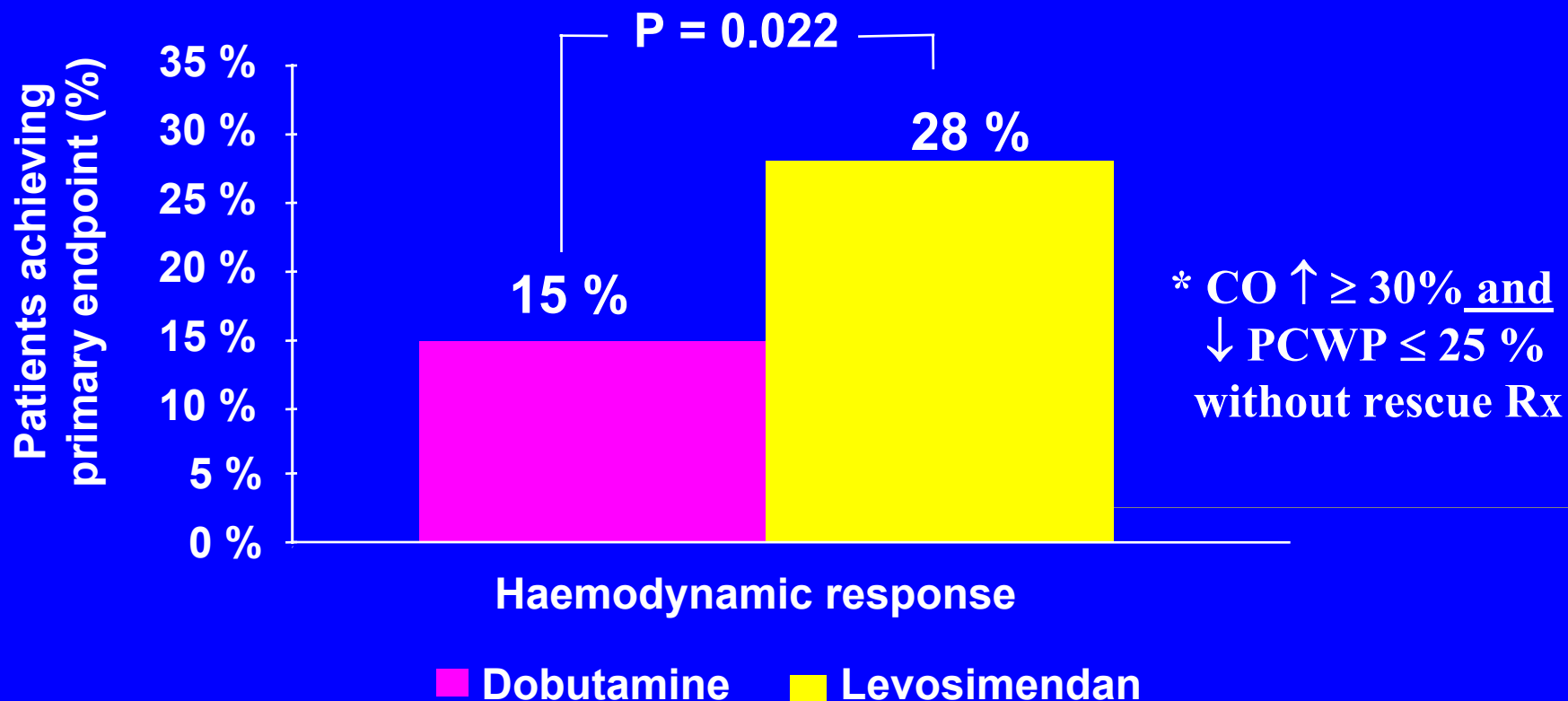
- **Mode of administration**
 - Bolus (milrinone 25-75ug/kg in 10-20min, enoximone, 0.25-0.75 mg/kg)
 - Followed by continuous infusion (milrinone 0.375-0.75ug/kg/min, enoximone 1.25 – 7.5 µg/kg/min)
- **Untoward effects**
 - Hypotension (pts with low filling pressures!)
 - Thrombocytopenia (0.4%)
 - Arrhythmias
- **Insufficient data on outcome**
- **Concerns about safety, particularly in CAD**

Levosimendan: Mechanisms of Action

- Ca^{++} sensitization of the contractile proteins
 - Inotropic effect
- Smooth muscle K^+ channel opening
 - Peripheral vasodilation
- PDEi (according to some data)
- Potent acetylated metabolite
 - Ca^{++} sensitizer, 80 hs half-life

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LIDO Trial: Patients achieving primary endpoint*



Follath et al. Lancet 2002

OTHER ASPECT IN AHF

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- **11.0. Comorbidities in acute heart failure**
 - 11.1. Coronary artery disease
 - 11.2. Valvular disease
 - 11.4. Management of AHF from prosthetic valve thrombosis
 - 11.5. Aortic dissection
 - 11.6. AHF and hypertension
 - 11.7. Renal failure
 - 11.8. Arrhythmias and acute heart failure, brady- and tachy-
 - 11.9. Acute heart failure induced during surgery
- **12.0. Surgical treatment of acute heart failure**
 - 12.1. AHF complications related to AMI :
 - 12.1.1. Free wall rupture
 - 12.1.2. Postinfarction ventricular septal rupture (VSR)
 - 12.1.3. Acute mitral regurgitation (MR)
- **13.0. Mechanical assist devices**
 - 13.1. Indication
 - 13.1.1. Intraaortic balloon counterpulsation pump (IABC)
 - 13.1.2. Ventricular assist devices
 - 13.1.3. Selection of candidates for device therapy
 - 13.2. Heart transplantation

Therapy / Medication	Level of Recommendation	Level of Evidence	Comments
CPAP/NIPV	II a	B	For hypoxemia and congestion or oedema
Diuretics	I	B	Dosing individual
Vasodilators	I	B	Effective therapy when clinically indicated
ACE i	Not recommended		Not as initial therapy, indicated after stabilization
Angiotensin II blocking agents	Not recommended		Not as initial therapy , indicated if ACEi intolerant
Betablocking agents	II a	B	Indicated when tolerated, first line therapy in tachycardia or after AMI
Inotropic agents	II b	B	In cardiogenic shock
Levosimendan	II a	B	In decompensated Heart failure

European Society of Cardiology Guidelines on Acute Heart Failure

- Patient care dependent on severity and etiology (several and combined)
- Management is based on etiology and mechanisms
- Current evidence and practical care described
- New controlled trials and means of care emerging – update in 2007-2008 by ESC