Acute Heart Failure

Update 2012

Prof. dr. Christiaan JM Vrints
University of Antwerp

www.escardio.org/acutecc

Saving lives is our mission

Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

ESC Guidelines HF 2012

European Heart Journal Advance Access published May 19, 2012

European Heart Journal
doi:10.1093/eurheartj/ehs104

ESC GUIDELINES

ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012

The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC

Authors/Task Force Members: John J. V. McMurray (Chairperson) (UK)*, Stamatis Adamopoulos (Greece), Stefan D. Anker (Germany), Angelo Auricchio (Switzerland), Michael Böhm (Germany), Kenneth Dickstein (Norway), Volkmar Falk (Switzerland), Gerasimos Filippatos (Greece), Cândida Fonseca (Portugal), Miguel Angel Gomez Sanchez (Spain), Tiny Jaarsma (Sweden), Lars Køber (Denmark), Gregory Y. H. Lip (UK), Aldo Pietro Maggioni (Italy), Alexander Parkhomenko (Ukraine), Burkert M. Pieske (Austria), Bogdan A. Popescu (Romania), Per K. Rønnevik (Norway), Frans H. Rutten (The Netherlands), Juerg Schwitter (Switzerland), Petar Seferovic (Serbia), Janina Stepinska (Poland), Pedro T. Trindade (Switzerland), Adriaan A. Voors (The Netherlands), Faiez Zannad (France), Andreas Zeiher (Germany).

Acute Heart Failure - Definition

- Acute heart failure (AHF) is defined as a rapid onset or change in the signs and symptoms of heart failure , resulting in the need for urgent therapy.
- AHF may be either new heart failure or worsening of pre-existing chronic heart failure.
- Patients may present as a medical emergency such as acute pulmonary oedema or cardiogenic shock.

Causes & precipitants of AHF

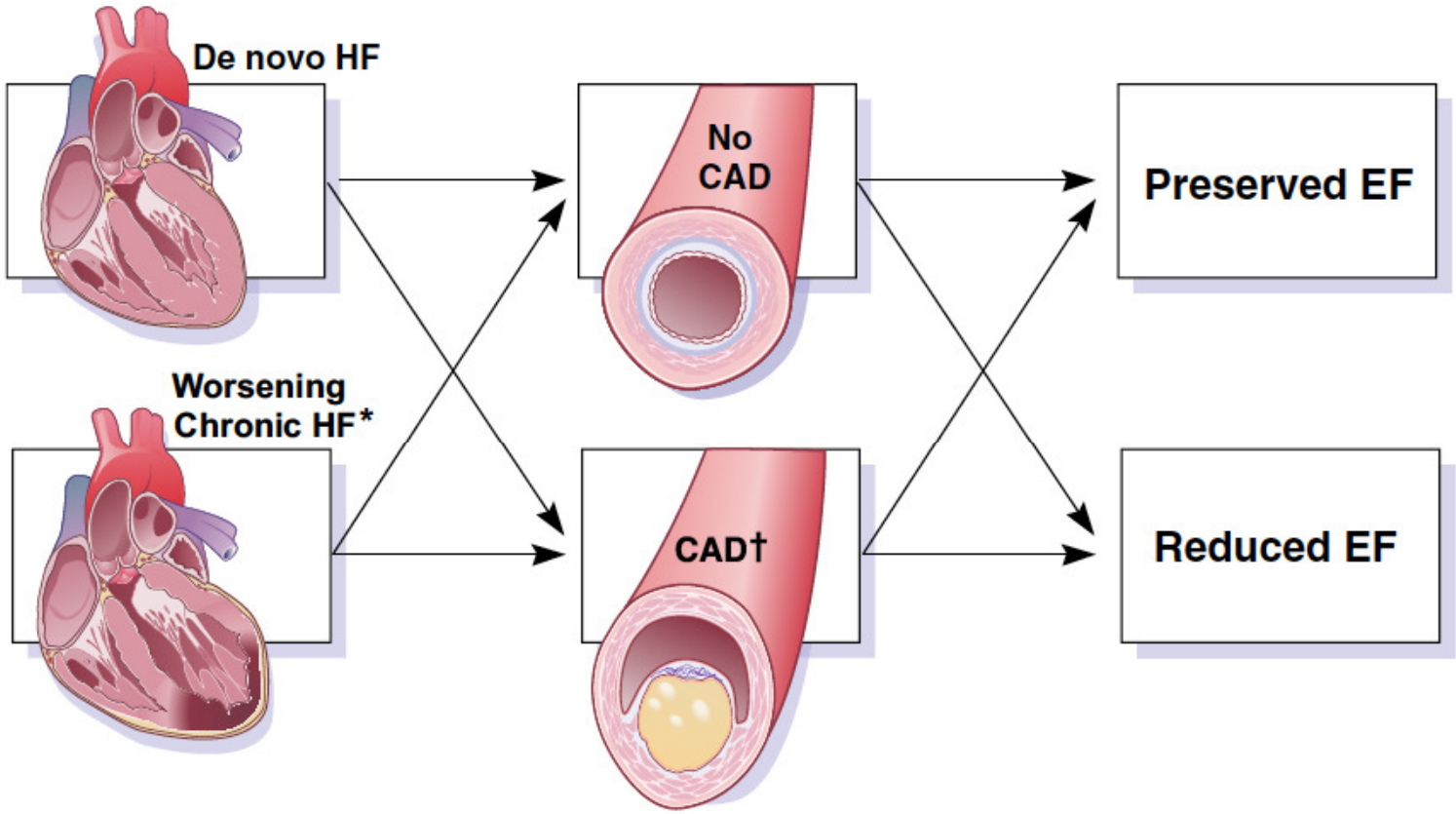
Usually leading to rapid deterioration

- Rapid arrhythmia or severe bradycardia/conduction disturbance
- Acute coronary syndrome (ACS)
- Mechanical complication of ACS (e.g. VSR, MV chordal rupture, RV infarction)
- Acute pulmonary embolism
- Hypertensive crisis
- Cardiac tamponade
- Aortic dissection
- Surgery and perioperative problems
- Peripartum cardiomyopathy

Usually leading to less rapid deterioration

- Infection (including infective endocarditis)
- Exacerbation of COPD/asthma
- Anaemia
- Kidney dysfunction
- Non-adherence to diet/drug therapy
- Iatrogenic causes (e.g. prescription of an NSAID or corticosteroid; drug interactions)
- Arrhythmias, bradycardia, and conduction disturbances not leading to sudden, severe change in heart rate
- Uncontrolled hypertension
- Hypothyroidism or hyperthyroidism
- Alcohol and drug abuse

Acute Heart Failure Syndromes

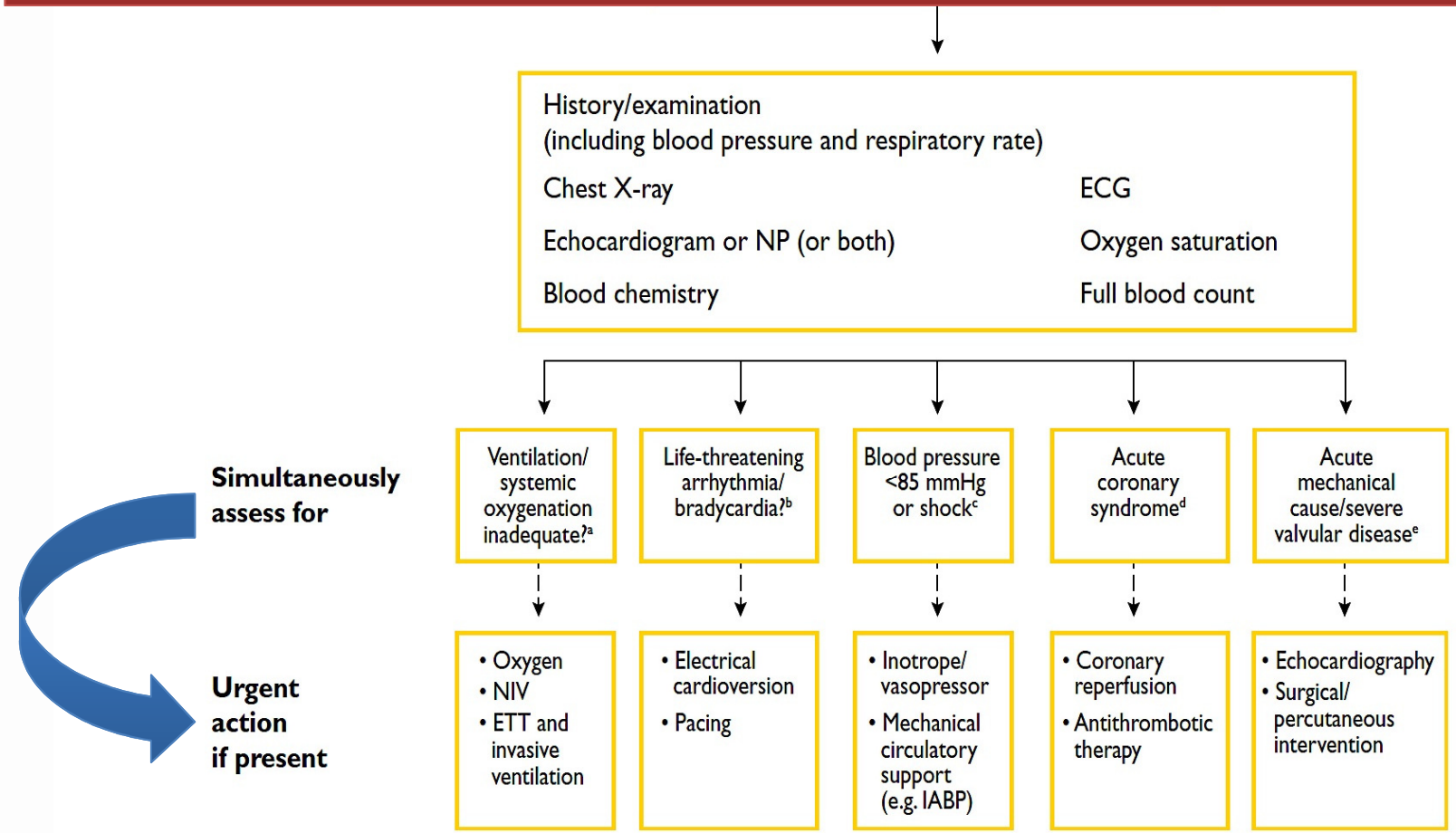


Evaluation of pts. with suspected AHF

3 important questions to be asked during **initial assessment**:

- Does the patient have **HF** or is there an **alternative cause** for their symptoms and signs (e.g. chronic lung disease, anaemia, kidney failure, or pulmonary embolism)?
- If the patient does have HF, is there a **precipitant** and does it require immediate treatment or correction (e.g. an arrhythmia or acute coronary syndrome)?
- Is the patient's condition **immediately life-threatening** because of hypoxaemia or hypotension leading to underperfusion of the vital organs (heart, kidneys, and brain)?

Evaluation of pts. with suspected AHF



Diagnosis and treatment are usually carried out in parallel, especially in patients who are particularly unwell, and management must be initiated promptly.

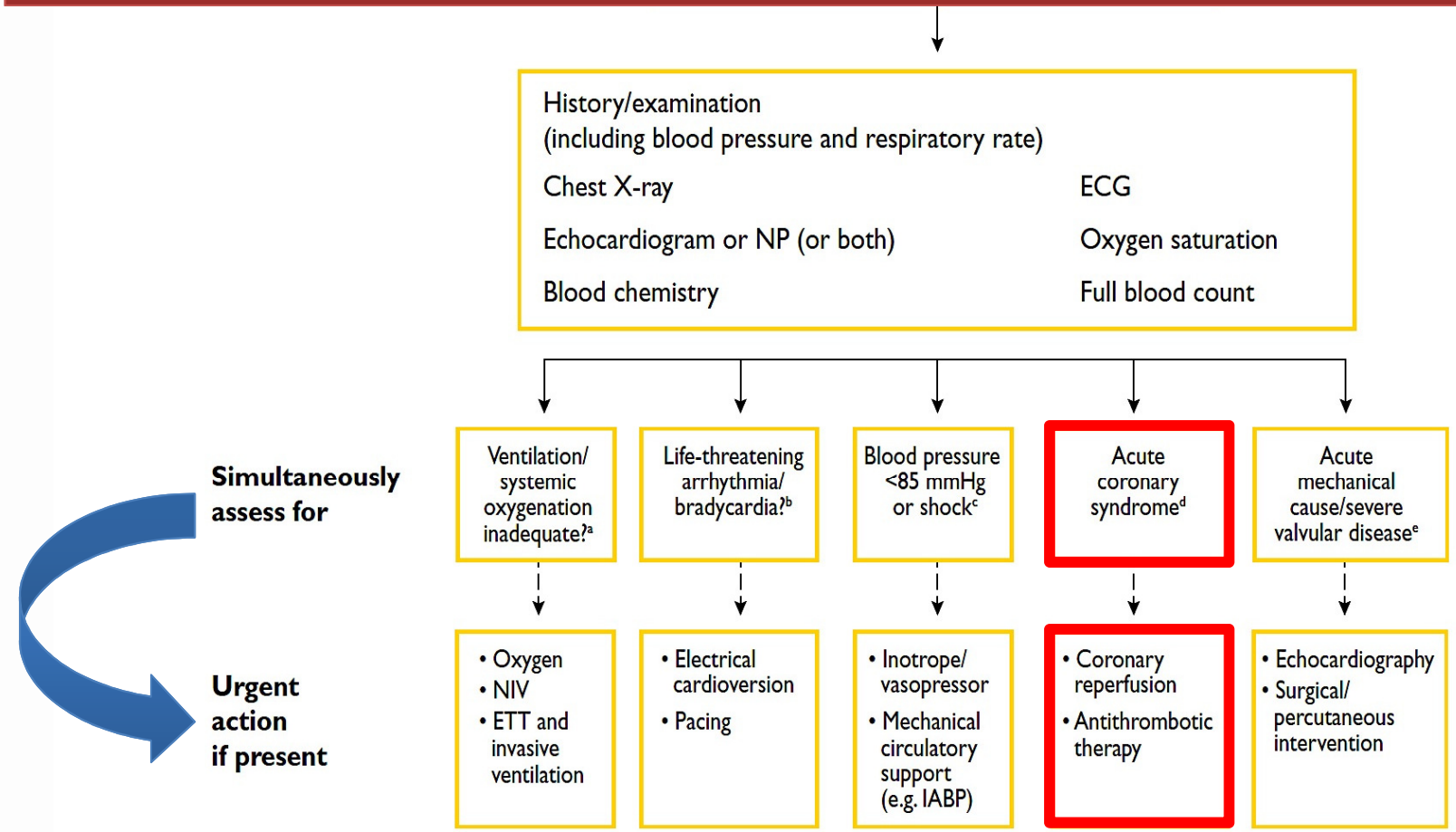
www.escardio.org/acutecc

Saving lives is our mission

Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

Evaluation of pts. with suspected AHF



Diagnosis and treatment are usually carried out in parallel, especially in patients who are particularly unwell, and management must be initiated promptly.

www.escardio.org/acutecc

Saving lives is our mission

Acute Cardiac Care
ESC Working Group

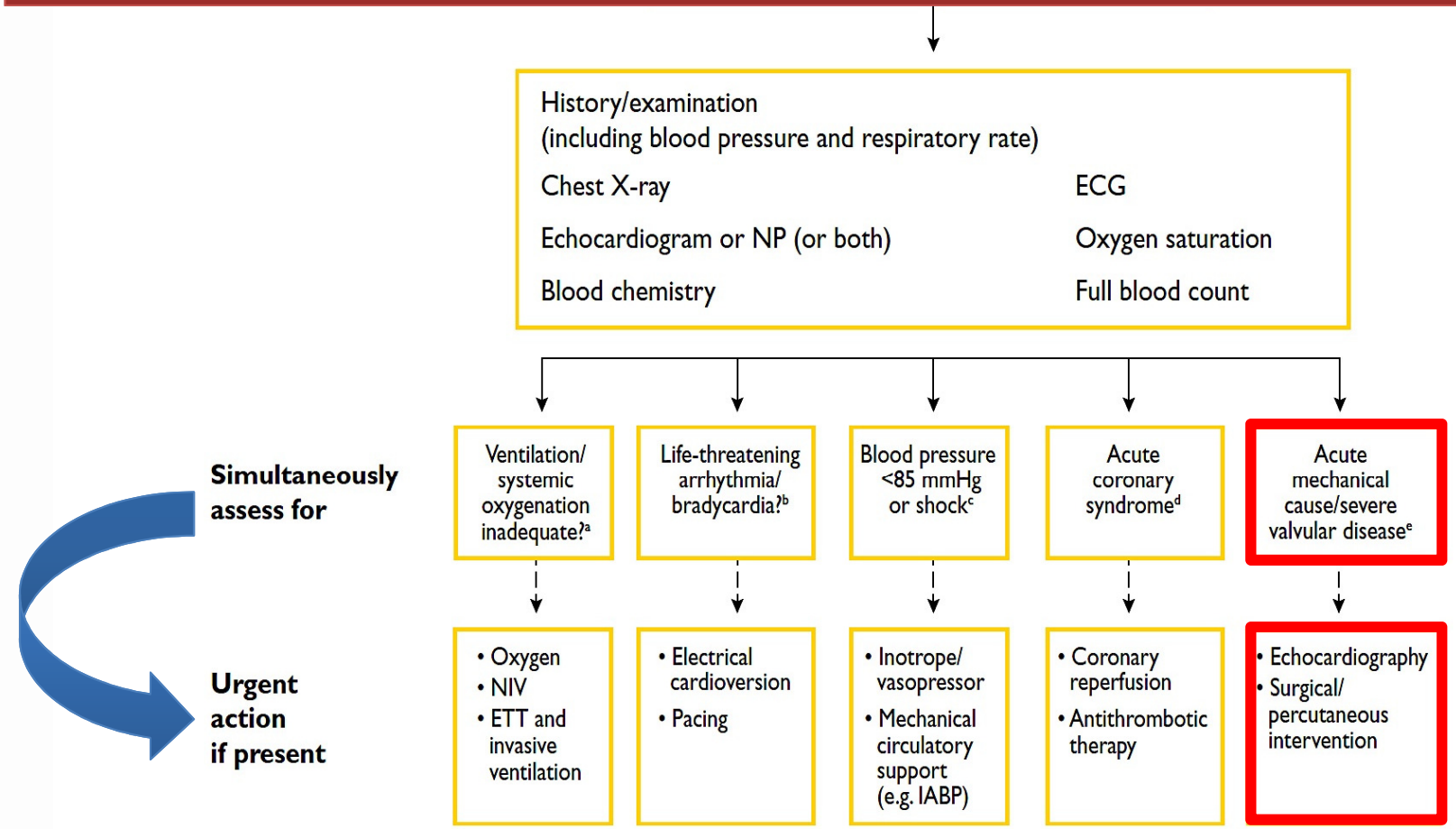
EUROPEAN SOCIETY OF CARDIOLOGY®

Treatment of acute heart failure:
acute coronary syndromes

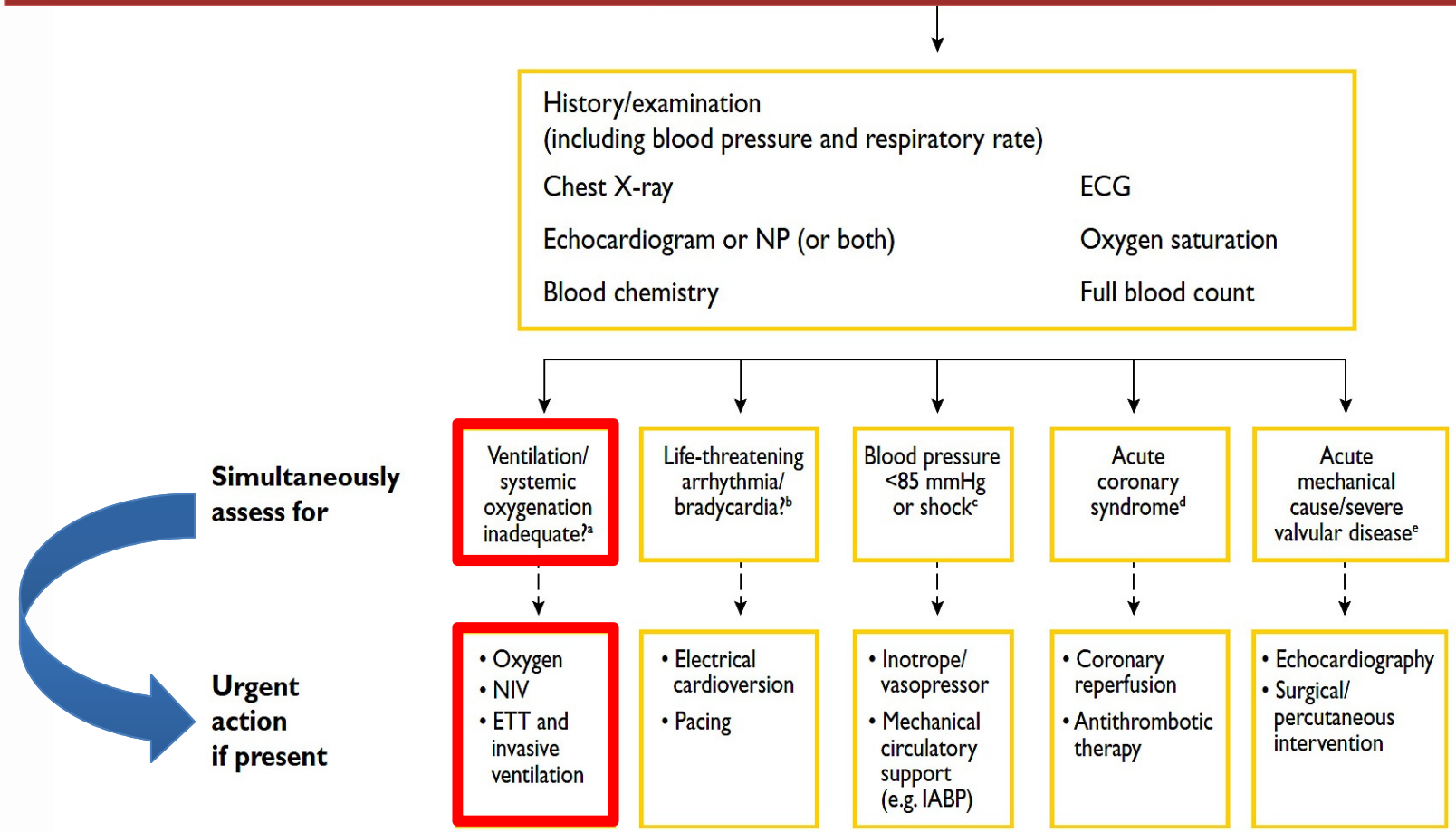
Immediate primary PCI (or CABG in selected cases) is recommended if there is an ST elevation or a new LBBB ACS in order to reduce the extent of myocyte necrosis and reduce the risk of premature death.	I	A
Alternative to PCI or CABG: *Intravenous thrombolytic therapy is recommended, if PCI/CABG cannot be performed, if there is ST-segment elevation or new LBBB, to reduce the extent of myocyte necrosis and reduce the risk of premature death.*	I	A
Early PCI (or CABG in selected patients) is recommended if there is non-ST elevation ACS in order to reduce the risk of recurrent ACS. Urgent revascularization is recommended if the patient is haemodynamically unstable.	I	A

An ACE inhibitor (or ARB) is recommended in patients with an EF ≤40%, after stabilization, to reduce the risk of death, recurrent myocardial infarction, and hospitalization for HF.	I	A
A beta-blocker is recommended in patients with an EF ≤40%, after stabilization, to reduce the risk of death and recurrent myocardial infarction.	I	B
An i.v. opiate (along with an antiemetic) should be considered in patients with ischaemic chest pain to relieve this symptom (and improve breathlessness). Alertness and ventilatory effort should be monitored frequently after administration because opiates can depress respiration.	IIa	C

Evaluation of pts. with suspected AHF



Evaluation of pts. with suspected AHF

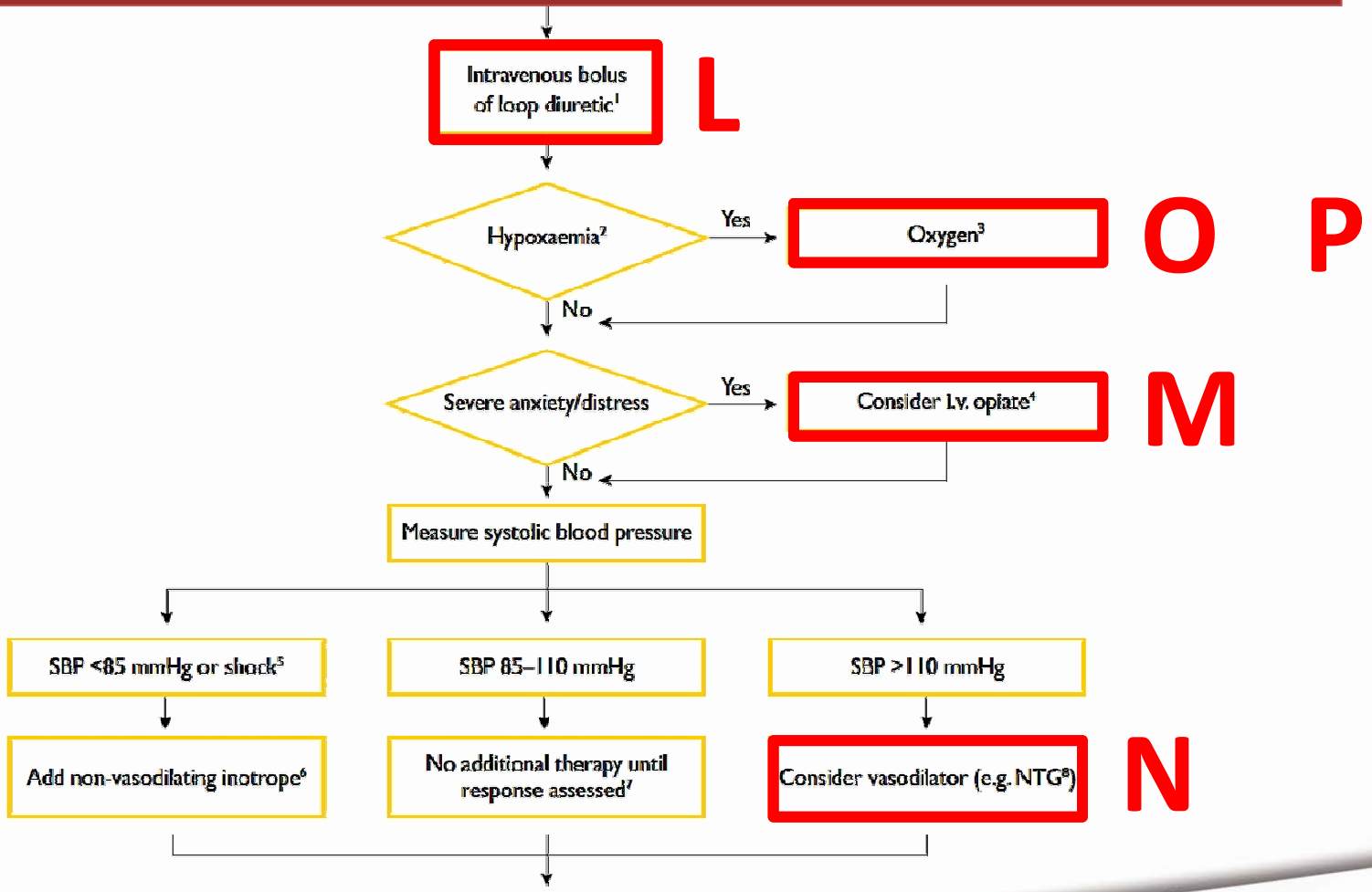


Treatment of acute heart fail
pulmonary congestion/oedema wit

L	An i.v. loop diuretic is recommended to improve breathlessness and relieve congestion. Sym… function, and electrolytes should be monitored regularly during use of i.v. diuretic.		B
O	High-flow oxygen is recommended in patients with a capillary oxygen saturation <9… to correct hypoxaemia.		C
	Thrombo-embolism prophylaxis (e.g. with LMWH) is recommended in pati… no contraindication to anticoagulation, to reduce the risk of deep veno…	I	A
	Non-invasive ventilation (e.g. CPAP) should be considered in dyspn… respiratory rate >20 breaths/min to improve breathlessness an… ventilation can reduce blood pressure and should not gener… …ssure <85 mmHg (and blood pressure should be monitored re…	IIa	B
M	An i.v. opiate (along with an antiemetic) should be … …tressed patients to relieve these symptoms and improve breathless… …nonitored frequently after administration because opiates can dep…	IIa	C
N	An i.v. infusion of a nitrate should be co… …oedema and a systolic blood pressure >110 mmHg, who d… …duce pulmonary capillary wedge pressure and systemic vascular r… …d congestion. Symptoms and blood pressure should be monitore…	IIa	B
	An i.v. infusion of sodium… …th pulmonary congestion/oedema and a systolic blood pressure >1… …or aortic stenosis, to reduce pulmonary capillary wedge pressure and systemic … …mmended in patients with acute myocardial infarction. Nitroprusside may also relieve dy… …ptoms and blood pressure should be monitored frequently during administration of i…	IIb	B
	Inotropic agents are NOT recommended … …atient is hypotensive (systolic blood pressure <85 mmHg), hypoperfused, or shocked because of safety co… …ns (atrial and ventricular arrhythmias, myocardial ischaemia, and death).	III	C

L M N O P

Acute pulmonary oedema/congestion



www.escardio.org/acutecc

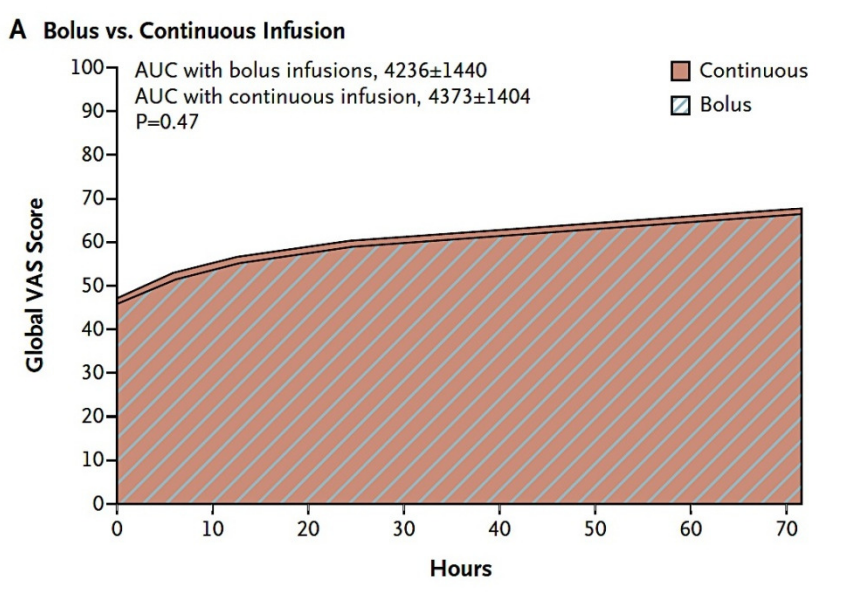
Saving lives is our mission

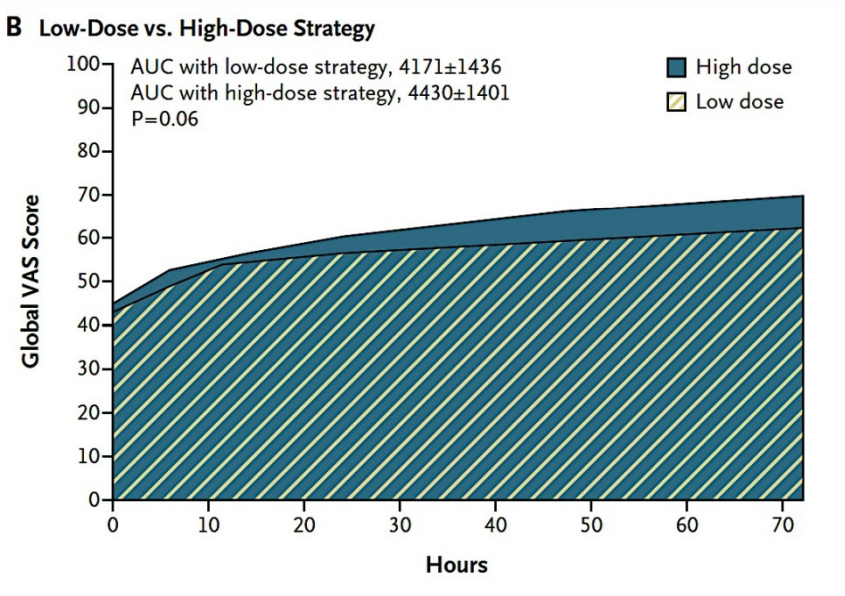
Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

Diuretic Strategies in Patients with Acute Decompensated Heart Failure: DOSE trial

Patients' Global Assessment of Symptoms during the 72-Hour Study-Treatment Period.





GM Felker et al.
N Engl J Med 2011;364:797-805

www.escardio.org/acutecc

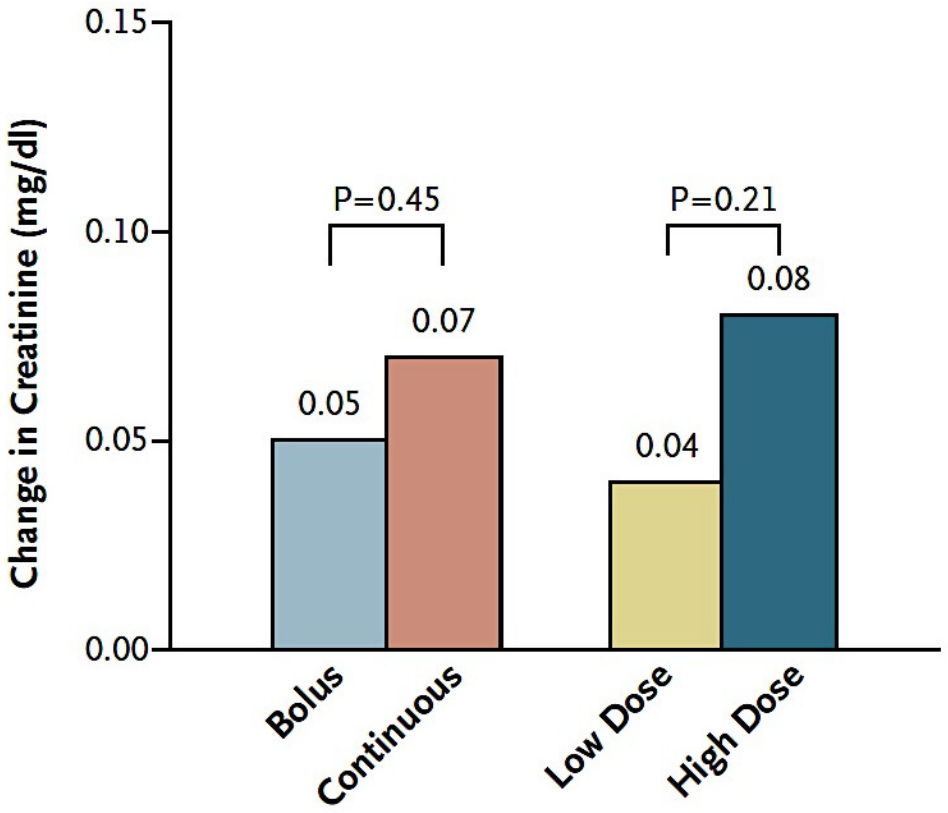
Saving lives is our mission

Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

Diuretic Strategies in Patients with Acute Decompensated Heart Failure: DOSE trial

Mean Change in Serum Creatinine Level.



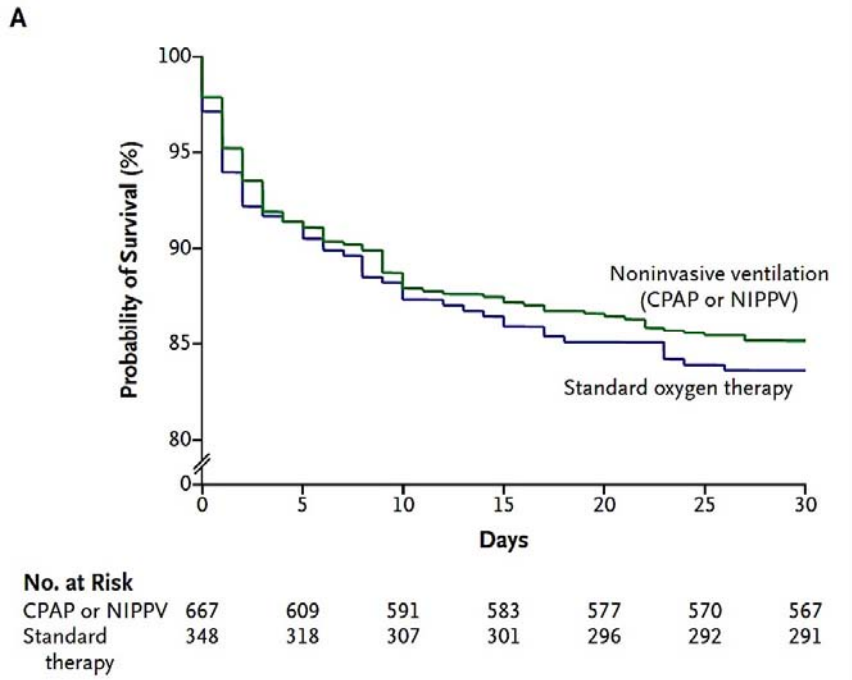
GM Felker et al.
N Engl J Med 2011;364:797-805

What are the implications of the DOSE trial?

- Since the DOSE trial demonstrated:
  - No benefit with a continuous infusion than with a regimen of intermittent boluses of diuretics.
  - A high dose of loop diuretics, as compared with a low dose, does not substantially worsen renal function.
- Therefore:
  - Since a high-dose regimen may relieve dyspnea more quickly without adverse effects on renal function, that regimen is preferable to a low-dose regimen.
  - Administration of boluses may be more convenient than continuous infusion and is equally effective.

Gregg C. Fonarow
N Engl J Med 2011; 364:877-878

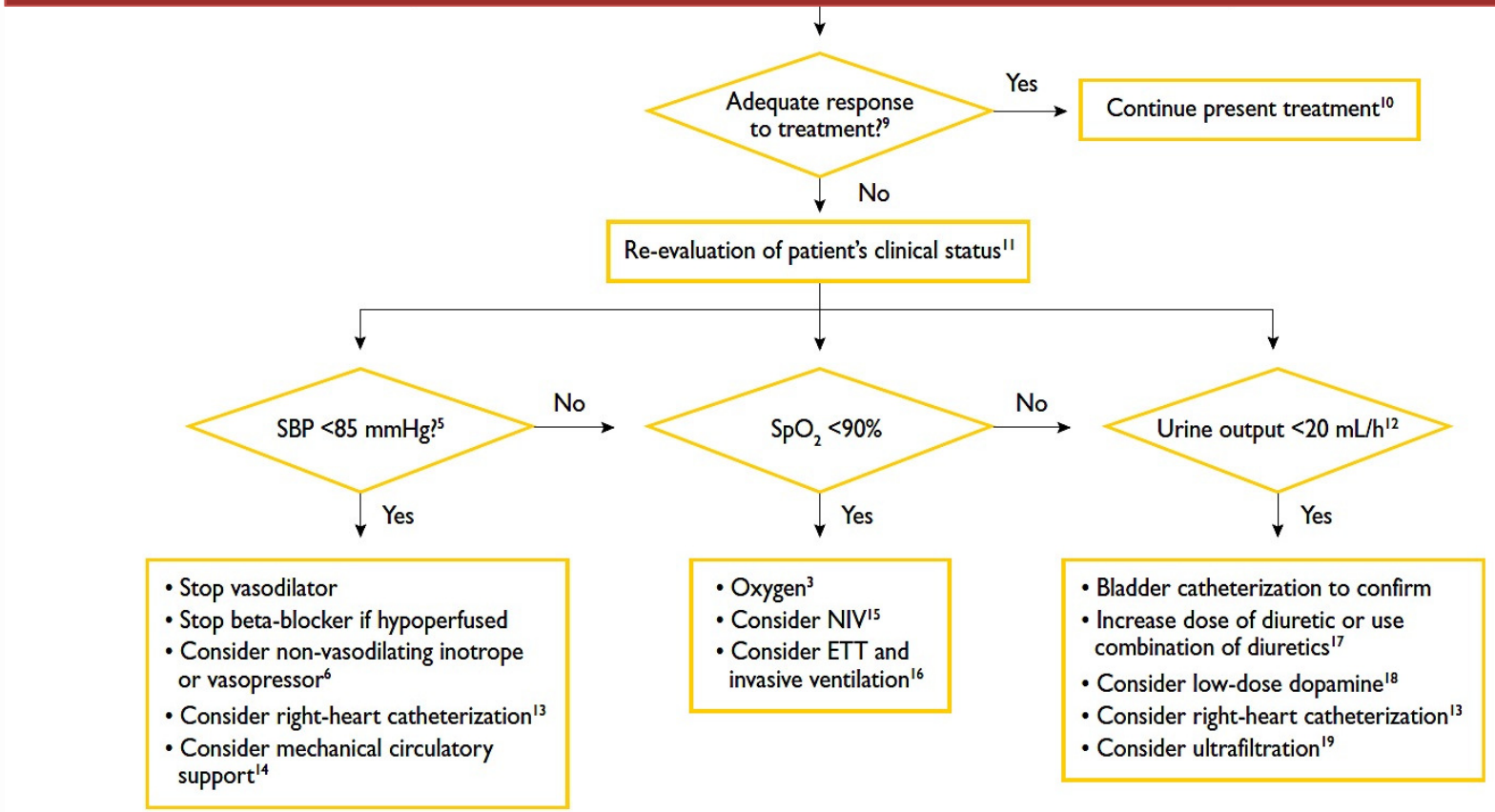
Acute pulmonary oedema
Non-Invasive Ventilation



In patients with acute pulmonary edema, NIV induces a more rapid improvement in respiratory distress and metabolic disturbance than does standard oxygen therapy but has no effect on short-term mortality **--> useful as adjunctive therapy**

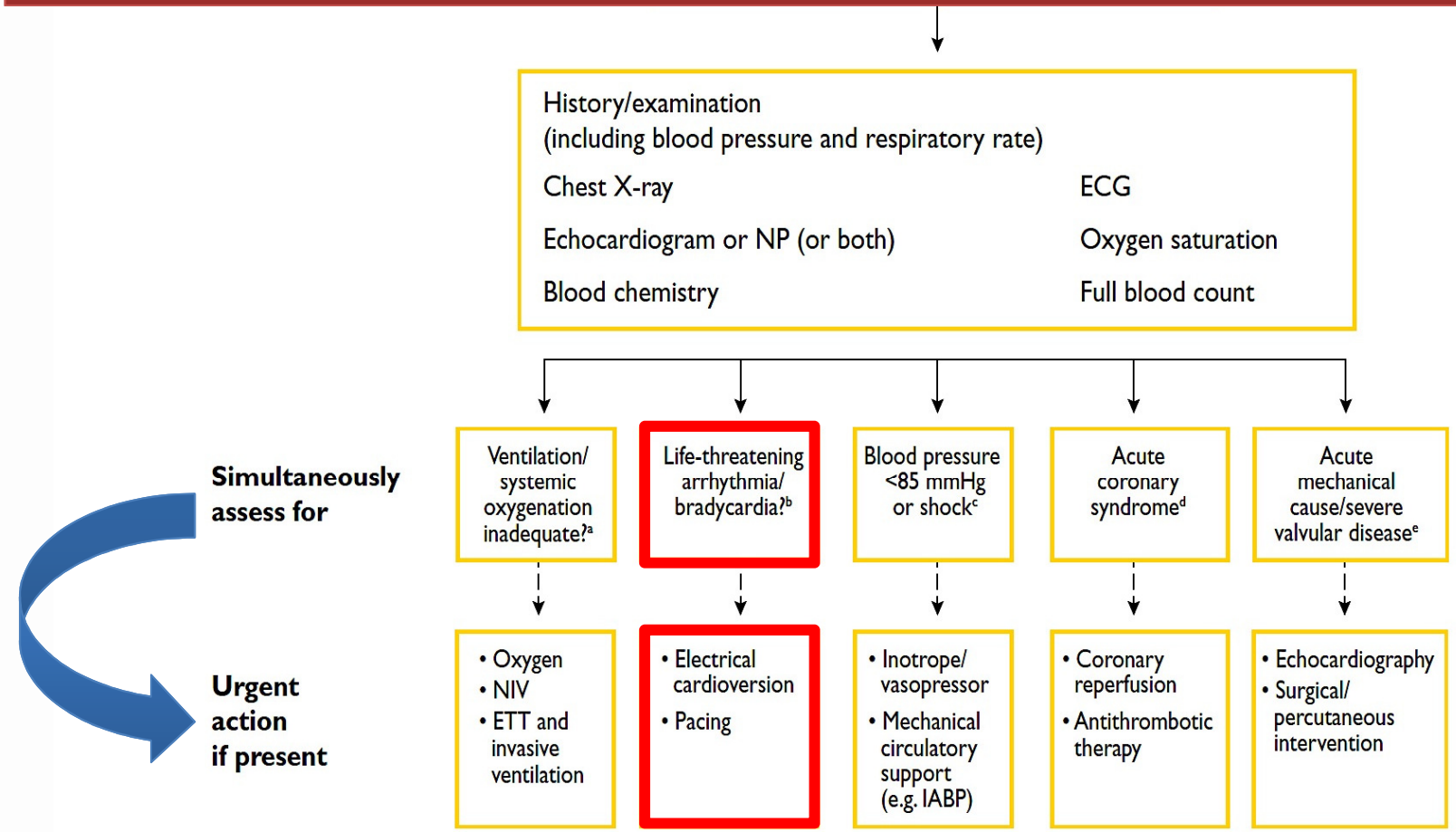
A Gray et al.
N Engl J Med 2008;359:142-51

Acute pulmonary oedema/congestion



CPAP = continuous positive airway pressure; ETT = endotracheal tube; i.v. = intravenous; NIPPV = non-invasive positive pressure ventilation; NIV = non-invasive ventilation; NTG = nitroglycerine; PaO_2 = partial pressure of oxygen; SBP = systolic blood pressure; SpO_2 = saturation of peripheral oxygen.

Evaluation of pts. with suspected AHF



Treatment of acute heart failure:
atrial fibrillation or bradycardia

Patients with AF and a rapid ventricular rate		
Patients should be fully anticoagulated (e.g. with i.v. heparin), if not already anticoagulated and with no contraindication to anticoagulation, as soon as AF is detected to reduce the risk of systemic arterial embolism and stroke.	I	A
Electrical cardioversion is recommended in patients haemodynamically compromised by AF and in whom urgent restoration of sinus rhythm is required to improve the patient's clinical condition rapidly.	I	C
Electrical cardioversion or pharmacological cardioversion with amiodarone should be considered in patients when a decision is made to restore sinus rhythm non-urgently ('rhythm control' strategy). This strategy should only be employed in patients with a first episode of AF of <48 h duration (or in patients with no evidence of left atrial appendage thrombus on TOE).	I	C
Intravenous administration of a cardiac glycoside should be considered for rapid control of the ventricular rate.	I	C
Dronedarone is not recommended because of safety concerns (increased risk of hospital admission for cardiovascular causes and an increased risk of premature death), particularly in patients with an EF ≤40%.	III	A
Class I antiarrhythmic agents are not recommended because of safety concerns (increased risk of premature death), particularly in patients with LV systolic dysfunction.	III	A
Patients with severe bradycardia or heart block		
Pacing is recommended in patients haemodynamically compromised by severe bradycardia or heart block to improve the patient's clinical condition.	I	C

Digoxin: back to the Future?

European Heart Journal (2012) **33**, 1137–1141
doi:10.1093/eurheartj/ehs004

CLINICAL RESEARCH
Heart failure/cardiomyopathy

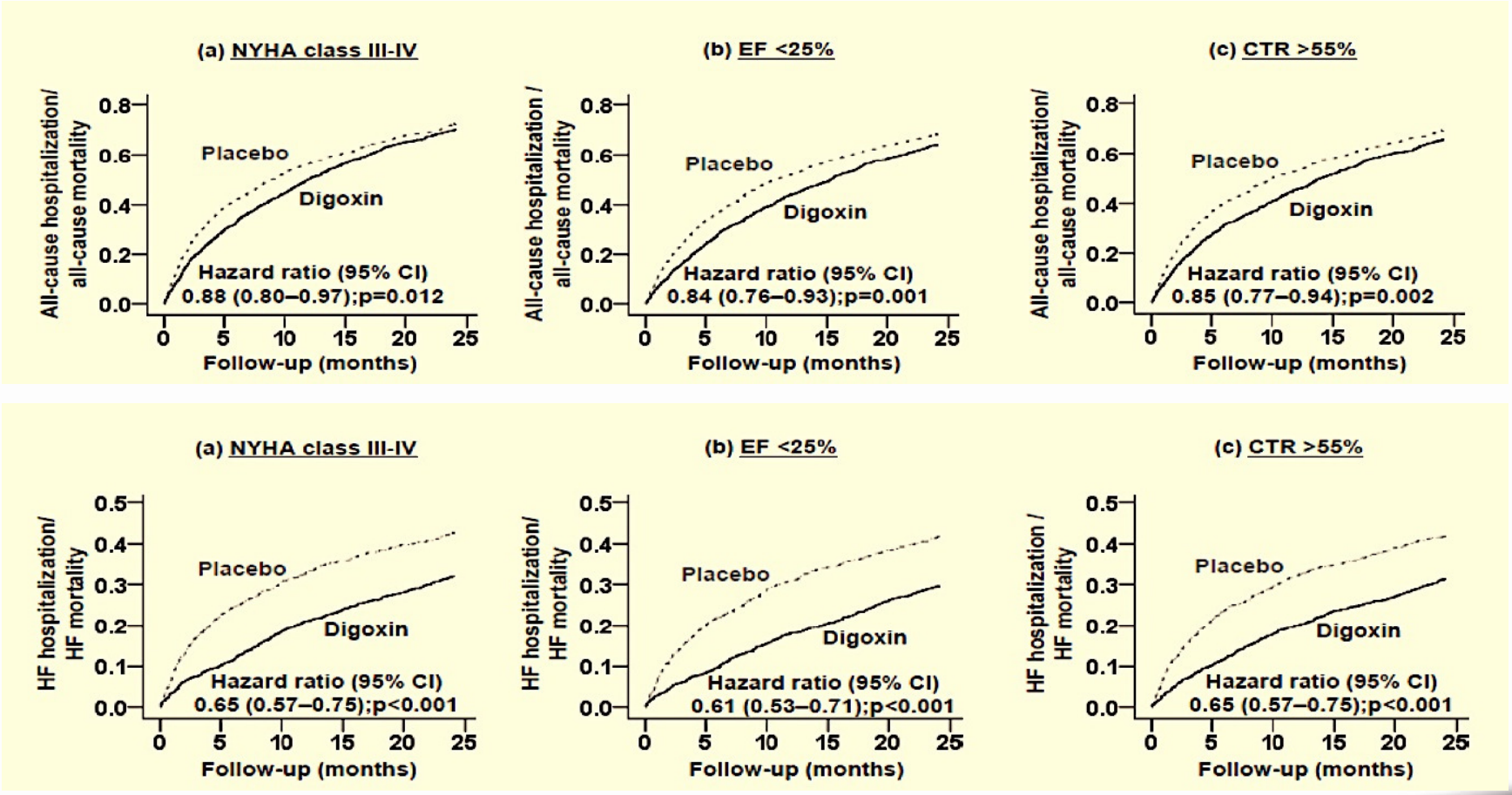
Should we SHIFT our thinking about digoxin? Observations on ivabradine and heart rate reduction in heart failure

Davide Castagno[1], Mark C. Petrie[2], Brian Claggett[3], and John McMurray[4]*

[1]Division of Cardiology, Department of Internal Medicine, University of Turin, Turin, Italy; [2]Advanced Heart Failure Service, Golden Jubilee National Hospital, Clydebank, Glasgow, UK; [3]Department of Biostatistics, Harvard School of Public Health, Boston, MA, USA; and [4]BHF Cardiovascular Research Centre, University of Glasgow, Glasgow G12 8QQ, UK

Received 9 October 2011; revised 15 December 2011; accepted 3 January 2012; online publish-ahead-of-print 8 March 2012

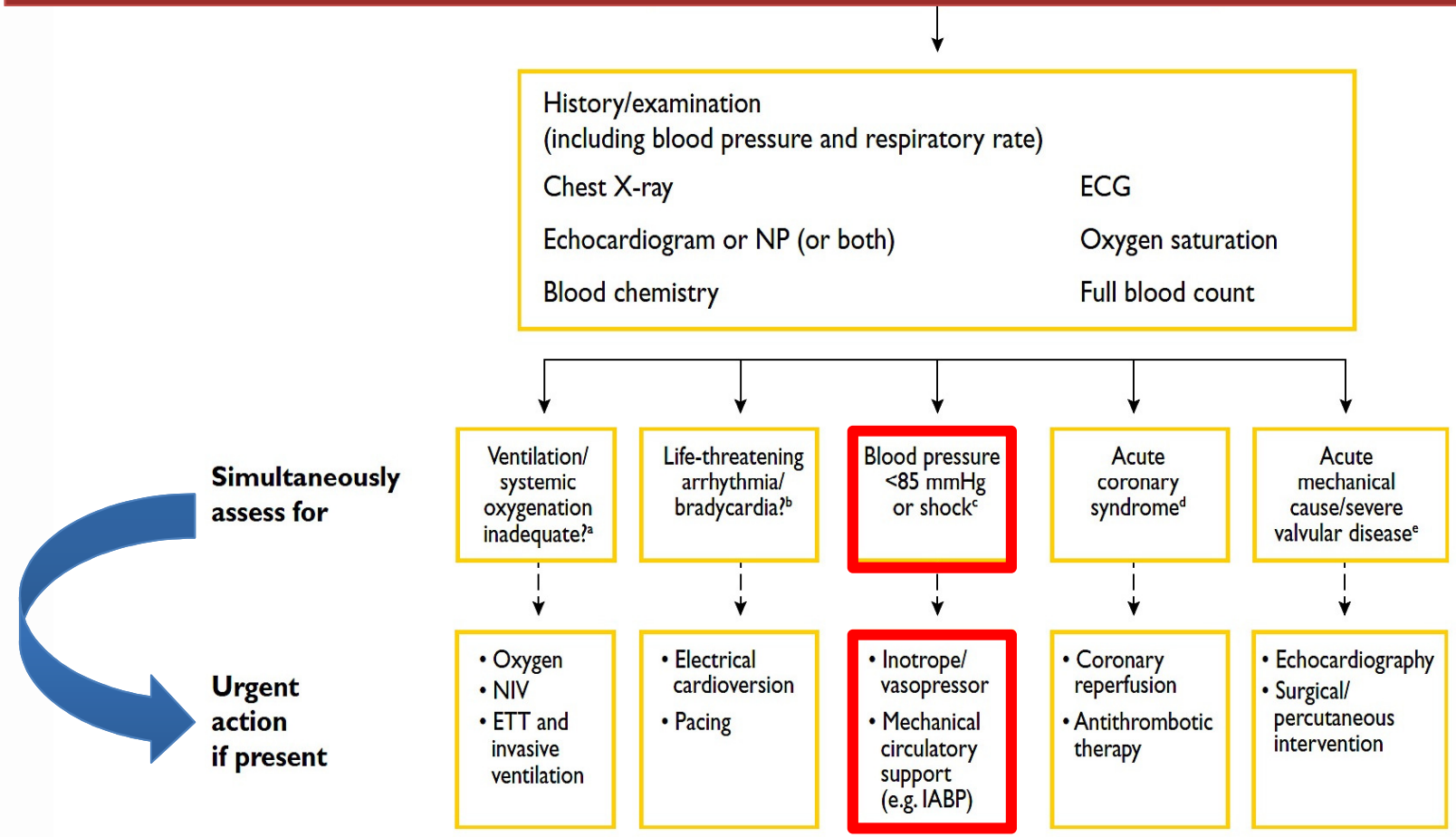
Digoxin: back to the Future?



Effect of digoxin in high risk HF in the DIG trial

M Gheorghiade
@ Heart Failure 2012

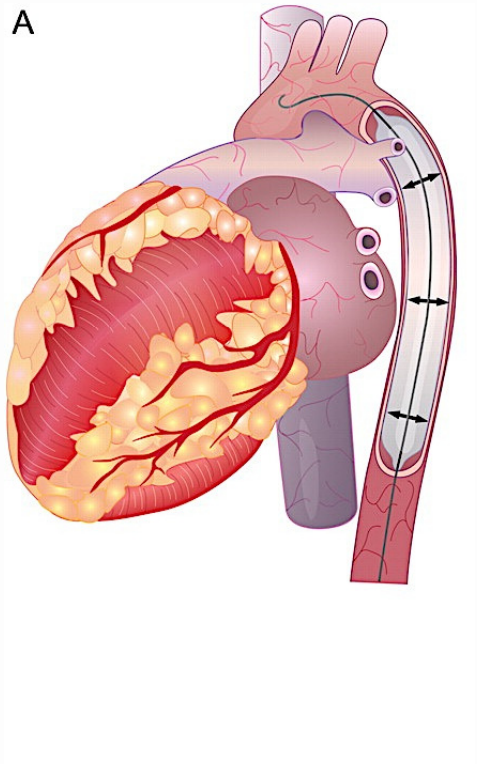
Evaluation of pts. with suspected AHF



Treatment of acute heart failure:
hypotension, hypoperfusion or shock

Electrical cardioversion is recommended if an atrial or ventricular arrhythmia is thought to be contributing to the patient's haemodynamic compromise in order to restore sinus rhythm and improve the patient's clinical condition.	I	C
An i.v. infusion of an inotrope (e.g. dobutamine) should be considered in patients with hypotension (systolic blood pressure <85 mmHg) and/or hypoperfusion to increase cardiac output, increase blood pressure, and improve peripheral perfusion. The ECG should be monitored continuously because inotropic agents can cause arrhythmias and myocardial ischaemia.	IIa	C
Short-term mechanical circulatory support should be considered (as a 'bridge to recovery') in patients remaining severely hypoperfused despite inotropic therapy and with a potentially reversible cause (e.g. viral myocarditis) or a potentially surgically correctable cause (e.g. acute interventricular septal rupture).	IIa	C
An i.v. infusion of levosimendan (or a phosphodiesterase inhibitor) may be considered to reverse the effect of beta-blockade if beta-blockade is thought to be contributing to hypoperfusion. The ECG should be monitored continuously because inotropic agents can cause arrhythmias and myocardial ischaemia, and, as these agents are also vasodilators, blood pressure should be monitored carefully.	IIb	C
A vasopressor (e.g. dopamine or norepinephrine) may be considered in patients who have cardiogenic shock, despite treatment with an inotrope, to increase blood pressure and vital organ perfusion. The ECG should be monitored as these agents can cause arrhythmias and/or myocardial ischaemia. Intra-arterial blood pressure measurement should be considered.	IIb	C
Short-term mechanical circulatory support may be considered (as a 'bridge to decision') in patients deteriorating rapidly before a full diagnostic and clinical evaluation can be made.	IIb	C

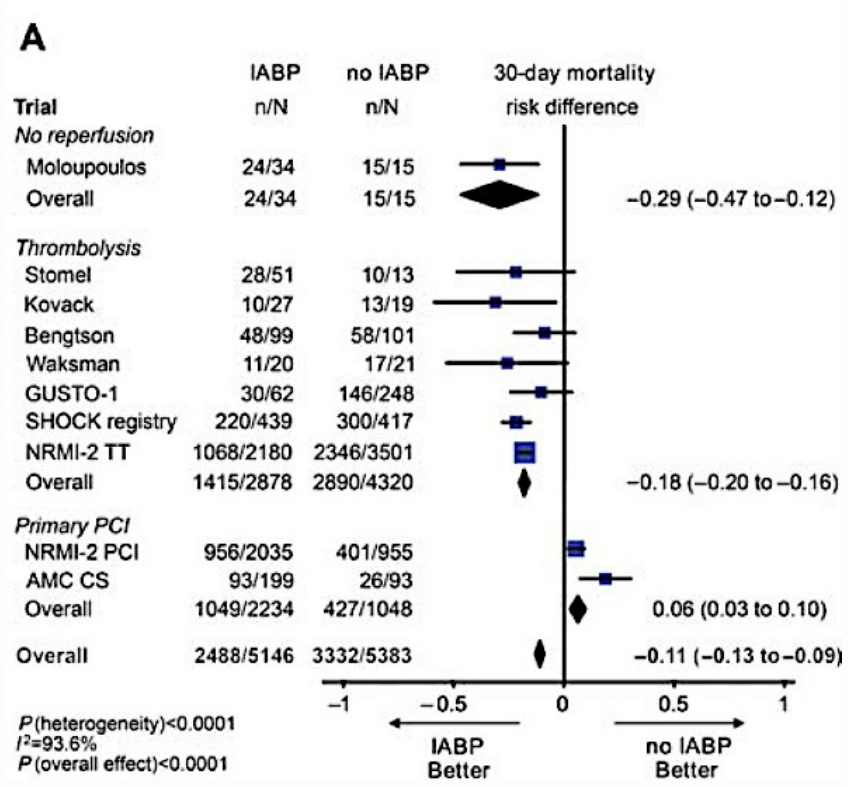
Intra-aortic balloon pump

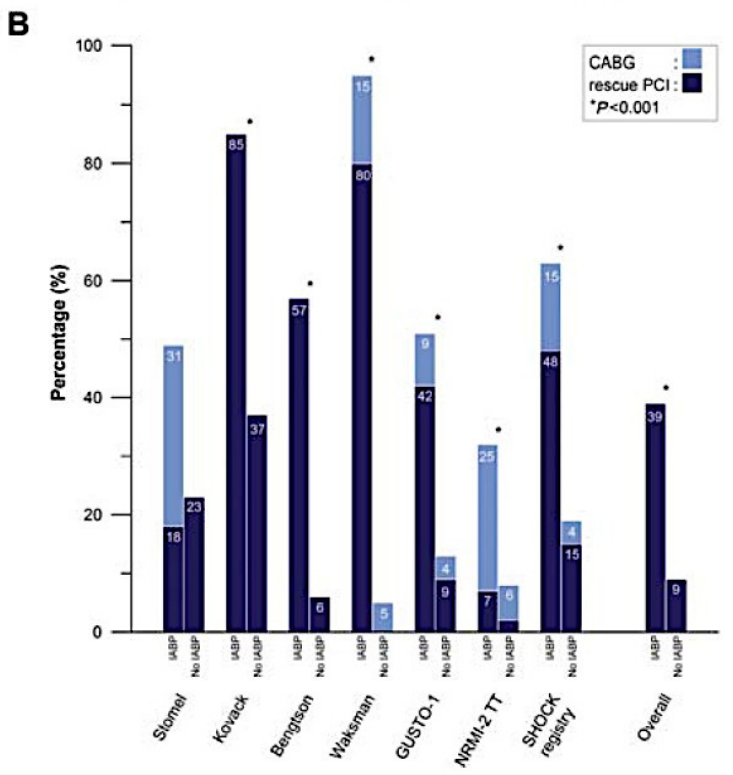


Conventional indications:

- before surgical correction of specific acute mechanical problems (VSR, acute MR)
- severe acute myocarditis
- in selected patients with acute myocardial ischaemia or infarction before, during, and after PCI or CABG.

IABP therapy in STEMI complicated by cardiogenic shock.





IABP therapy adjunctive to thrombolysis : benefit?
IABP therapy adjunctive to PPCI: no benefit

KD Sjauw et al.
Eur Heart J (2009) 30 (4): 459-468.

www.escardio.org/acutecc

Saving lives is our mission

Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

Mechanical circulatory support (MCS)

- Temporary MCS may be used in selected patients with AHF, including intra-aortic balloon counterpulsation, other percutaneous cardiac support, and ECMO.
- MCS, particularly ECMO, can be used as a 'bridge to decision (BTD)' in patients with acute and rapidly deteriorating HF where full evaluation has not been possible and in whom death will occur without MCS.
- However, the difficult decision to withdraw MCS may need to be made if the patient is not eligible for conventional corrective surgery or longer term MCS

Acute HF

www.escardio.org/acutecc

Saving lives is our mission

Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

Treating Acute HF: The Belgian Way

Treating Acute HF: The Dutch Way

www.escardio.org/acutecc

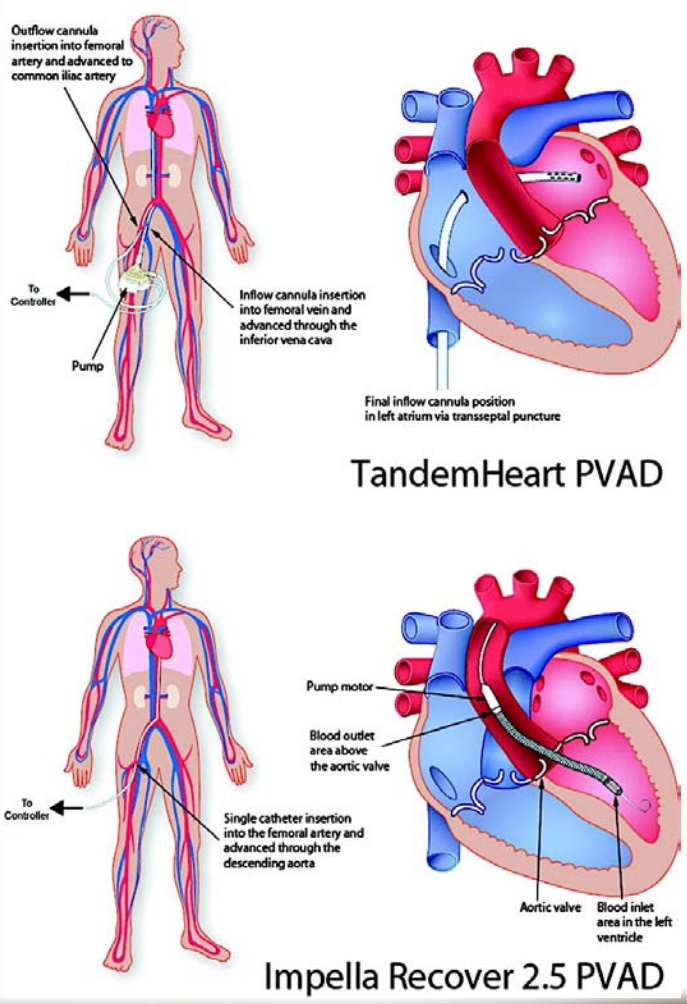
Saving lives is our mission

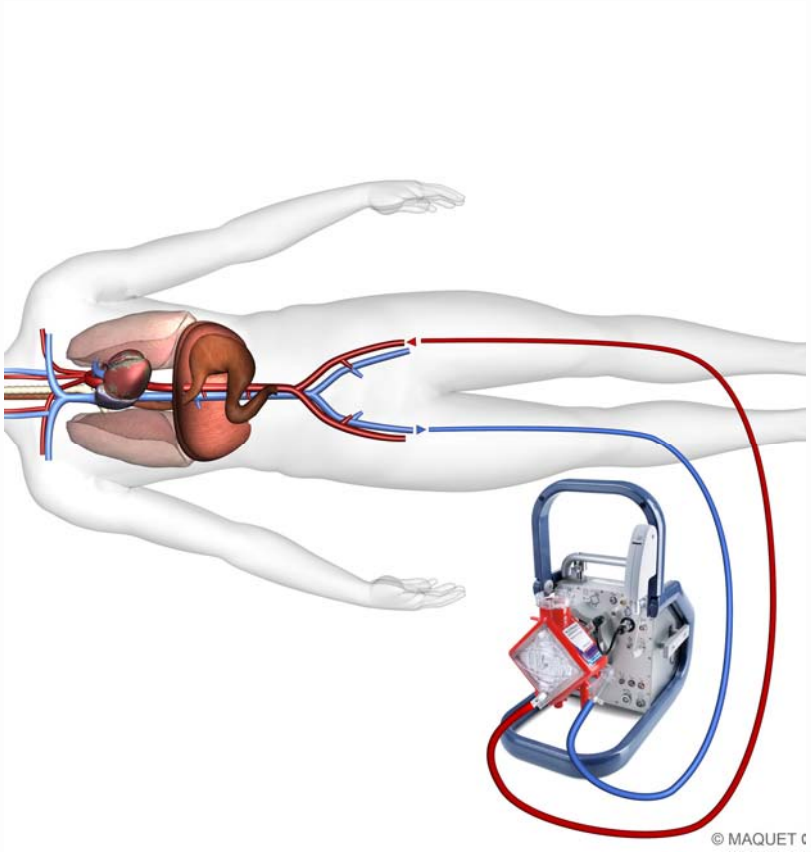
Acute Cardiac Care

ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

Percutaneous ventricular assist devices (PVADs)



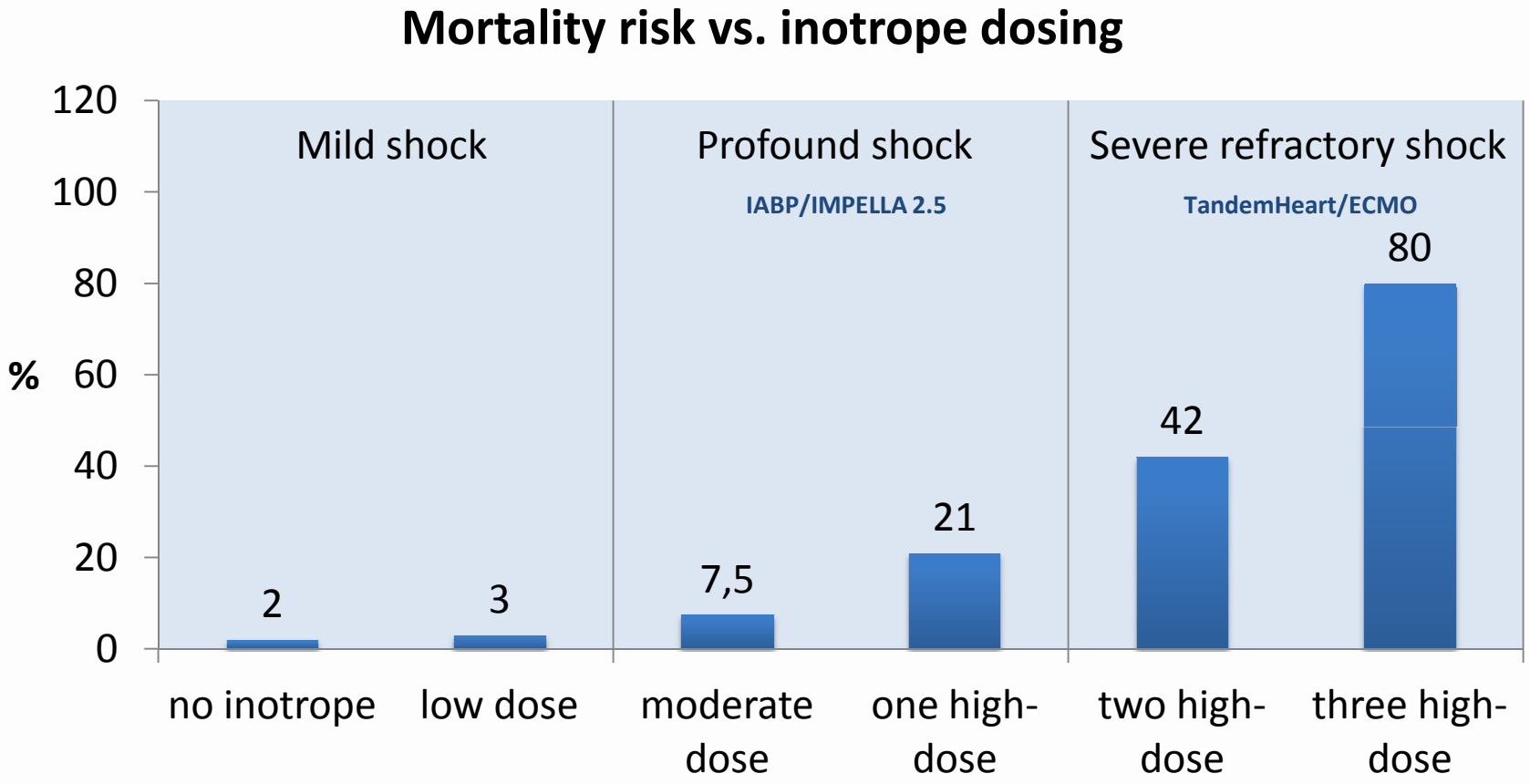


IABP vs. currently available pVAD

	IABP	TandemHeart pVAD	Impella 2.5 Recover system	ECMO
Pump mechanism	Pneumatic	Centrifugal	Axial flow	Centrifugal flow
Insertion	Retrograde 7-9F balloon catheter into descending aorta via femoral artery	21F inflow cannula into left atrium via femoral vein and transseptal puncture and 15/17F outflow cannula into femoral artery	12F catheter (13F sheath) placed retrograde across the aortic valve via femoral artery	18–31F inflow cannula into the right atrium via femoral vein and 15-22F outflow cannula into descending aorta via femoral artery
Difficulty of insertion	+	++++	+++	++
Degree of support	+ (⇑ *CO* by 0.5 l/min)	+++ (⇑ *CO* by 3.5–4 l/min)	++ (⇑ *CO* by 2.5 l/min)	++++ (⇑ *CO* to >4.5 l/min)
Cardiac power output[a]	+	+++	++	++++
Time for implantation	10 min	25–65 min	11–25 min	10–15 min
Limb ischemia	+	+++	++	+++
Hemolysis	0	++	++++	+++
Bleeding risks	+	+++	++	++++
Contraindications	Moderate–severe AI/aortic stenosis, coagulopathy, severe sepsis	Peripheral arterial disease (may be placed with antegrade sideport for limb perfusion), RV failure	LV thrombus, ventricular septal defect, severe aortic stenosis, RV failure, peripheral arterial disease	Contraindication to anticoagulation, irreversible brain injury, terminal disease

SS Basra et al.
Curr Opin Cardiol 2011 26:548–554

Paradigm shift in treatment cardiogenic shock



B Kar et al.
Circulation. 2012;125:1809-1817

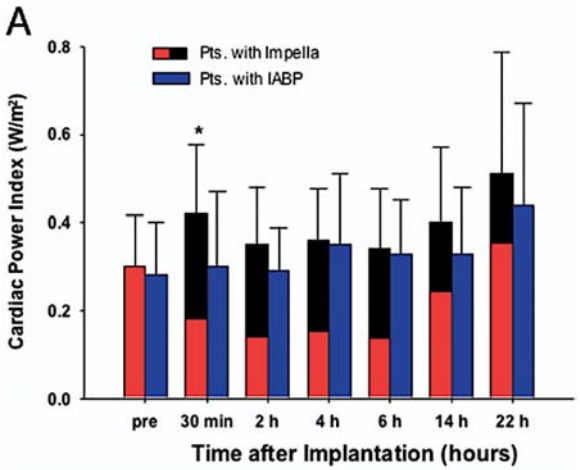
Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

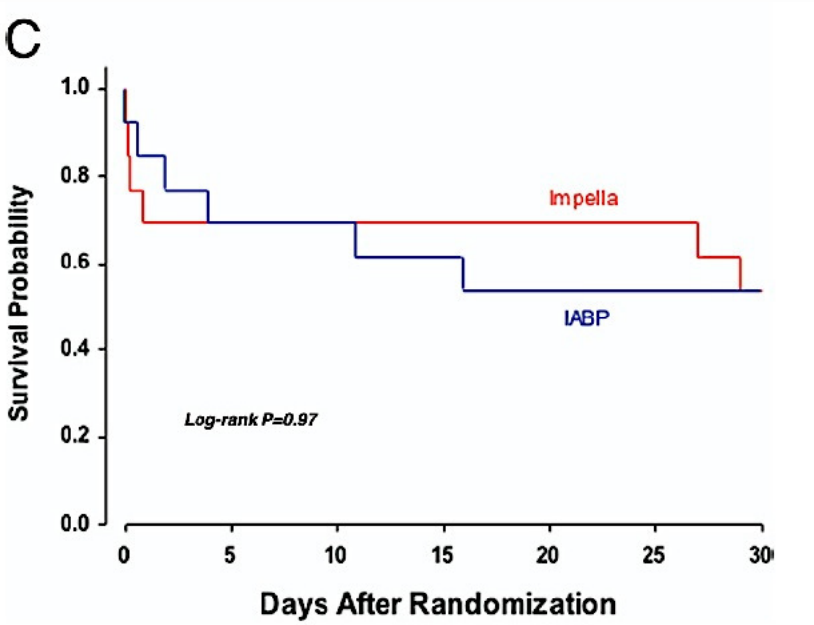
www.escardio.org/acutecc

Saving lives is our mission

ISAR SHOCK: Impella 2.5 vs. IABP in STEMI with shock

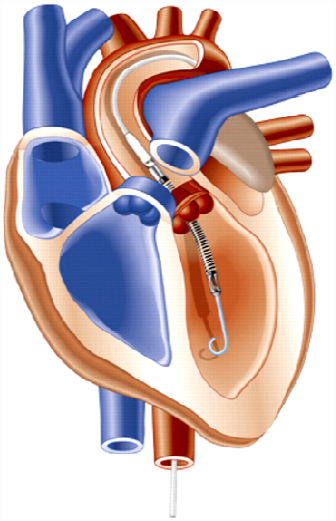


25 patients

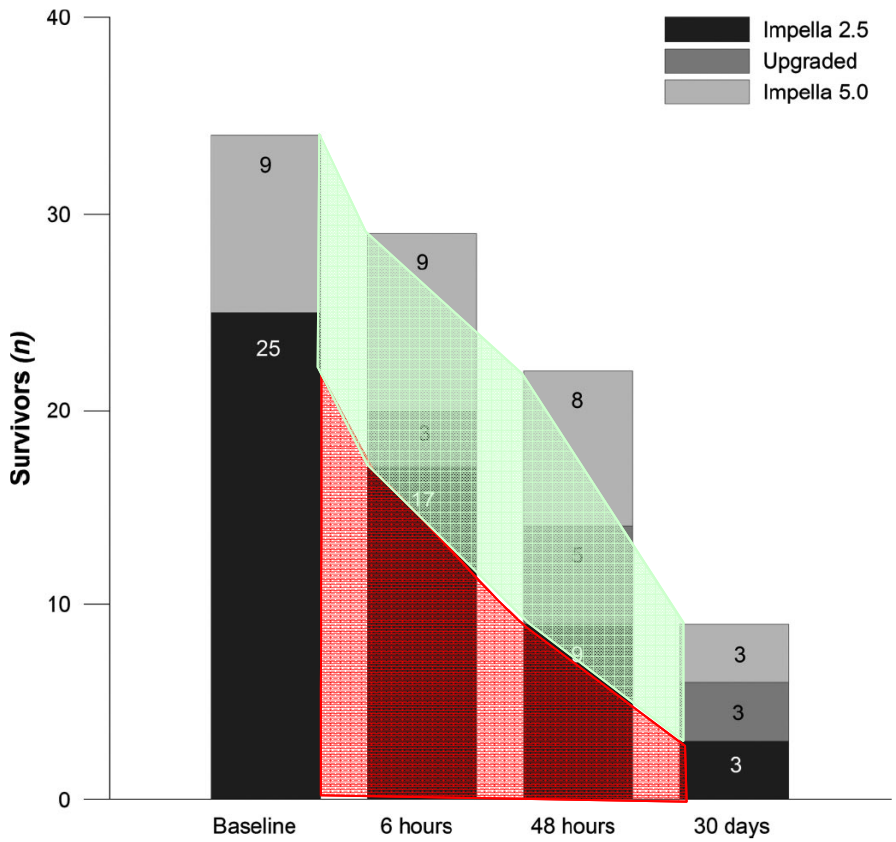


M Seyfarth et al.
J Am Coll Cardiol 2008;52:1584–8

Impella 2.5 & 5.0
STEMI with severe and profound cardiogenic shock



- 34 STEMI patients
- Improved survival in patients who received immediate Impella 5.0 treatment, as well as in patients who were upgraded from 2.5 to 5.0 support,
- Low survival in patients who received only Impella 2.5 support.



AE Engström et al.
Crit Care Med 2011; 39: 2072–2079

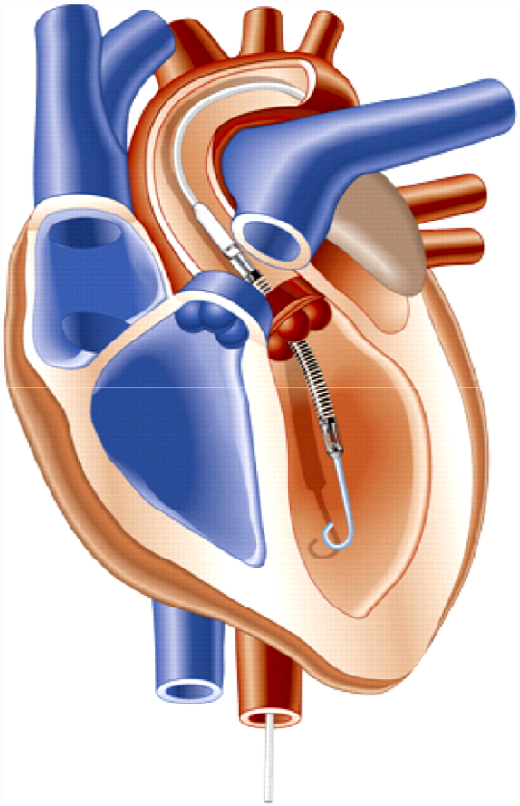
www.escardio.org/acutecc

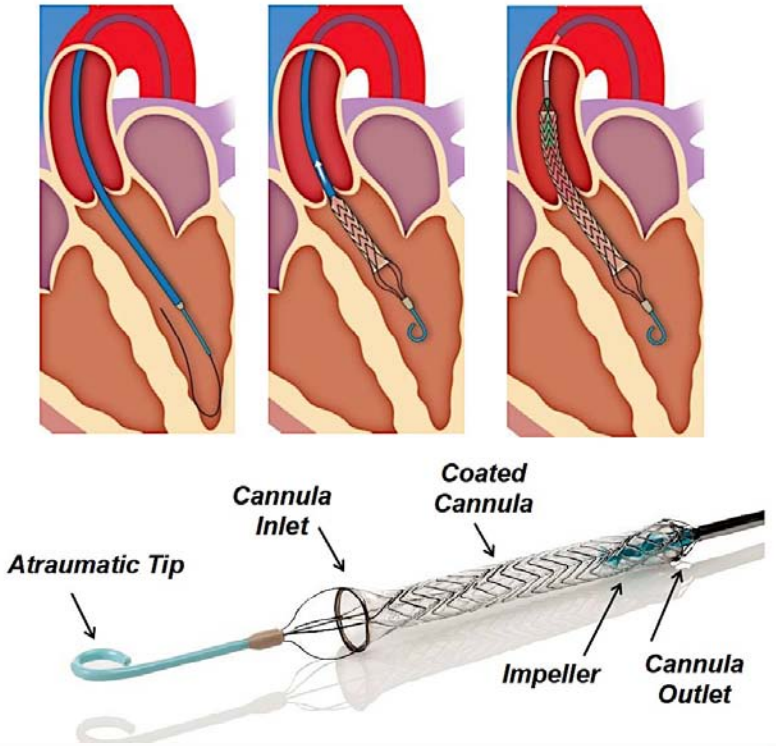
Saving lives is our mission

Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

pVAD new developments





pVAD in Severe Cardiogenic Shock

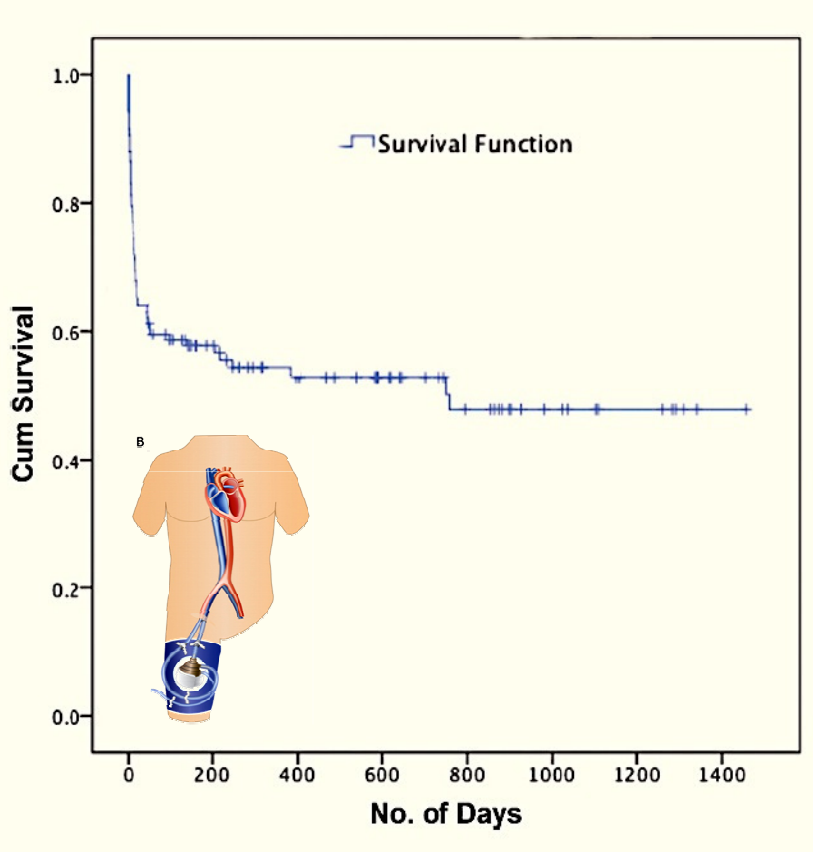


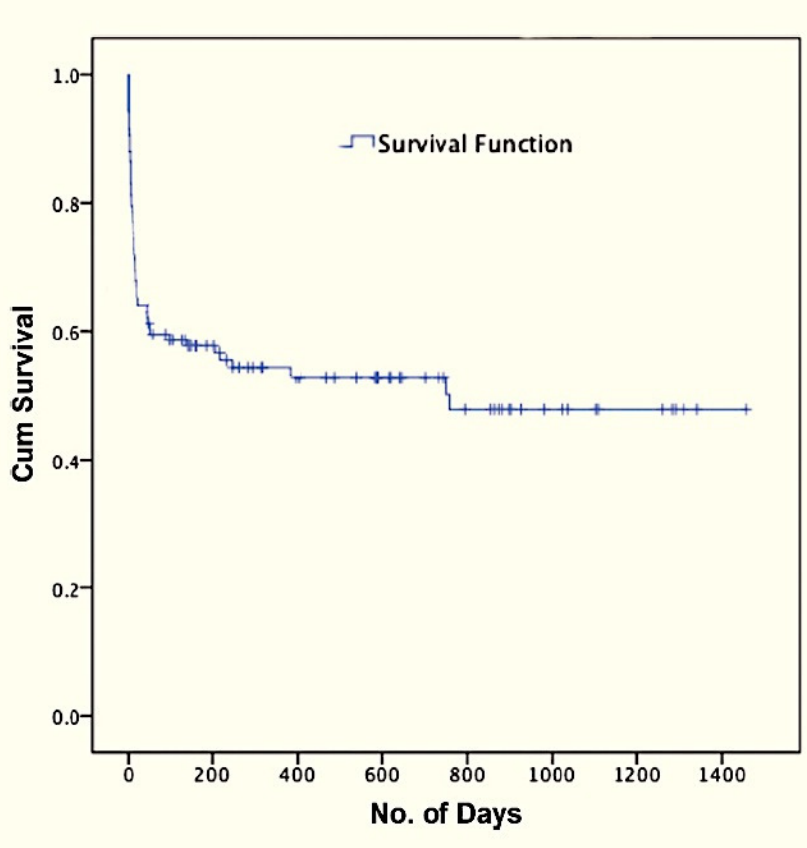
Table 4 Safety and Efficacy of Use of Tandem Heart Percutaneous Ventricular Assist Device: Complication Rate in Our Center

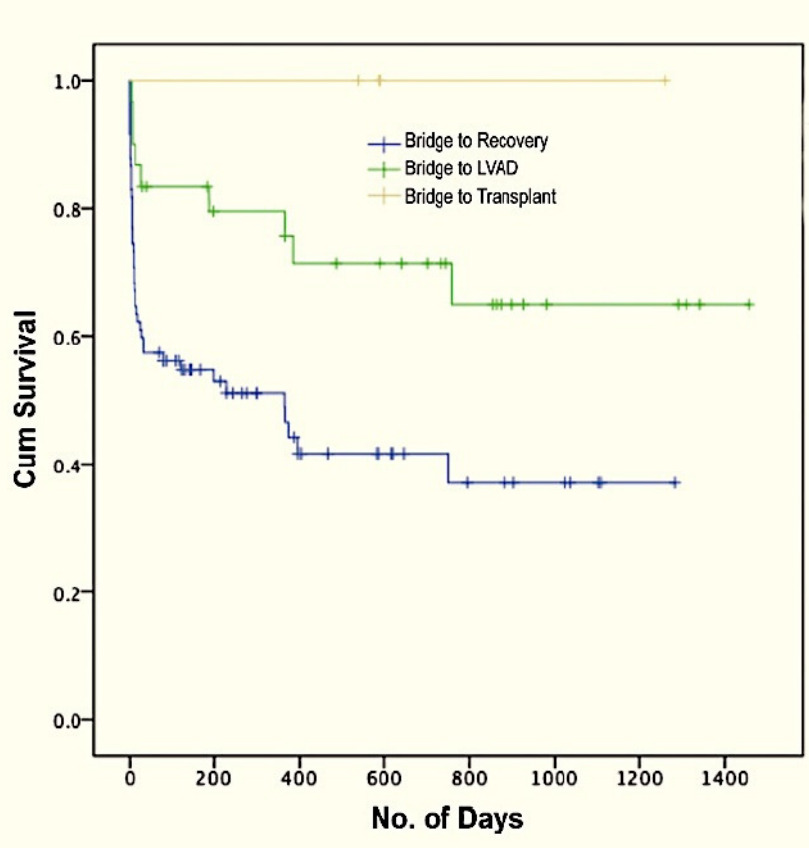
Adverse Event	Frequency	%
Groin hematoma	6/117	5.12
Limb ischemia	4/117	3.41
Bleeding around cannula site	34/117	29.05
Femoral artery dissection	1/117	0.85
Atrial perforation	1/117	0.85
Sepsis	35/117	29.90
Coagulopathy	13/117	11.00
Stroke	8/117	6.83
Blood transfusions	70/117	59.80
Gastrointestinal bleed	23/117	19.65

117 patients with SRCS implanted with TandemHeart pVAD

B Kar et al.
J Am Coll Cardiol 2011;57:688–96

pVAD in Severe Cardiogenic Shock





117 patients with SRCS implanted with TandemHeart pVAD

B Kar et al.
J Am Coll Cardiol 2011;57:688–96

LVAD as destination therapy

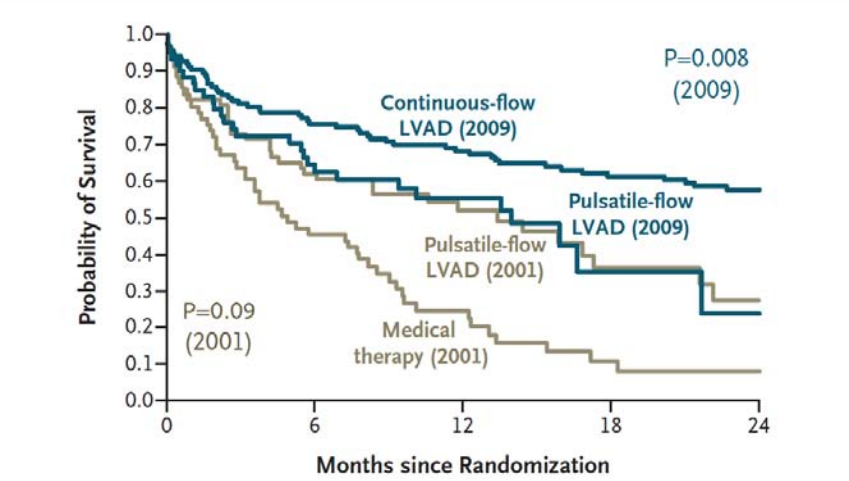
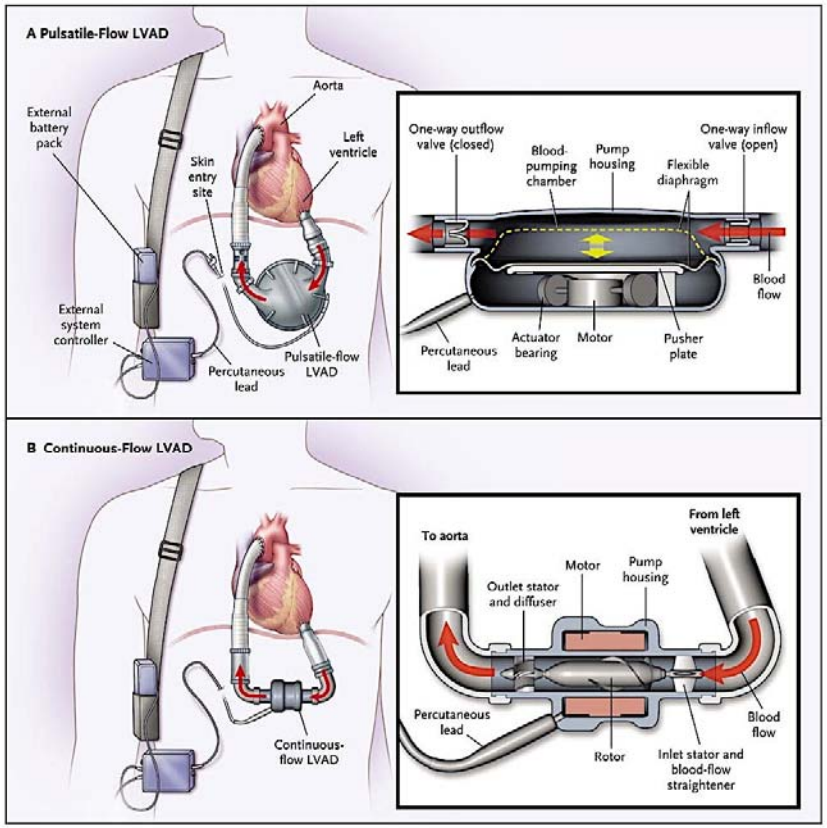
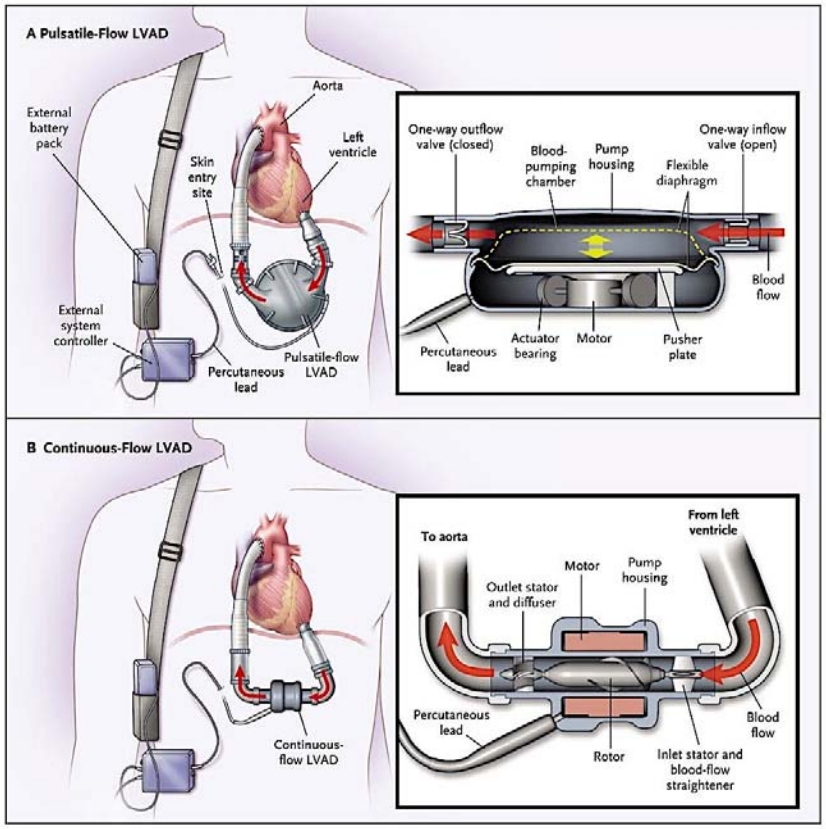


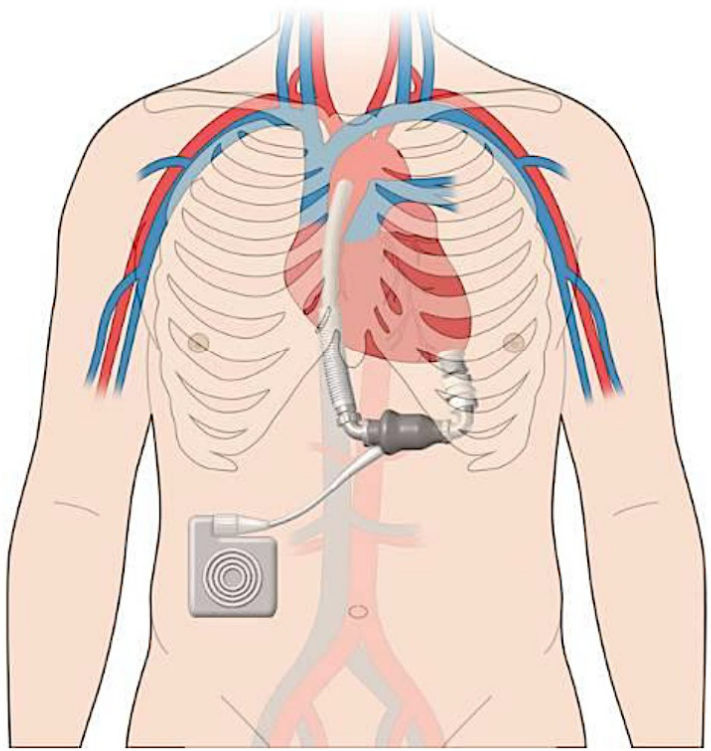
Figure 1. Survival Rates in Two Trials of Left Ventricular Assist Devices (LVADs) as Destination Therapy.

The curves labeled 2009 are those reported by Slaughter and colleagues in this issue of the *Journal*[2]; those labeled 2001 were reported for the REMATCH trial.[1]



LVAD new developments





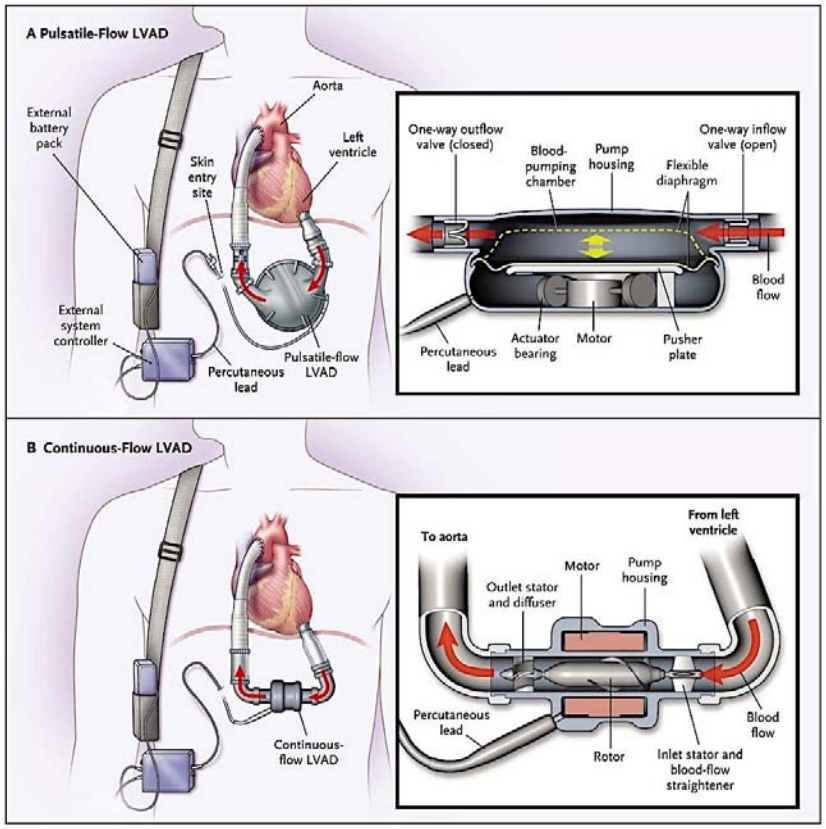
www.escardio.org/acutecc

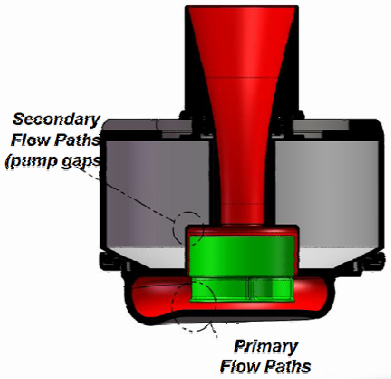
Saving lives is our mission

Acute Cardiac Care
ESC Working Group

EUROPEAN SOCIETY OF CARDIOLOGY®

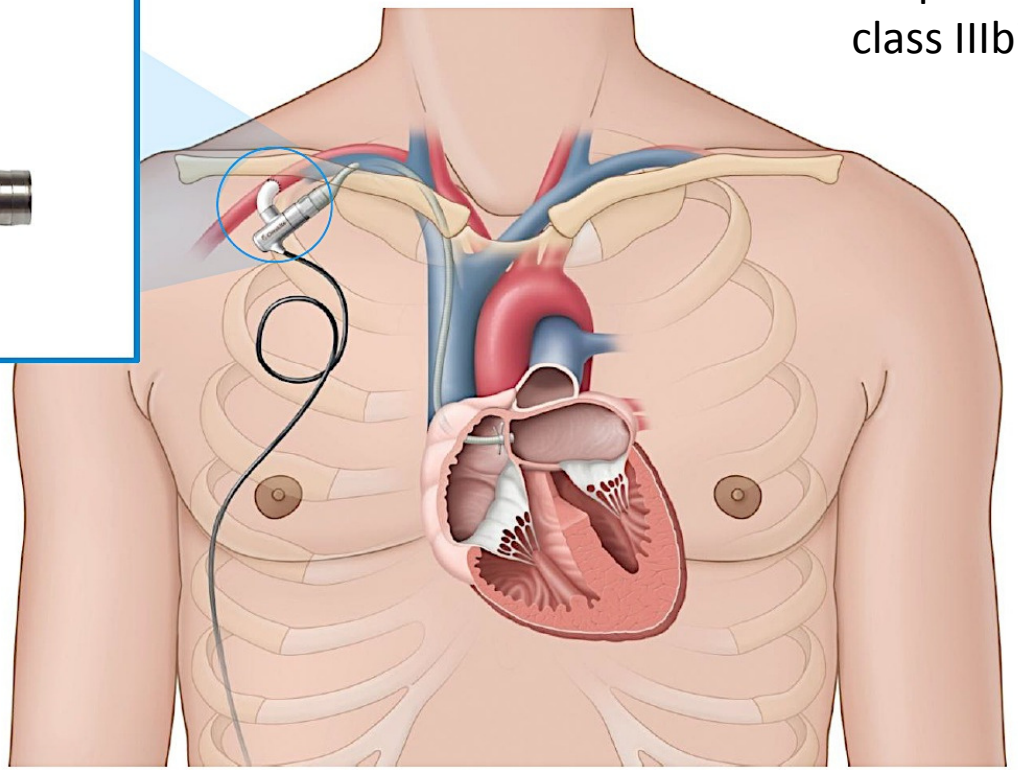
LVAD new developments





Fully magnetic levitated rotor

LVAD new developments



Partial support for patients in class IIIb?

- Inflow cannula transseptally positioned in the left atrium by the interventional cardiologist
- Outflow graft sutured to the subclavian artery by the surgeon

Conclusions

- Always look for precipitating causes
  - ACS: early revascularization
  - Atrial fib.: rapid rate control with digitalis
- Use LMNOP with IV bolus of loop diuretics
- Noninvasive ventilation: helpful as adjunctive therapy
- Consider temporary use of mechanical support systems in patients unresponsive to inotropics and potential reversible cause
  - Bridge to recovery
  - Bridge to destination therapy

Thank You!