Sessions d'Actualització en Cardiologia
Curs 2016 - 17
Primers Dilluns de Mes

“Organització Assistencial en Xarxa del Xoc Cardiogènic, una Possibilitat de Millora”

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Barcelona

Potentials conflicts of interest related to this presentation:

- Speaker: Abbott, Novartis, Maquet, Orion-Pharma
- Clinical trials: Cardiorentis, Novartis, Orion-Pharma
- Grants: Abbott, Maquet, Novartis, Orion-Pharma

This is What I’M Going To Talk About

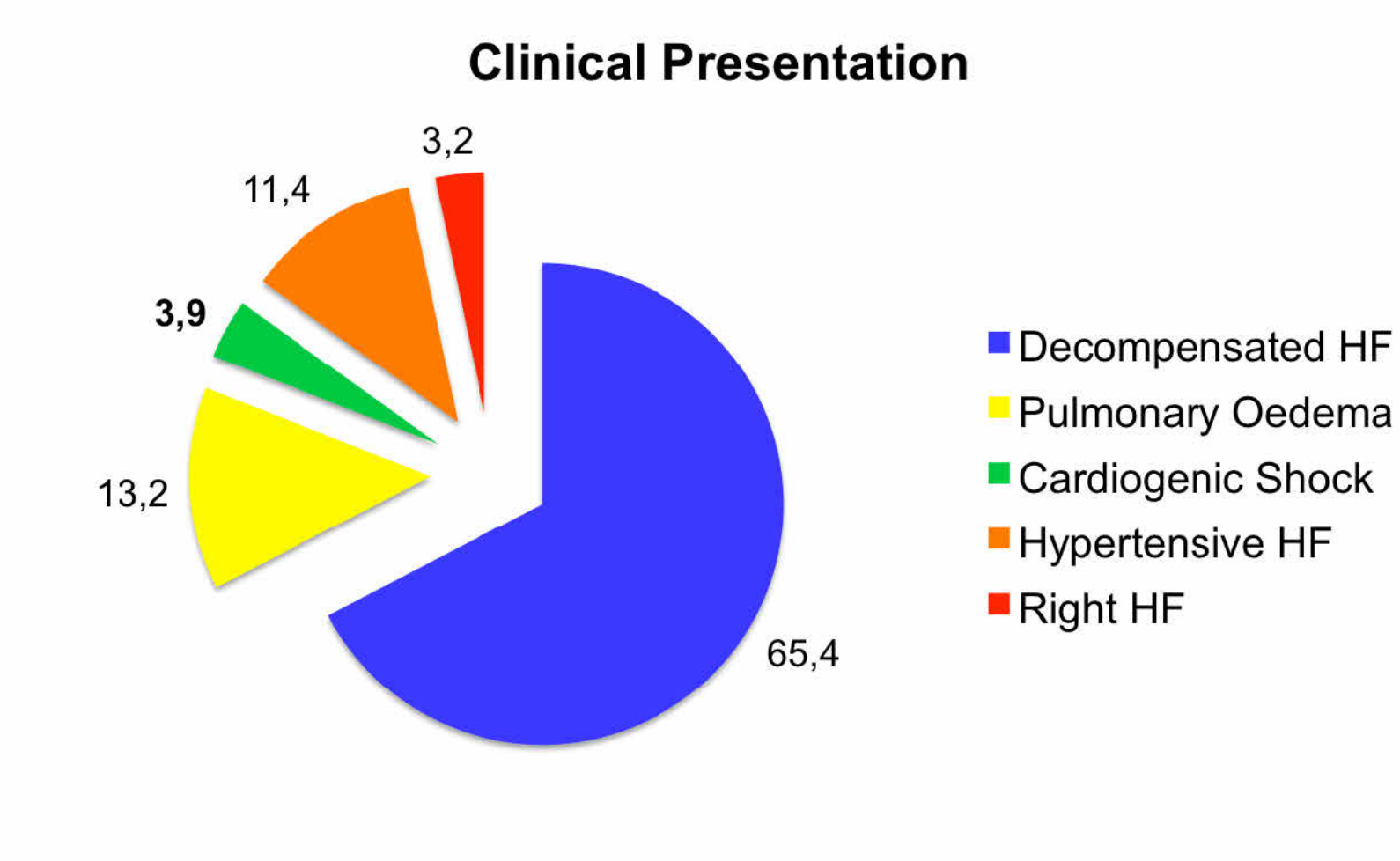
- Why?
- Who?
- How?
- When?
- Take home messages


WHY?


Why?!

Clinical Presentation AHF

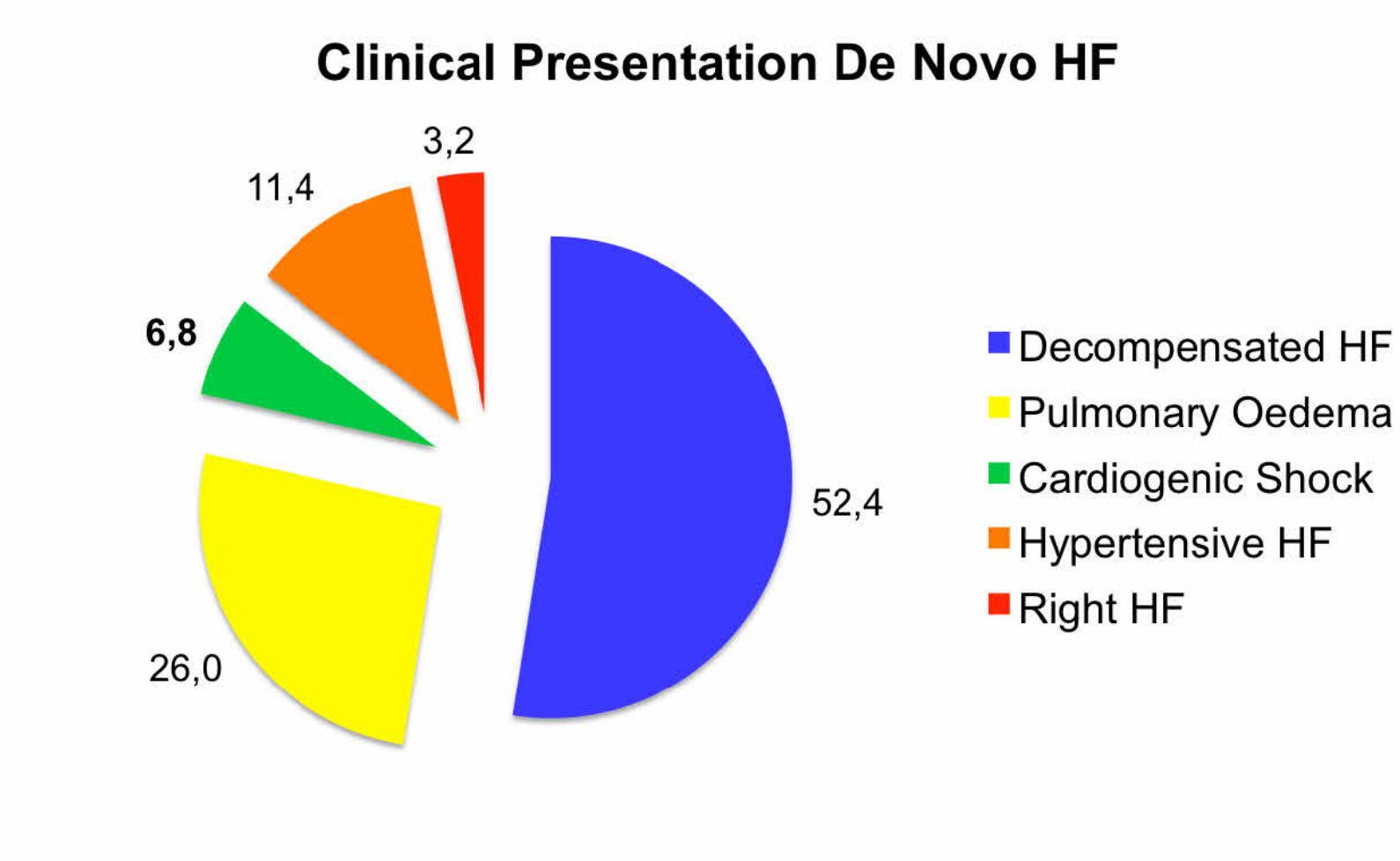
EHS-HF II



Nieminen M. Eur Heart J. 2006;27(22):2725-36

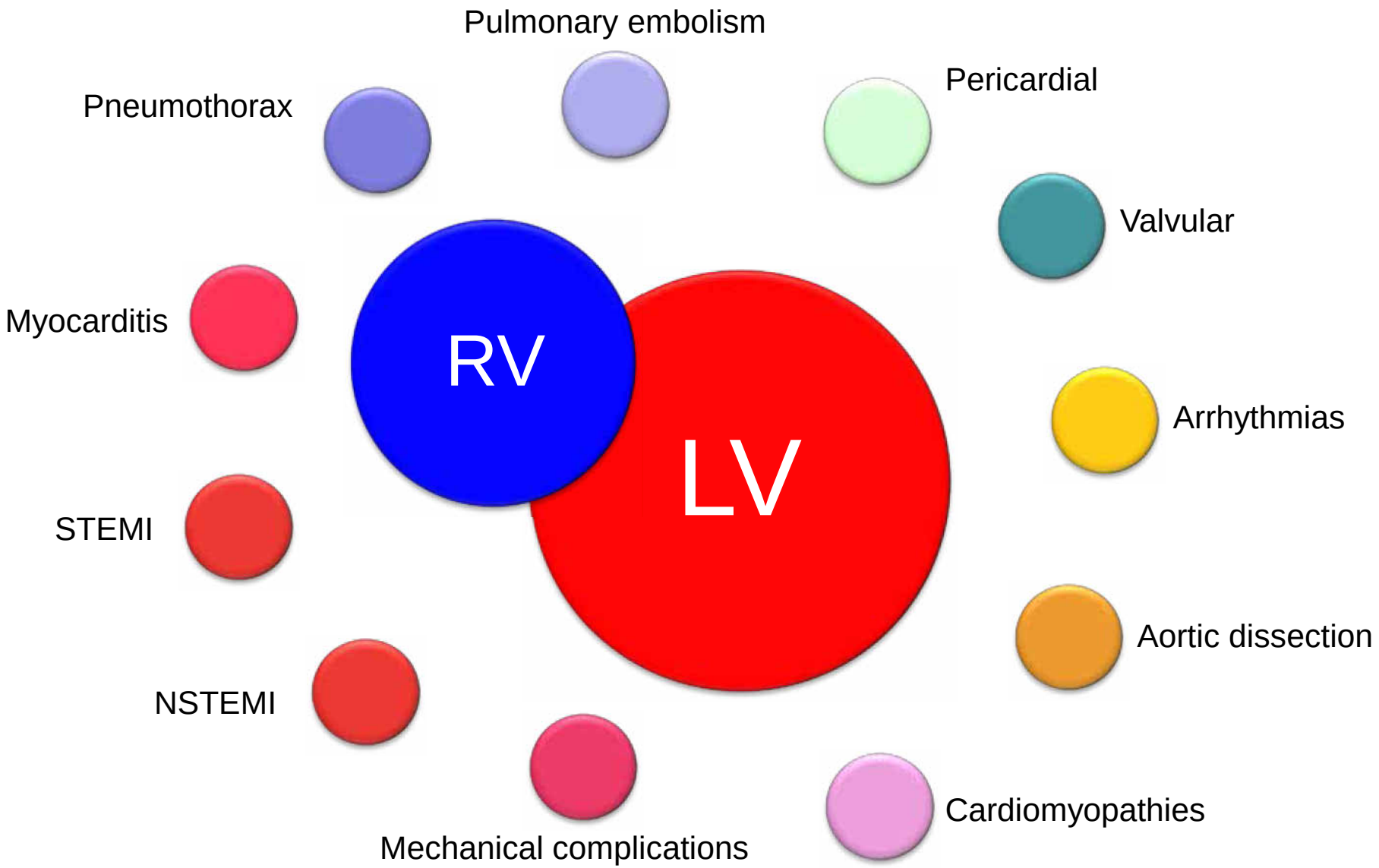
Clinical Presentation of AHF

EHS-HF II

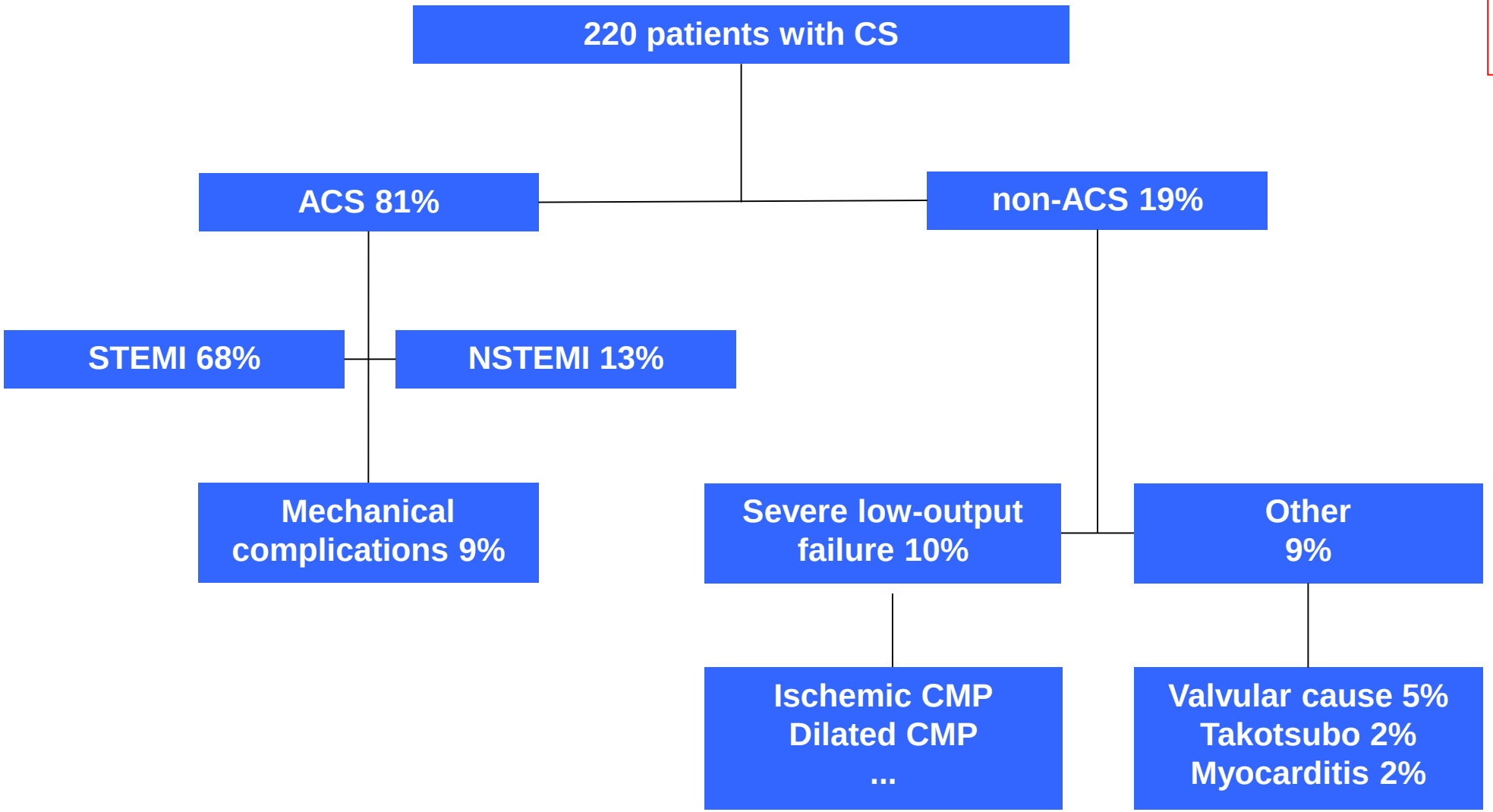


Nieminen M. Eur Heart J. 2006;27(22):2725-36

Cardiogenic Shock: Etiology



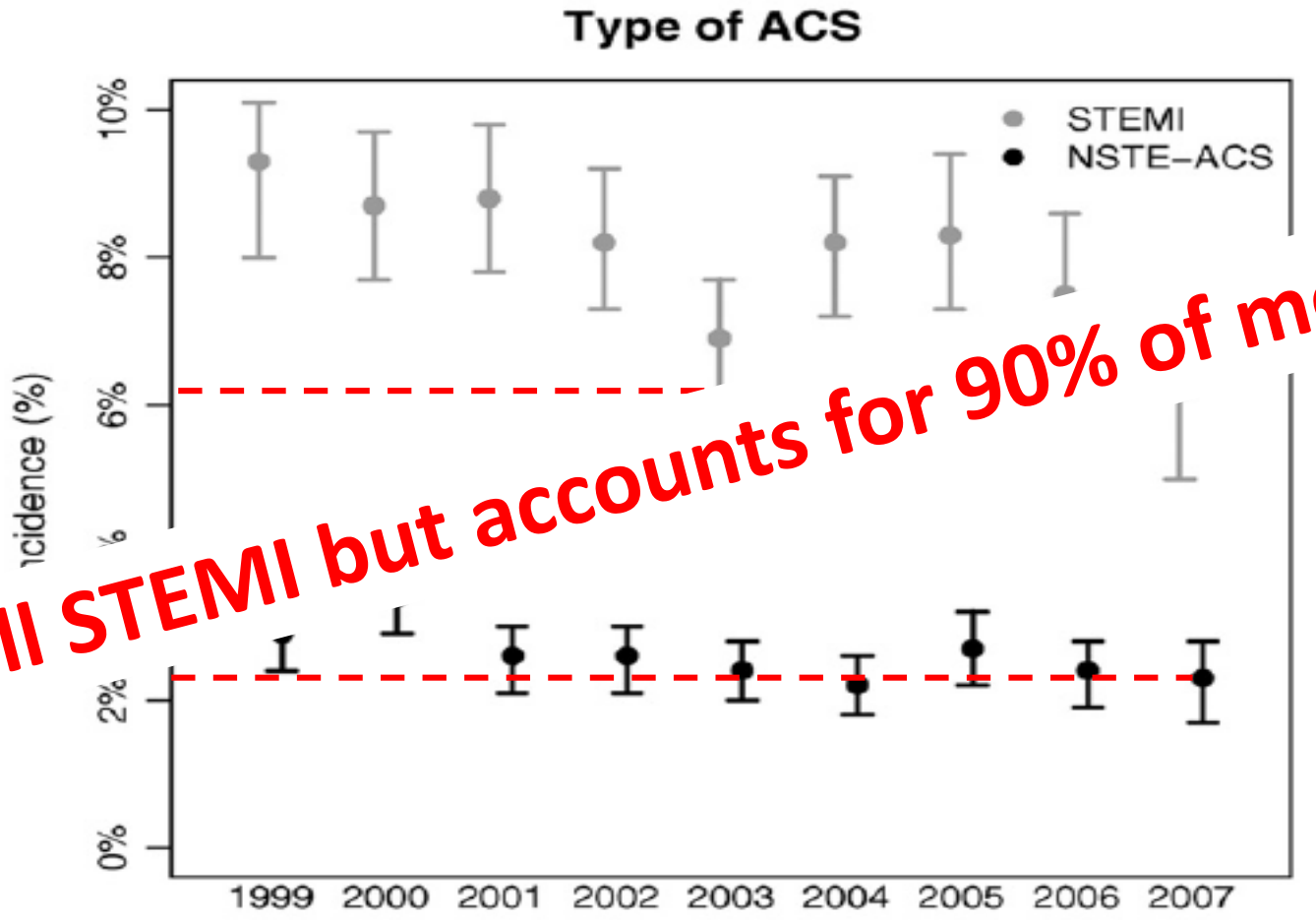
CardShock Study: Etiology



Harjola V-P et al. Eur J Heart Fail. 2015;17(5):501

Data from the Grace Registry (1999-2007)

Incidence according to type of ACS

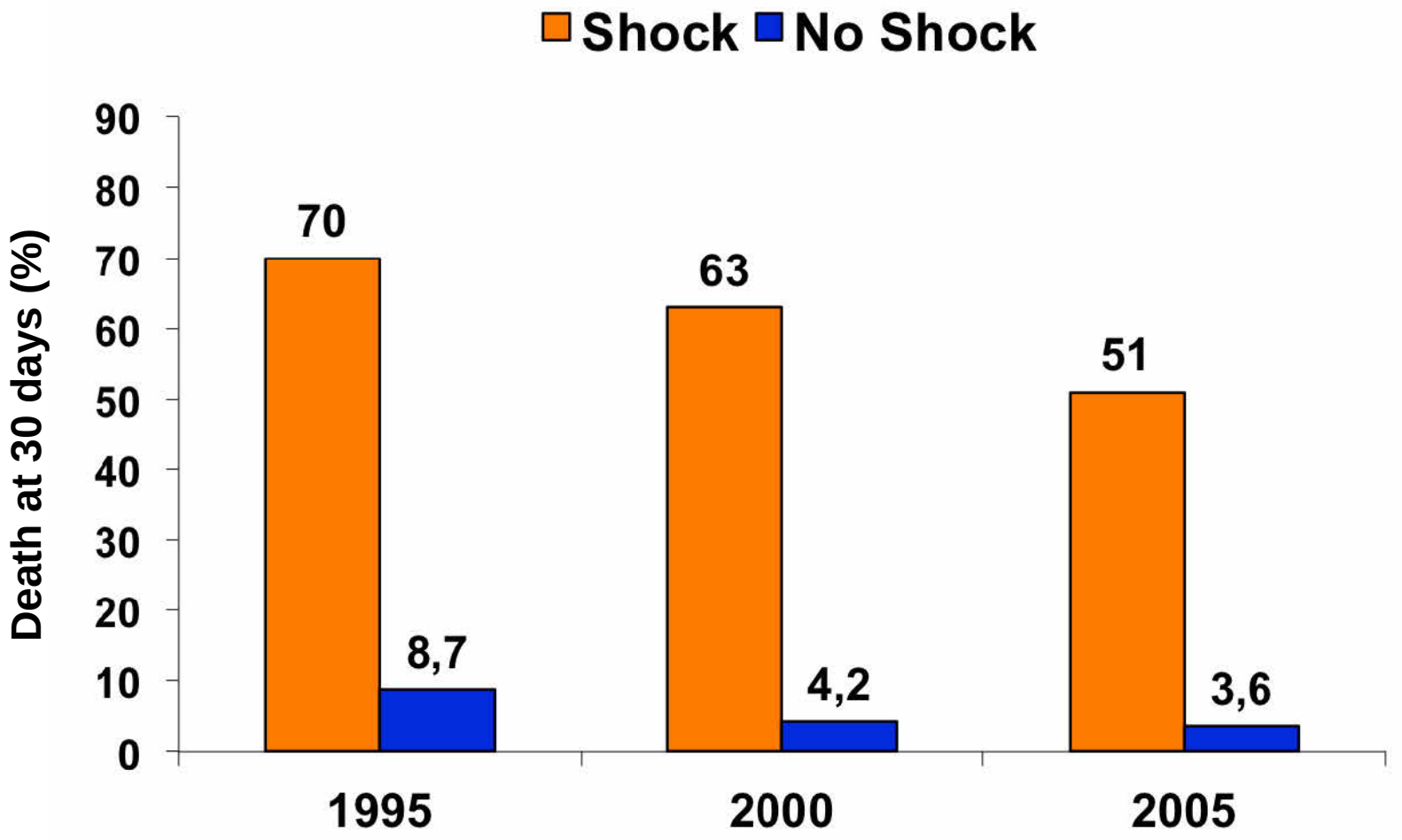


<10% of all STEMI but accounts for 90% of mortality

Awad H et al. Am Heart J 2012;163:963-71

In-hospital Mortality

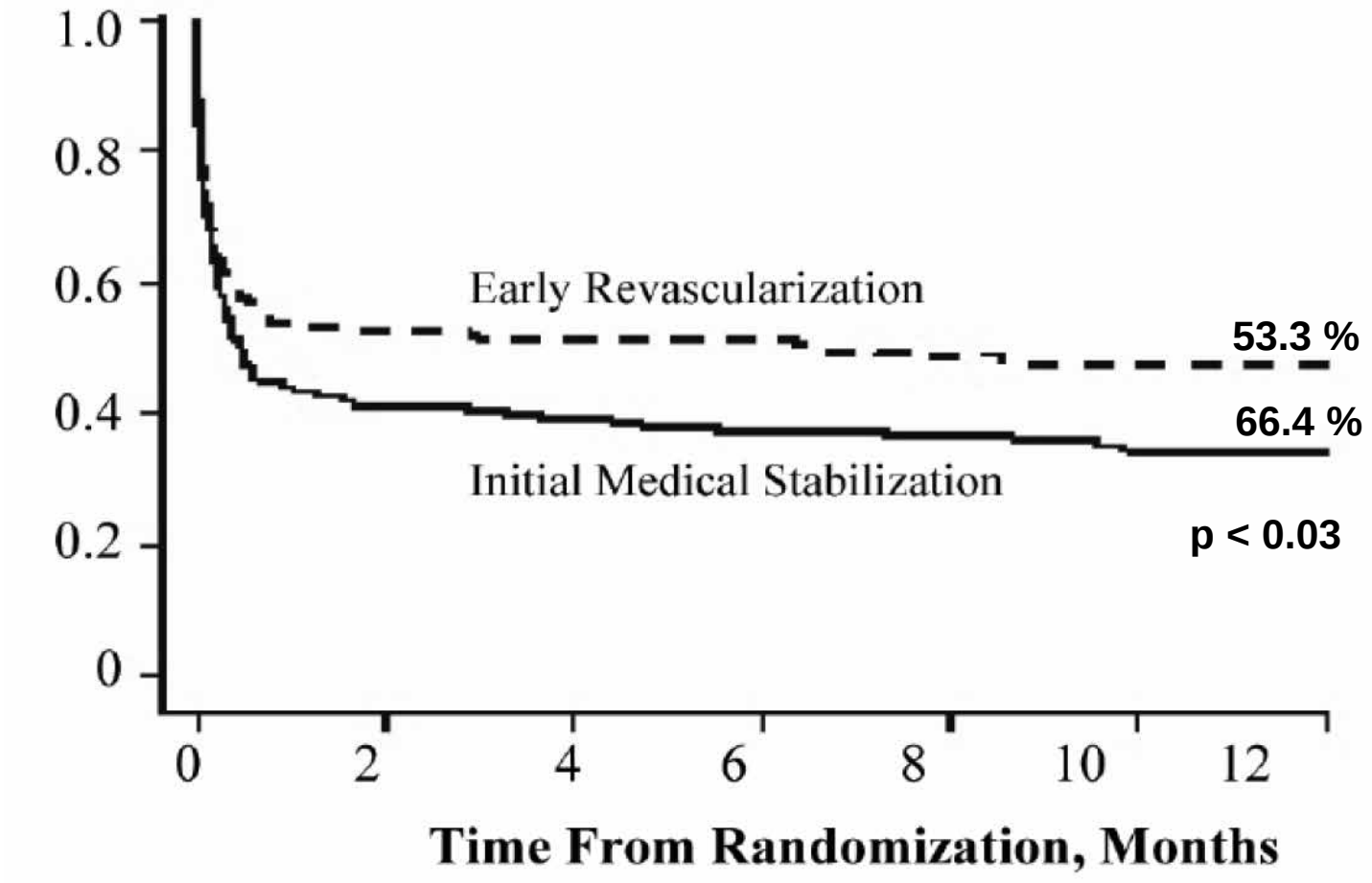
USIK 1995, USIC 2000, FAST-MI France National Registry



Aissaoui et al. Eur Heart J 2012;33:2535

The Shock Trial: a Revolution

Mortality in the SHOCK Trial (n = 302)

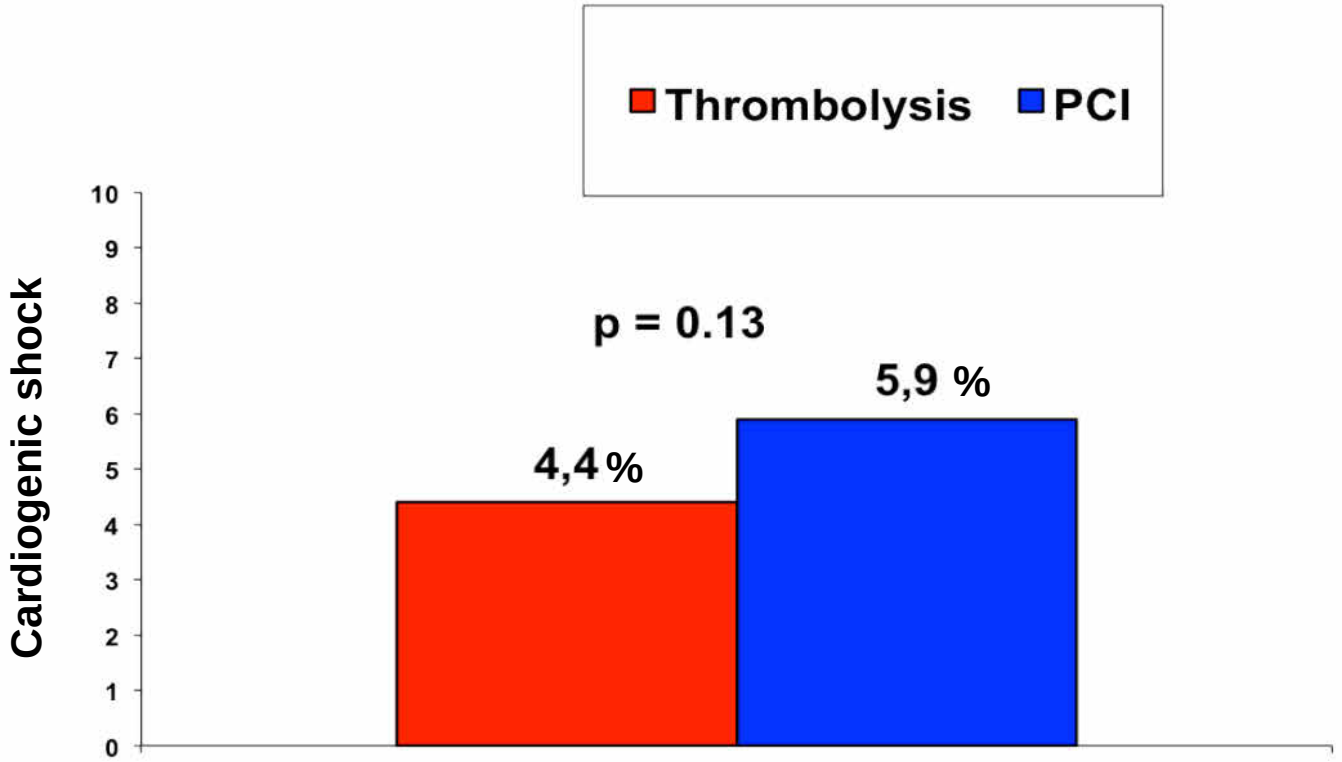


Hochman JS. NEJM 1999; 341:625

Prehospital Thrombolysis in the Primary PCI Networking Era

STREAM n = 1892

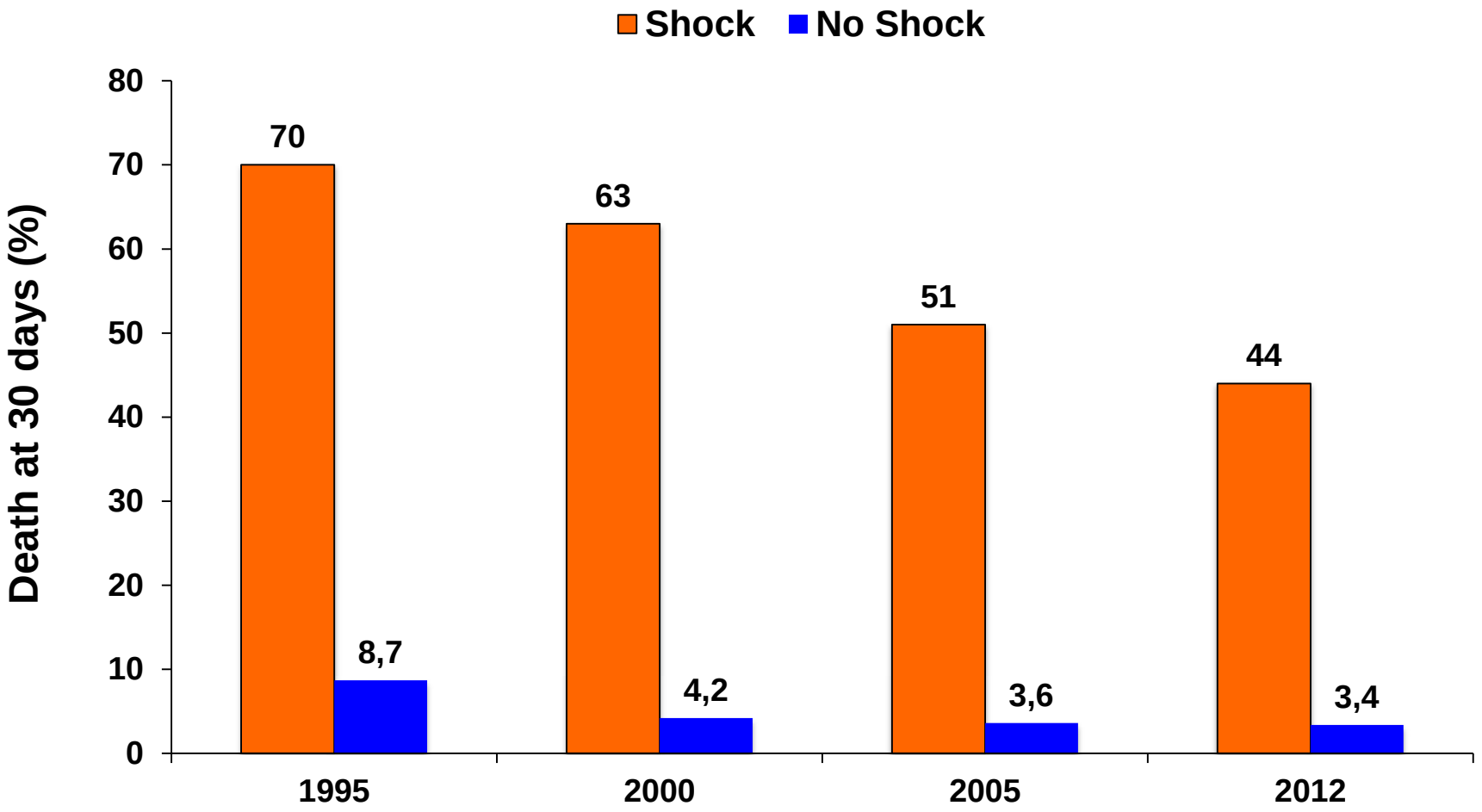
Prehospital thrombolysis < 3 h from symptom onset vs PCI



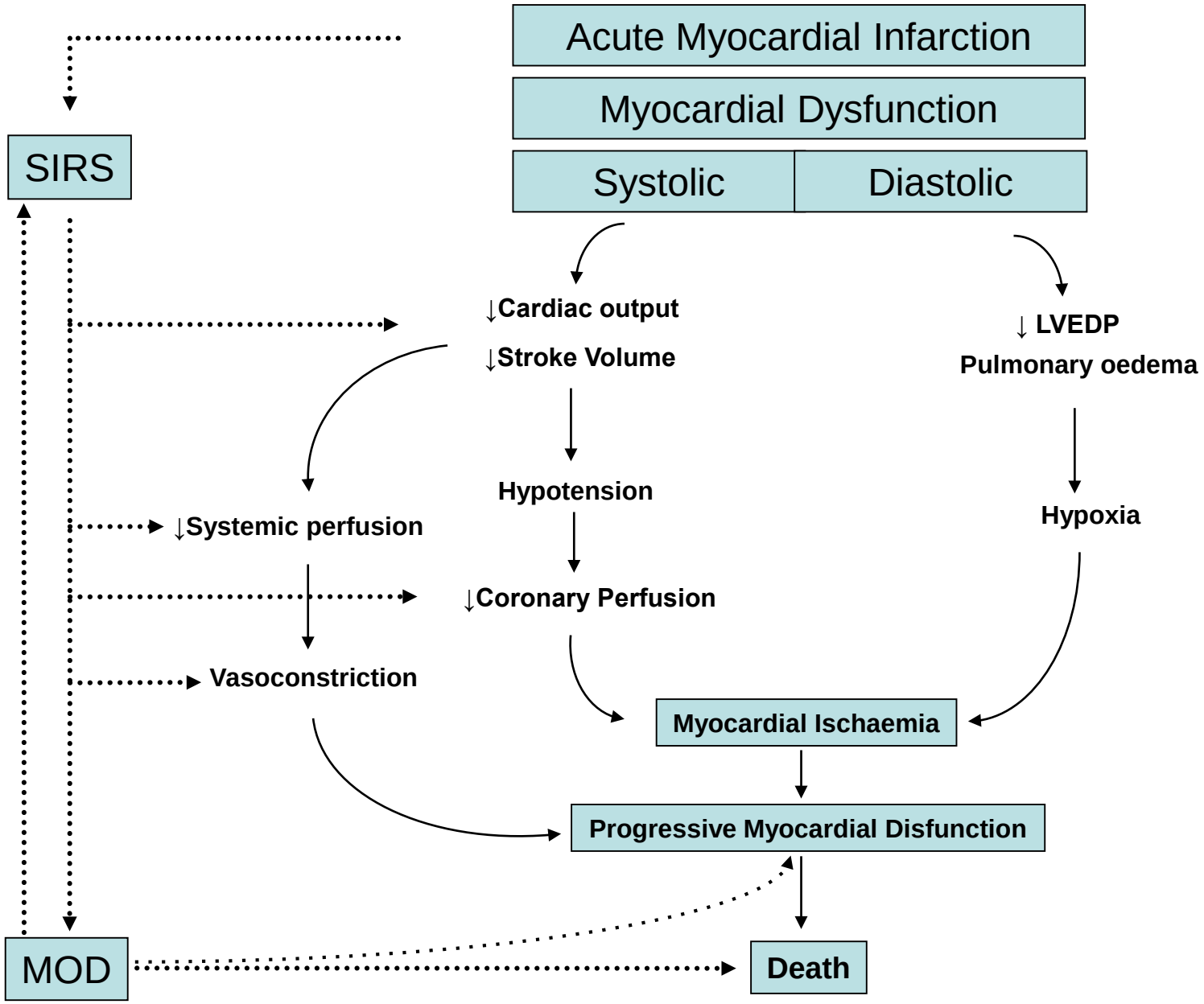
Armstrong PW. N Engl J Med 2013; 368:1379-1387

Current In-hospital Mortality

USIK 1995, USIC 2000, FAST-MI France National Registry and CardShock



Modified from Aissaoui et al. Eur Heart J 2012;33:2535



Adapted from: Reynolds et al. Circulation 2008;117:686


WHO?

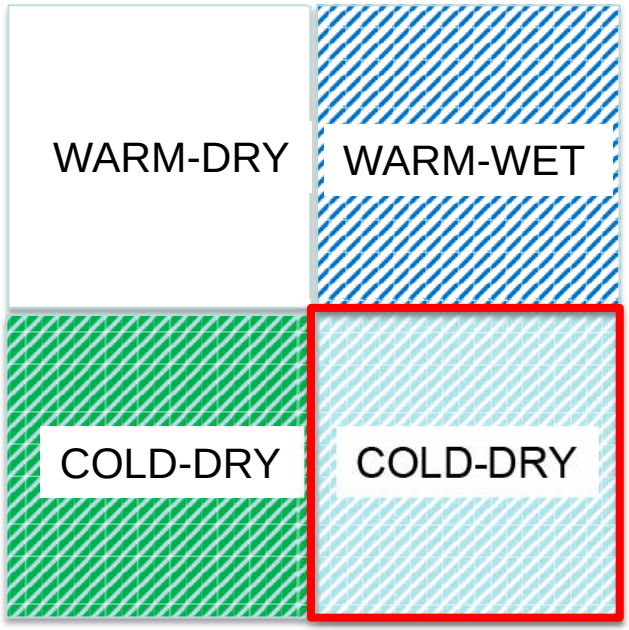

6'6"
6'0"
5'6"
5'0"
4'6"
4'0"
3'6"
3'0"
PORSCHE

Clinical profiles of patients with acute heart failure based on the presence/absence of congestion and/or hypoperfusion

Congestion (-) **Congestion (+)**

Hypoperfusion (-)

Hypoperfusion (+)

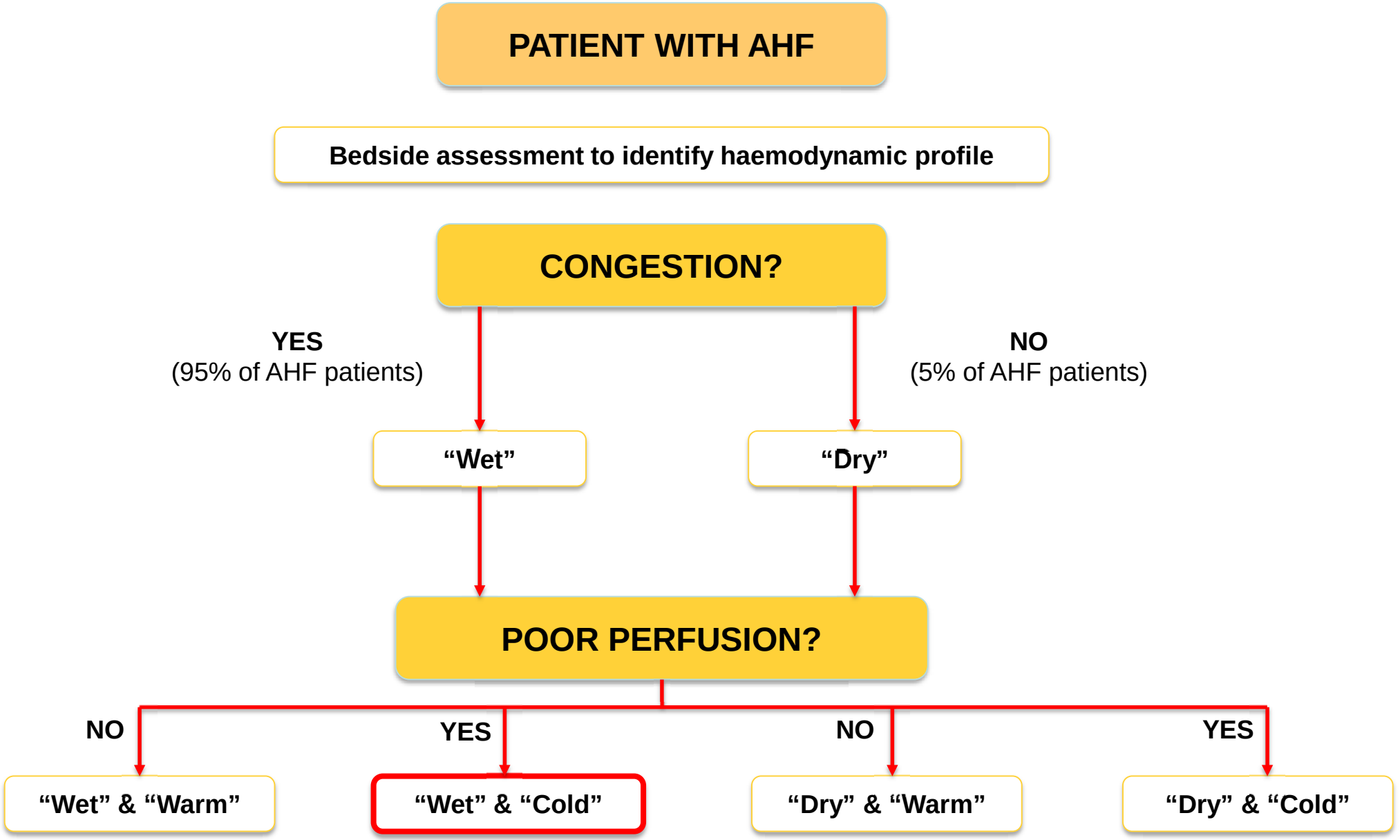


- Cold sweated extremities
- Oliguria
- Mental confusion
- Dizziness
- Narrow pulse pressure

- Pulmonary congestion
- Orthopnea
- Peripheral bilateral oedema
- Jugular venous dilatation
- Ascites
- Hepatojugular reflux

Hypoperfusion not synonymous with hypotension

Nohria et al. JAMA 2002;287:628



Adapted from 2016 ESC HF Guidelines

“Wet” & “Cold”

Systolic blood pressure <90 mmHg?

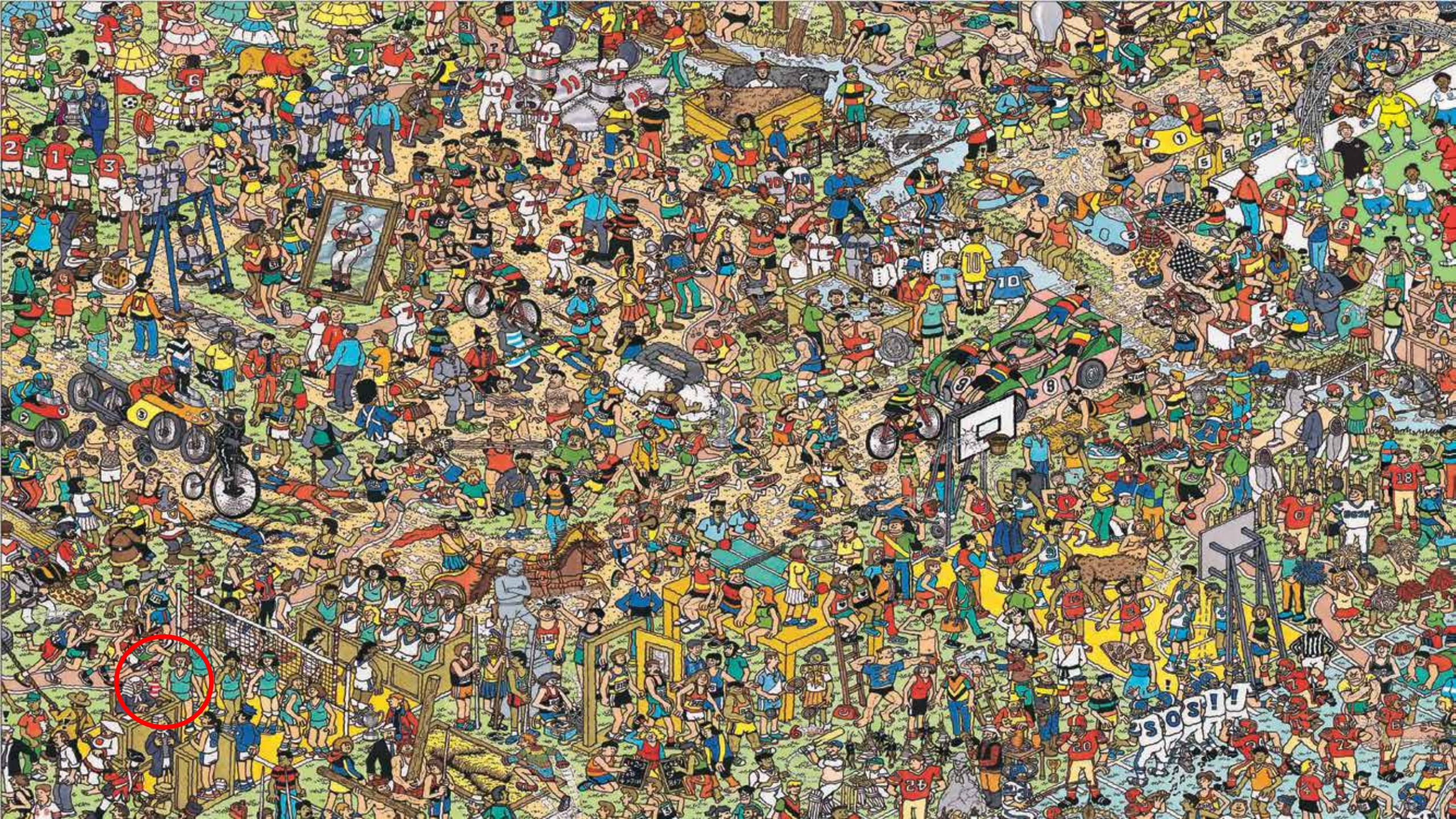
YES

- Inotropic agent
- Consider vasopressor in refractory cases
- Diuretic (when perfusion corrected)
- Consider mechanical circulatory support if no response to drugs

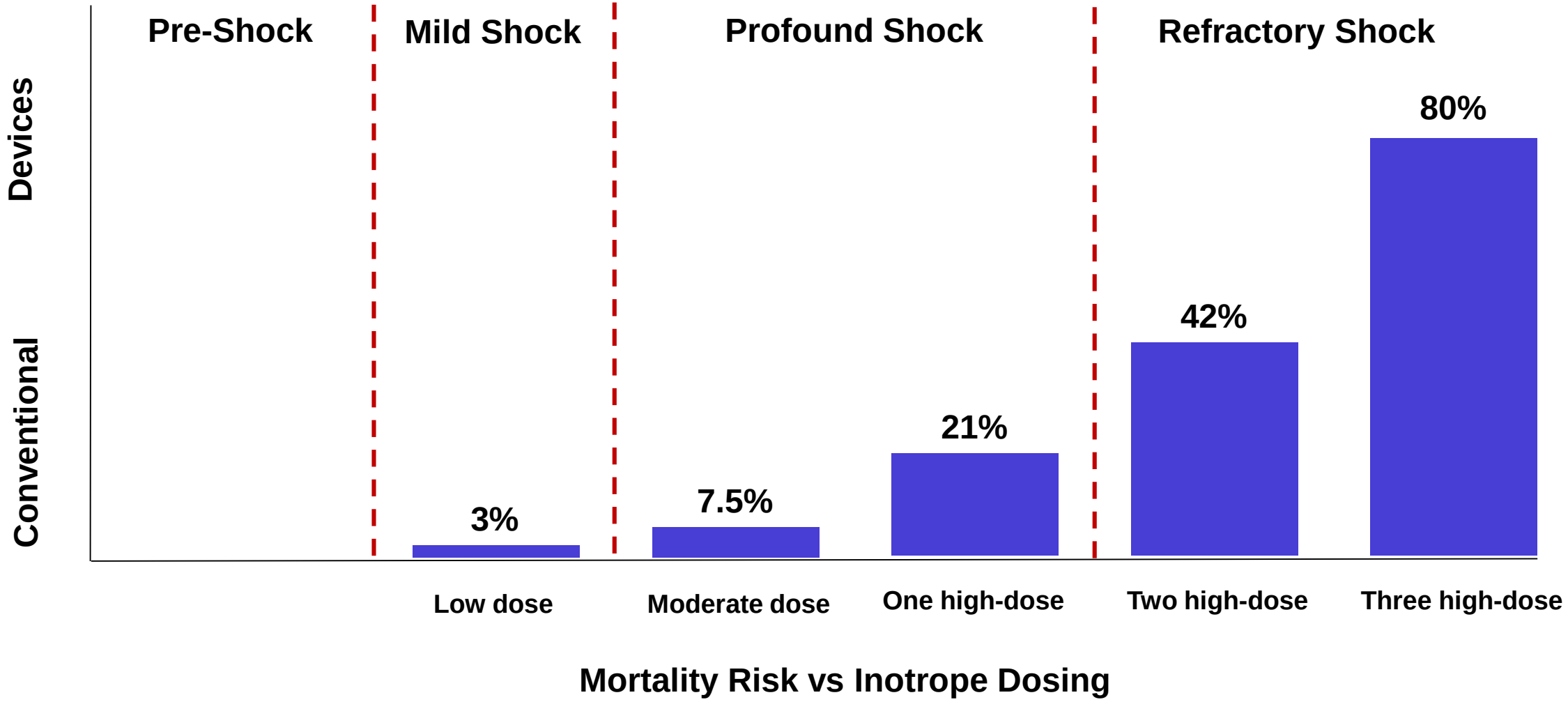
NO

- Vasodilators
- Diuretics
- Consider inotropic agent in refractory cases

Adapted from 2016 ESC HF Guidelines



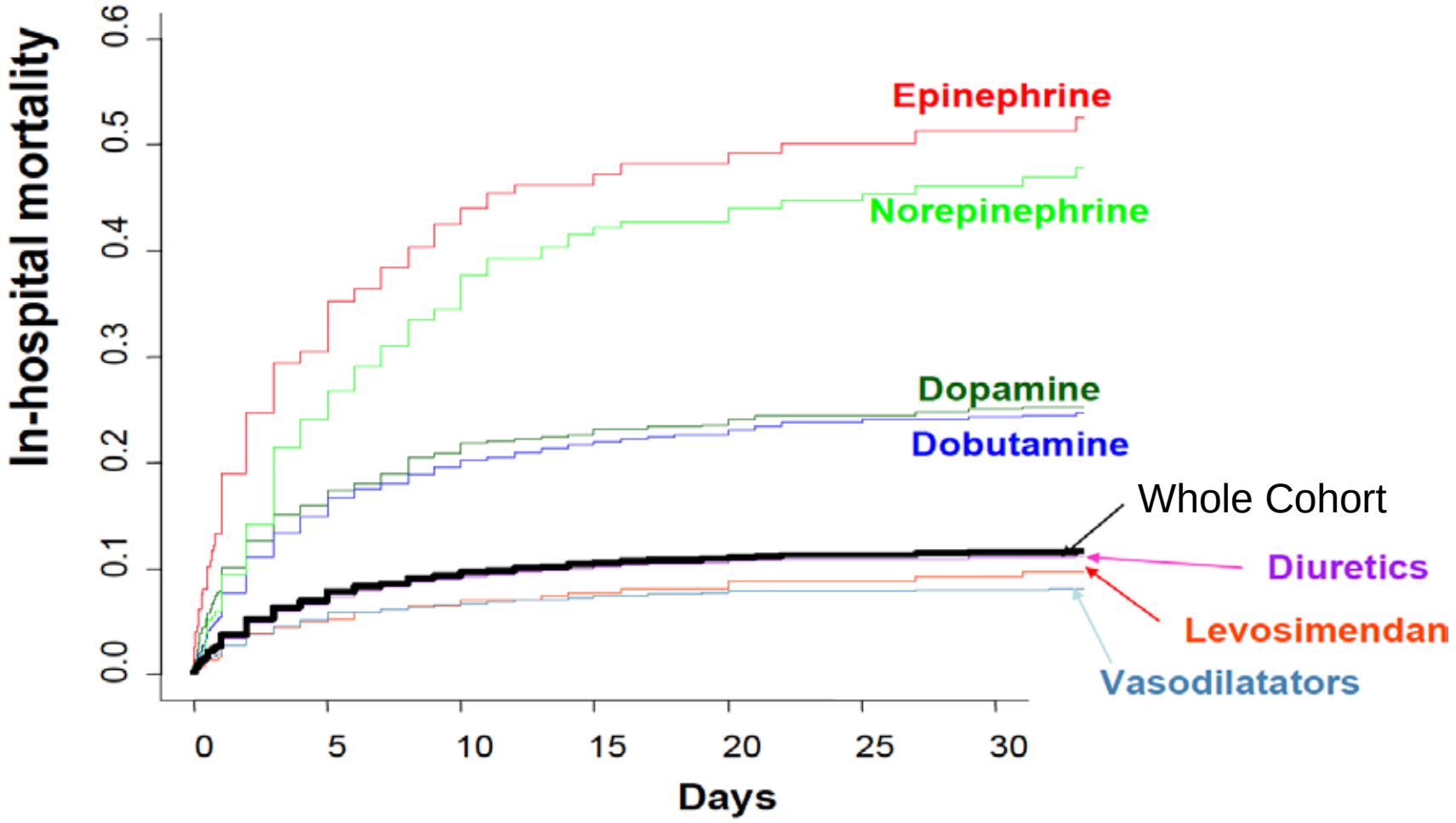
CS May Not Be Easy to Diagnose In Early Stages



Adapted from: Biswajit Kar et al. Circulation. 2012;125:1809-1817

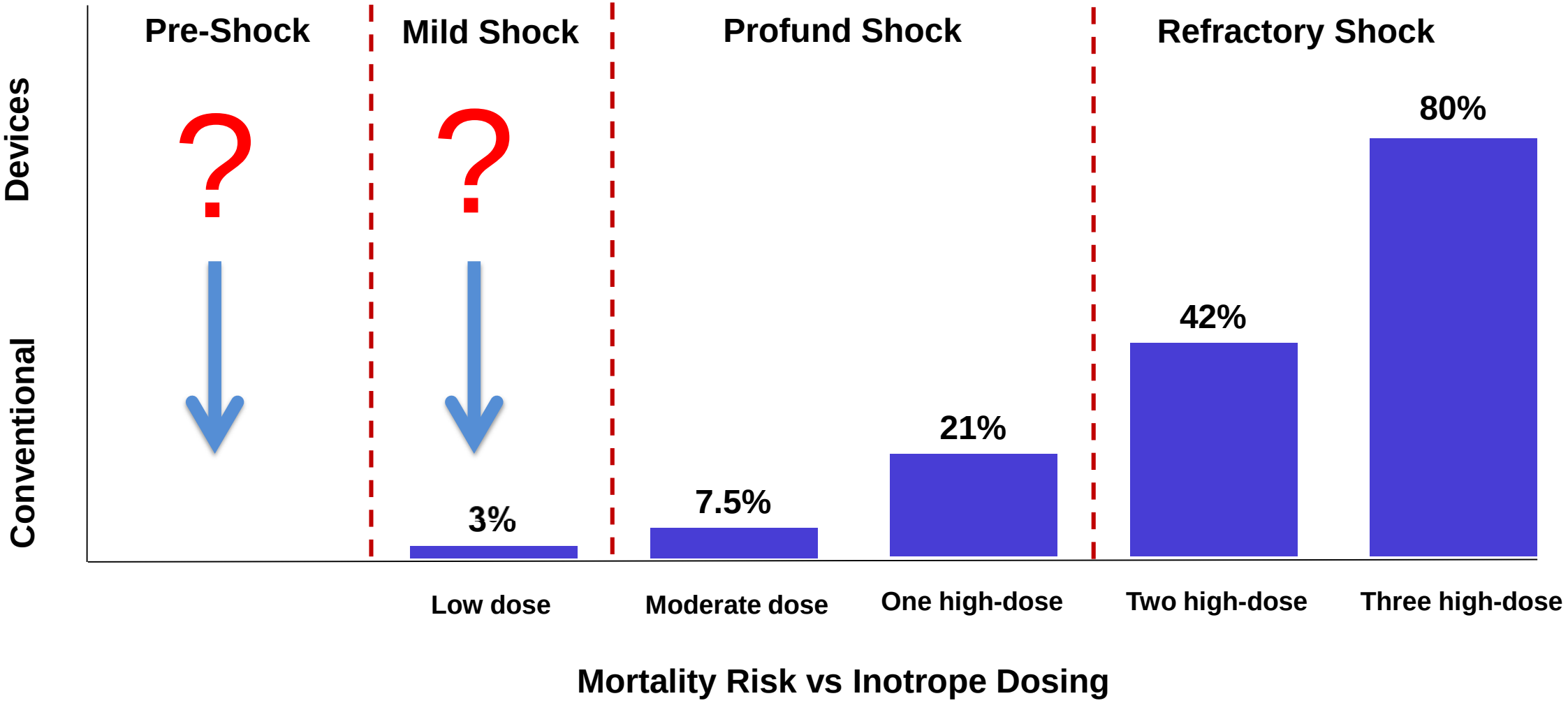
Effect of AHF Treatment on Mortality: Propensity Score Analysis

ALARM-HF Registry



Mebazaa A. Intensive Care Med. 2011 Feb;37(2):290

CS May Not Be Easy to Diagnose In Early Stages



Adapted from: Biswajit Kar et al. Circulation. 2012;125:1809-1817


YURI LASHOV/AFP/GETTY IMAGES

Does Pre-Shock Exist?

Table 1. Characteristics of Patients with Nonhypotensive Cardiogenic Shock, Classic Cardiogenic Shock, and Hypotension without Hypoperfusion in the SHOCK Trial Registry

Characteristic	Nonhypotensive Cardiogenic Shock (n = 49)	Classic Shock (n = 943)	Hypotension without Hypoperfusion (n = 76)	*P* Value*
	Pre-shock			
Age (years)	67 ± 12	70 ± 11	63 ± 13	<0.001 (0.50)
Female sex	39	40	47	0.47
Smoking	50	50	56	0.65
Diabetes				3
Hypertensic				2
Previous myocardial infarction	29	39	32	0.25
Previous angioplasty	10	10	7	0.64
Previous bypass surgery	6	6	6	0.76
Time from myocardial infarction to shock or hypotension (hours)	9	6	12	0.04 (0.22)
Time from admission to shock or hypotension (hours)	11	7	11	0.22
Anterior myocardial infarction	71	53	67	0.009 (0.03)
Pulmonary edema on chest	69	73	60	0.12

5% of CS patients could be classified as pre-shock patients

Menon V et al. Am J Med. 2000 Apr 1;108(5):374-80

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	Pre-shock			
Age (years)	67 ± 12	70 ± 11	63 ± 13	<0.001 (0.50)
Female sex	39	40	47	0.47
Smoking	50	50	56	0.65
Diabetes	20	34	31	0.13
Inhospital Mortality	**43%**	**62%**	**26%**	**<0.001**
Previous angioplasty	10	10	7	0.64
Previous bypass surgery	6	6	6	0.76
Time from myocardial infarction to shock or hypotension (hours)	9	6	12	0.04 (0.22)
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Does Pre-Shock Exist?

Table 2. Hemodynamic Measurements in Patients with Nonhypotensive Cardiogenic Shock, Classic Cardiogenic Shock, and Hypotension without Hypoperfusion in the SHOCK Trial Registry

Measurement	Nonhypotensive Cardiogenic Shock	Classic Shock	Hypotension without Hypoperfusion	*P* Value*
	Mean ± SD (Number of Patients)			
Heart rate (beats/min)	94 ± 27 (46)	95 ± 26 (892)	100 ± 22 (74)	0.28
Systolic blood pressure (mm Hg)	104 ± 34 (47)	86 ± 21 (897)	97.6 ± 18 (73)	<0.001 (<0.001)
Diastolic blood pressure (mm Hg)	62 ± 23 (43)	51 ± 16 (769)	57 ± 14 (71)	<0.001 (<0.001)
Pulmonary capillary wedge pressure (mm Hg)	25 ± 8 (30)	23 ± 8 (572)	22 ± 10 (69)	0.25
Cardiac output (L/min)	3.5 ± 1.1 (17)	3.9 ± 1.6 (307)	4.6 ± 1.9 (33)	0.04
Cardiac index (L/min/m^2)	1.9 ± 0.4 (19)	2.0 ± 0.8 (445)	2.5 ± 0.9 (51)	0.48
Left ventricular ejection fraction (%)	34 ± 12 (20)	33 ± 14 (360)	34 ± 13 (33)	0.54
Systemic vascular resistance (dynes/cm/sec^{-5})	1753 ± 675 (13)	1389 ± 689 (218)	1378 ± 687 (25)	0.19

Menon V et al. Am J Med. 2000 Apr 1;108(5):374-80

Clinical Signs of Shock and Pre-Shock

I. Signs of shock (organ hypoperfusion)

A. Metabolic acidosis

B. Systolic blood pressure <90 mm Hg

C. Urine output <20 ml/hr

D. Cold, clammy skin

E. Mental confusion

II. Signs of pre-shock or low-flow state. Any of the following unexplained findings in a patient clinically suspected of being at risk for developing shock:

A. Fall in urine output

B. Rise in heart rate

C. Fall in systolic blood pressure

D. Fall in skin temperature

Cardiogenic Shock: Levels of Severity

- Pre-Cardiogenic shock
- CS Grade I (mild)
- CS Grade II (profound)
- CS Grade III (refractory)

Cardiogenic Shock Grade I Criteria

- Systolic BP<90 mm Hg for 30 minutes or low dose inotrope/vasopressor required to maintain systolic BP>90 mm Hg
- Pulmonary congestion or elevated LV filling pressure
- Signs of impaired organ perfusion with at least one of the following:
    - ü altered mental status
    - ü cold clammy skin
    - ü oliguria
    - ü high lactate (> 2mmol/L)

Cardiogenic Shock Grade II (Profund Shock) Criteria

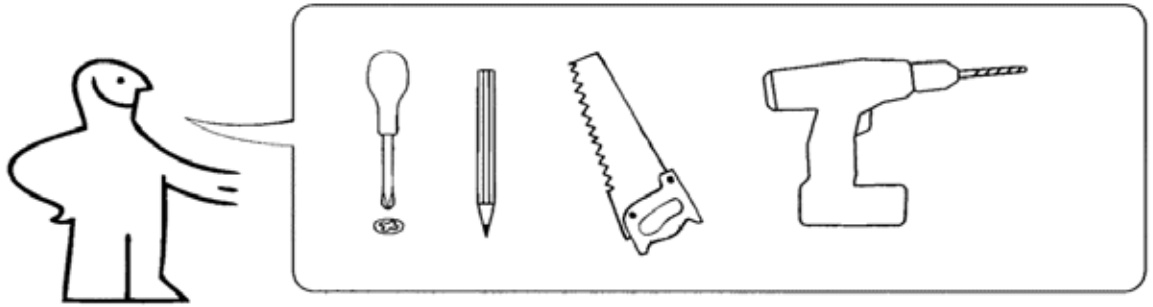
- Criteria for Cardiogenic shock AND
  - ü CI < 2.2 l/min/m OR
  - ü lactate > 4 mmol/L
- Despite at least 2 inotropes/vasopressors

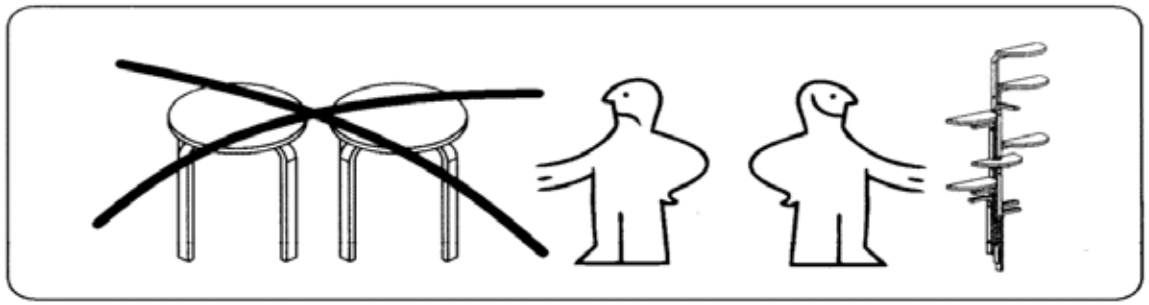
Cardiogenic Shock Grade III (Deep Shock) Criteria

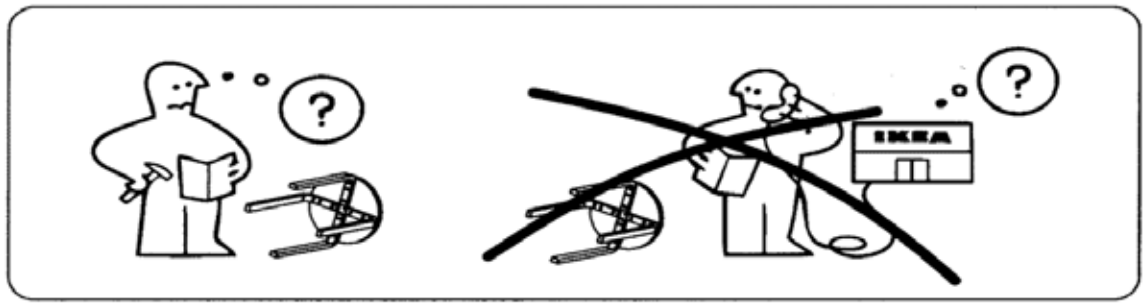
- Criteria for advanced cardiogenic shock
- AND two of the following criteria:
  - ü lactate > 8 mmol/L
  - ü anuria
  - ü respiratory failure (NIMV or IMV)
  - ü overt RHF
  - ü escalating inotropes/vasopressors

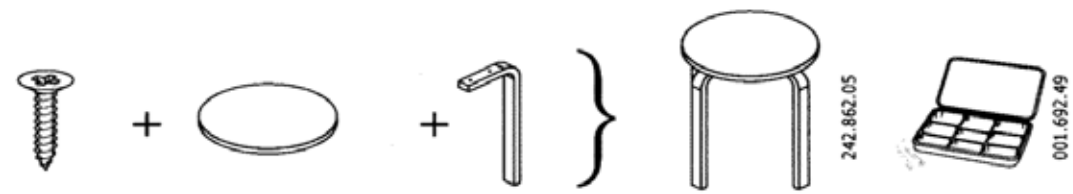

I THINK YOU SHOULD BE MORE SPECIFIC HERE IN STEP TWO
THEN A MIRACLE OCCURS

FROSTA X







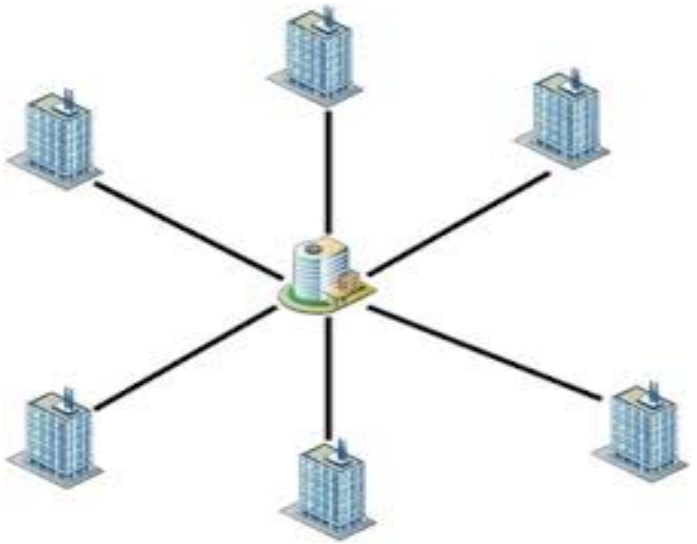


36x 3x 12x 3x 1x

IKEA
Design and Quality
IKEA of Sweden
Redesign by
Andreas Bhend

Cardiogenic Shock Network: How To Do It

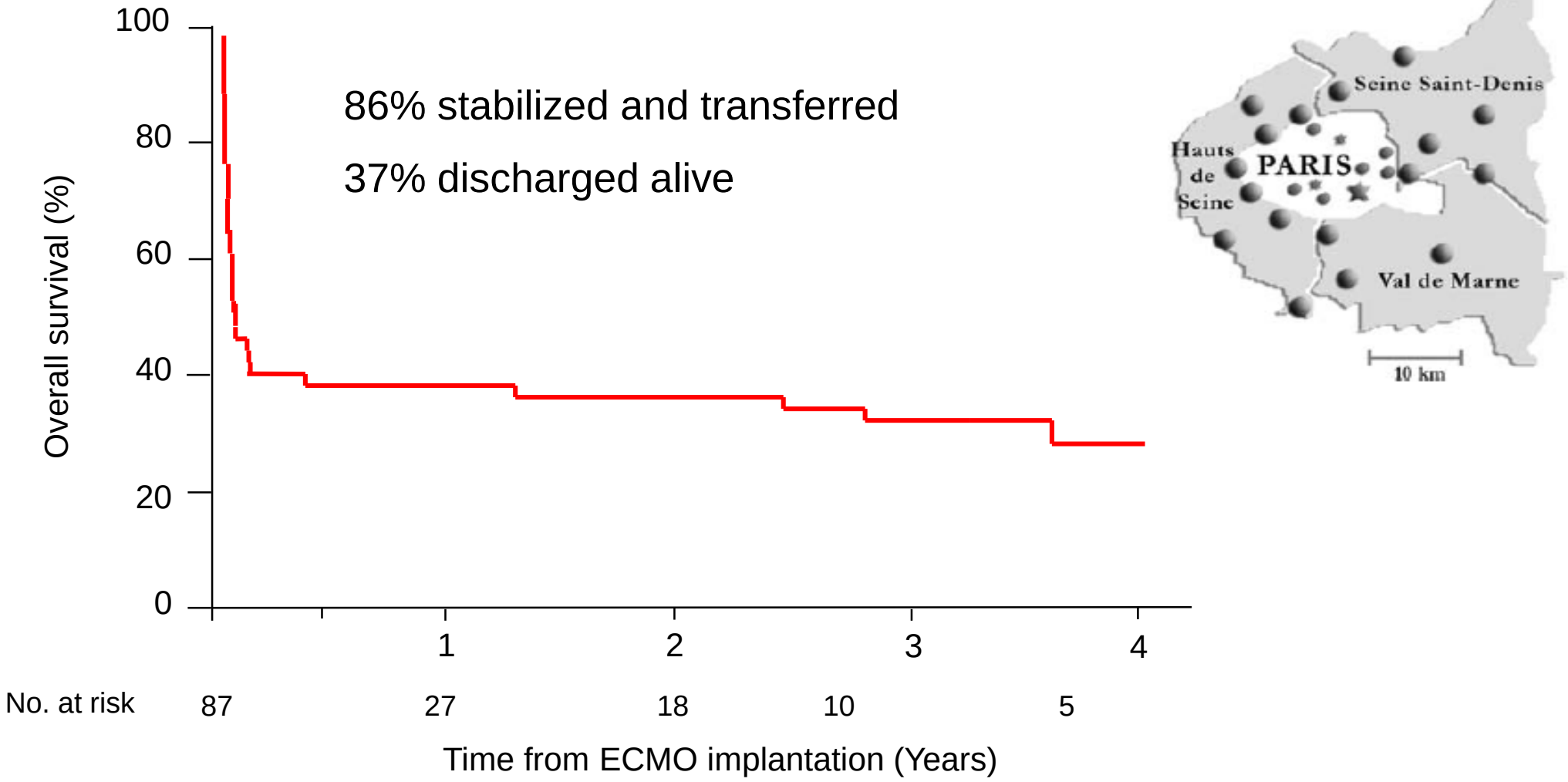
- Hub and Spoke Model



- Multidisciplinary CS Team

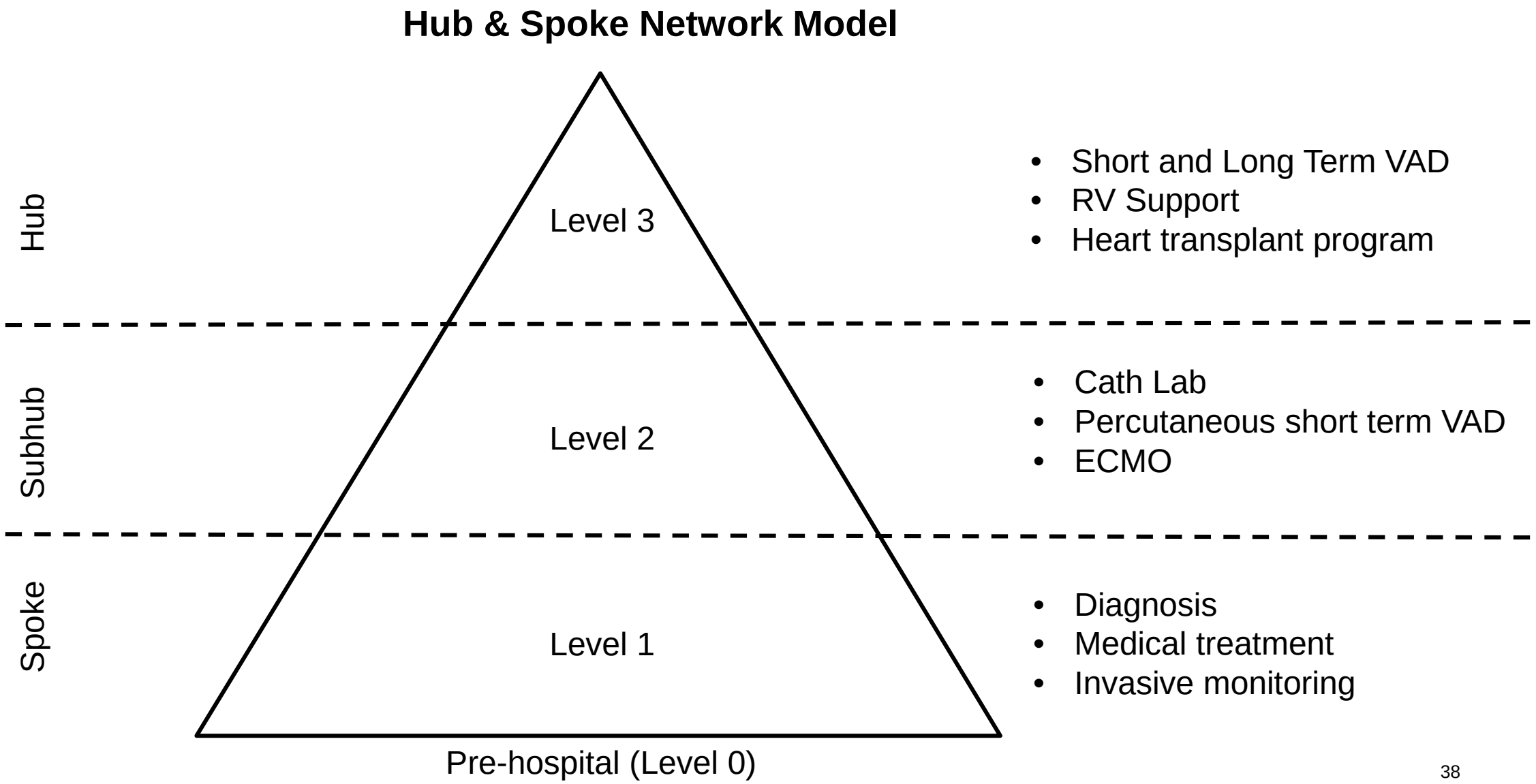
Cardiac RESCUE

ECMO for Transfer From Non-tertiary Centres (2005-2009)

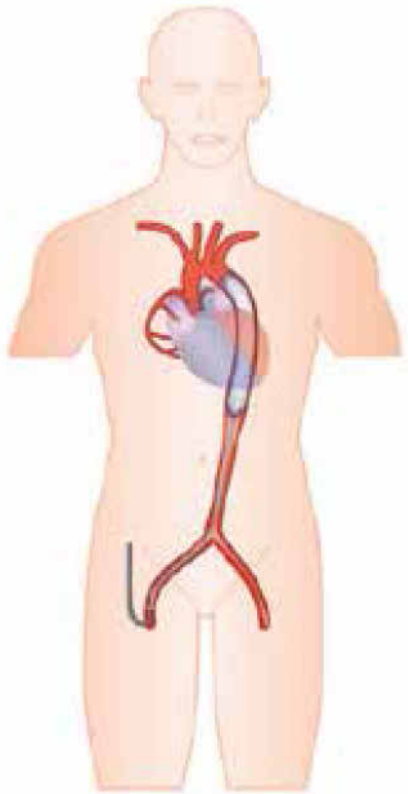


Beurtheret et al. Eur Heart J 2013;34:112

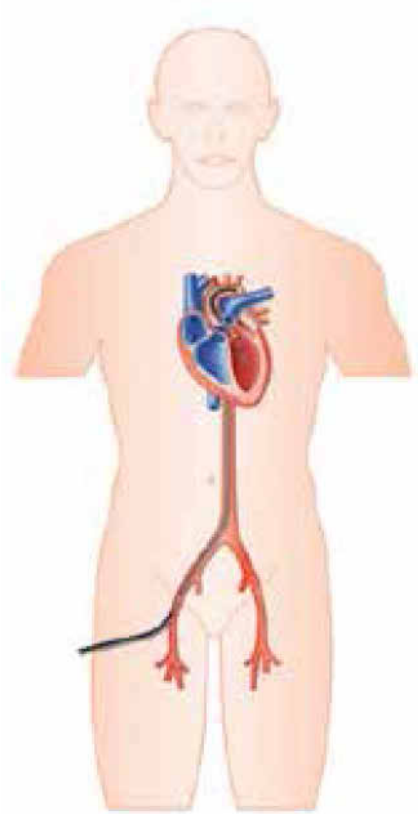
Cardiogenic Shock Network: How To Do It



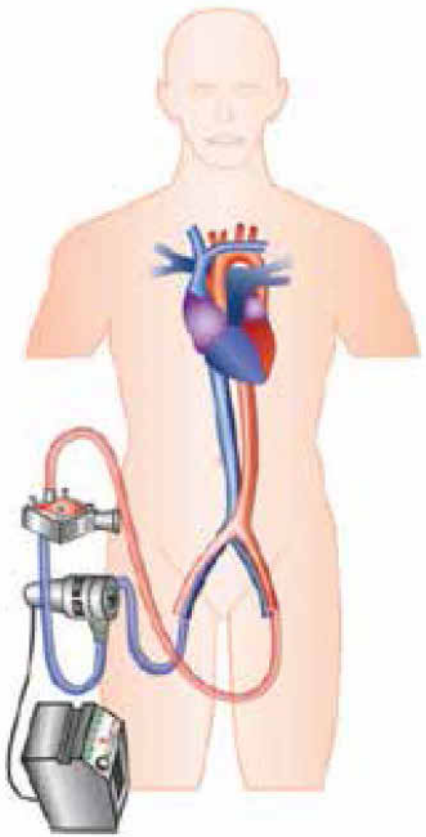
IABP, Impella®, ECMO of VAD?



IABP



Impella

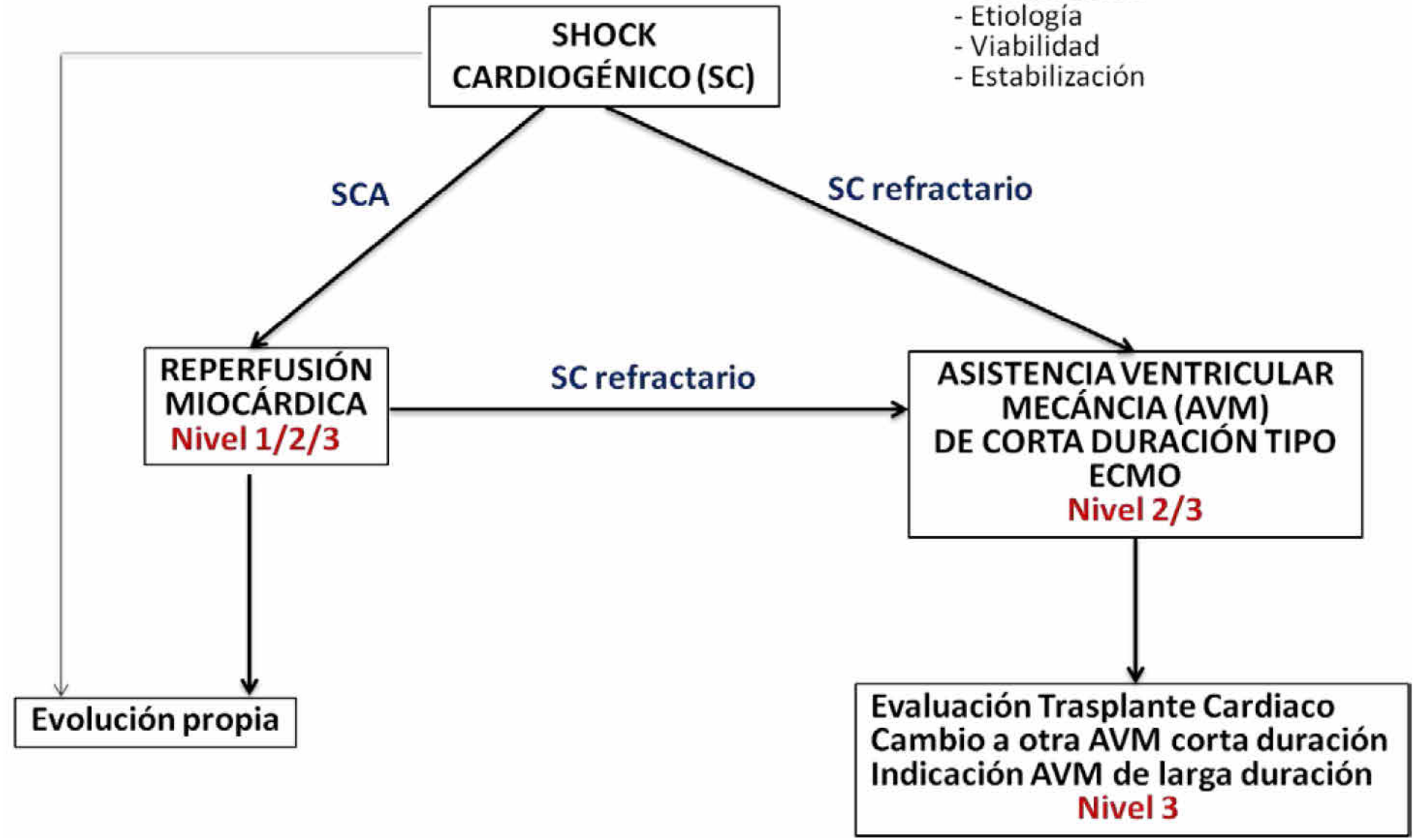


ECMO

VAD

Algoritmo según niveles asistenciales de atención al shock cardiogénico

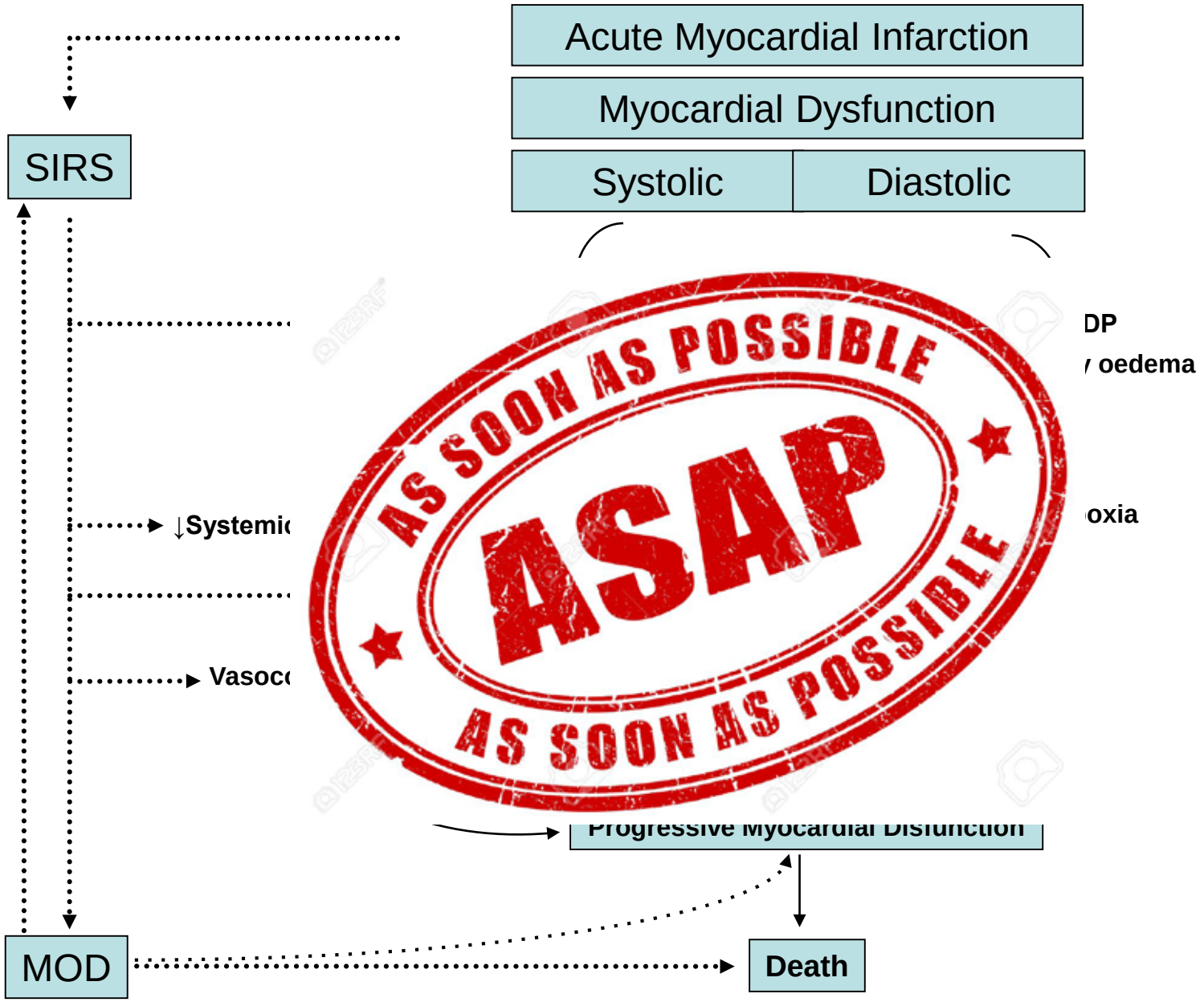
- **Nivel Asistencial: 0 / 1 /2 / 3**
  - Identificación
  - Etiología
  - Viabilidad
  - Estabilización



Challenges

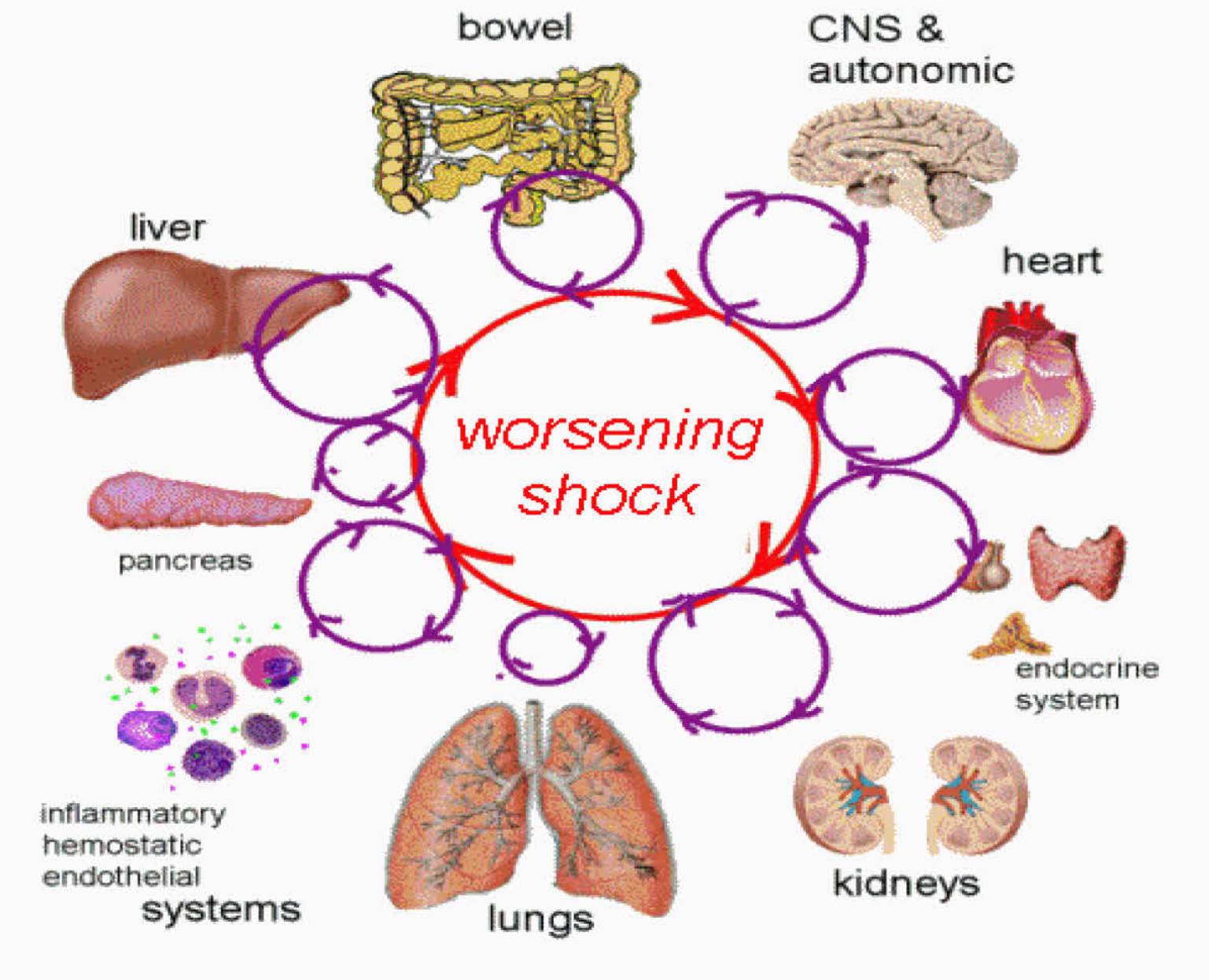
- Wide spectrum of indications (patients)
- Different devices (different features)
- Existing guidelines are non-specific
- No algorithms for device/patient selection
- Lack of protocols
- Current CS shock criteria (definitions) and INTEMACS I are not appreciating the following:
  - ü RV Function
  - ü Level of CS
  - ü Degree of end organ Failure/dysfunction


NOW
LATER



Adapted from: Reynolds et al. Circulation 2008;117:686

Multiple Organ Dysfunction Syndrome



Key Messages

- CS first cause of in-hospital death for AMI (other etiologies 20% of cases)
- Common pathophysiology
- Early revascularization is the only intervention that has been proven to be effective in avoiding progression to shock and improve survival
- Prompt recognition is essential but diagnosis in early stages can be challenging
- Hub and spoke network model essential in order to ensure equipoise
- Many challenges related to its implementation

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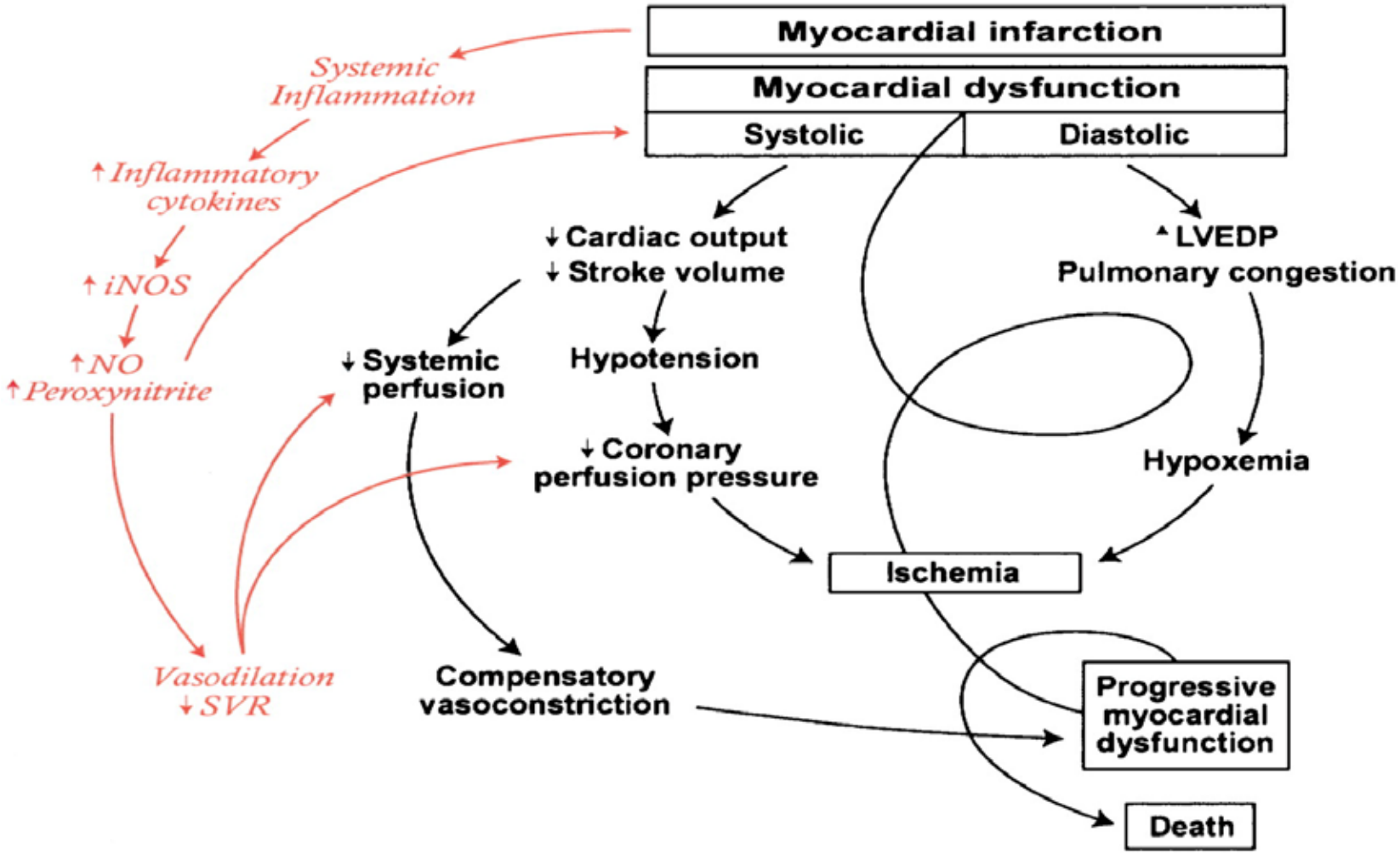
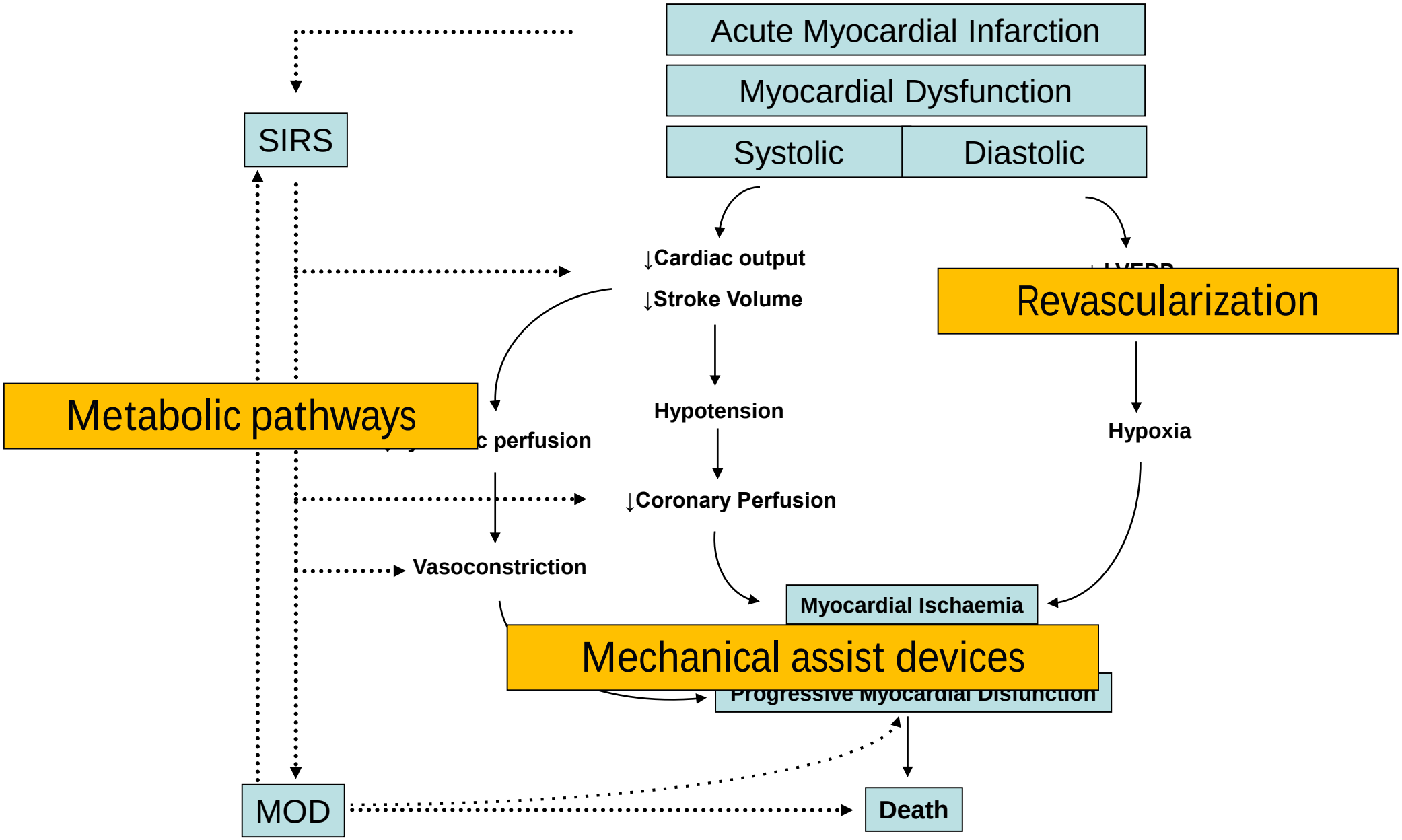
CS Different Etiologies But Common Pathophysiology



Hochman, J. S. Circulation 2003;107:2998-3002



Adapted from: Reynolds et al. Circulation 2008;117:686

My Definition of Pre-Shock

Definition with clinical signs		Definition without clinical signs
Cold/clammy extremities Altered mental status Oliguria		
Heart rate > 90/min AND/OR	OR	Heart rate > 100/min AND
Systolic BP > 90 but < 110 mmHg		Systolic BP < 100 mmHg

Without vasopressors and/or inotropes