

# Prise en charge du choc cardiogénique en 2015

**Enseignement du DESC de Réanimation**

Antoine Kimmoun  
Service de Réanimation Médicale Brabois  
CHU de Nancy  
Le 16 avril 2015



# Définition

- Pression artérielle systolique  $< 90$  mmHg pendant plus de 30 min
- Vasopresseur pour obtenir une pression artérielle systolique  $\geq 90$  mmHg
- Index cardiaque  $< 1,8$  l/min/m<sup>2</sup>
- Une augmentation des pressions de remplissage ventriculaire gauche
- Altération de la perfusion tissulaire:
  - Trouble de conscience
  - Oligurie
  - Extrémités froides
  - Augmentation du lactate

# Confirmation paraclinique

- Par cathérisme de Swan-Ganz historiquement
  - Index cardiaque
  - Pression artérielle pulmonaire d'occlusion
  - Résistances vasculaires systémiques et pulmonaires

Reynolds HR et al. **Circulation** 2008;117:686-697

- Par thermodilution transpulmonaire

Friesecke S et al. **Crit Care Med** 2009; 37:119 –12

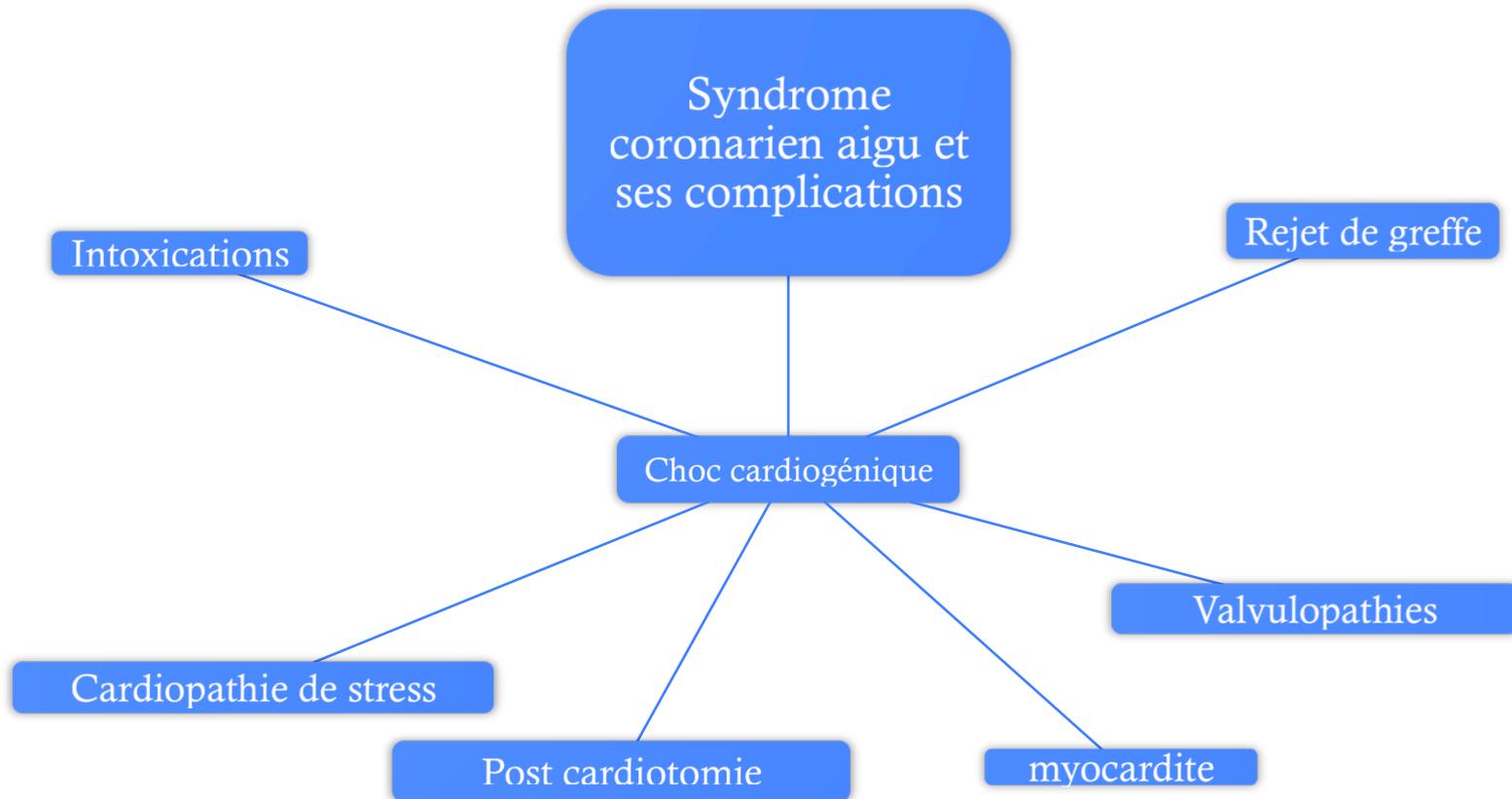
- Par échocardiographie

Gabriele V et al. **J Am Soc Echocardiogr** 2014;27:683.e1-683.e33.

# Epidémiologie

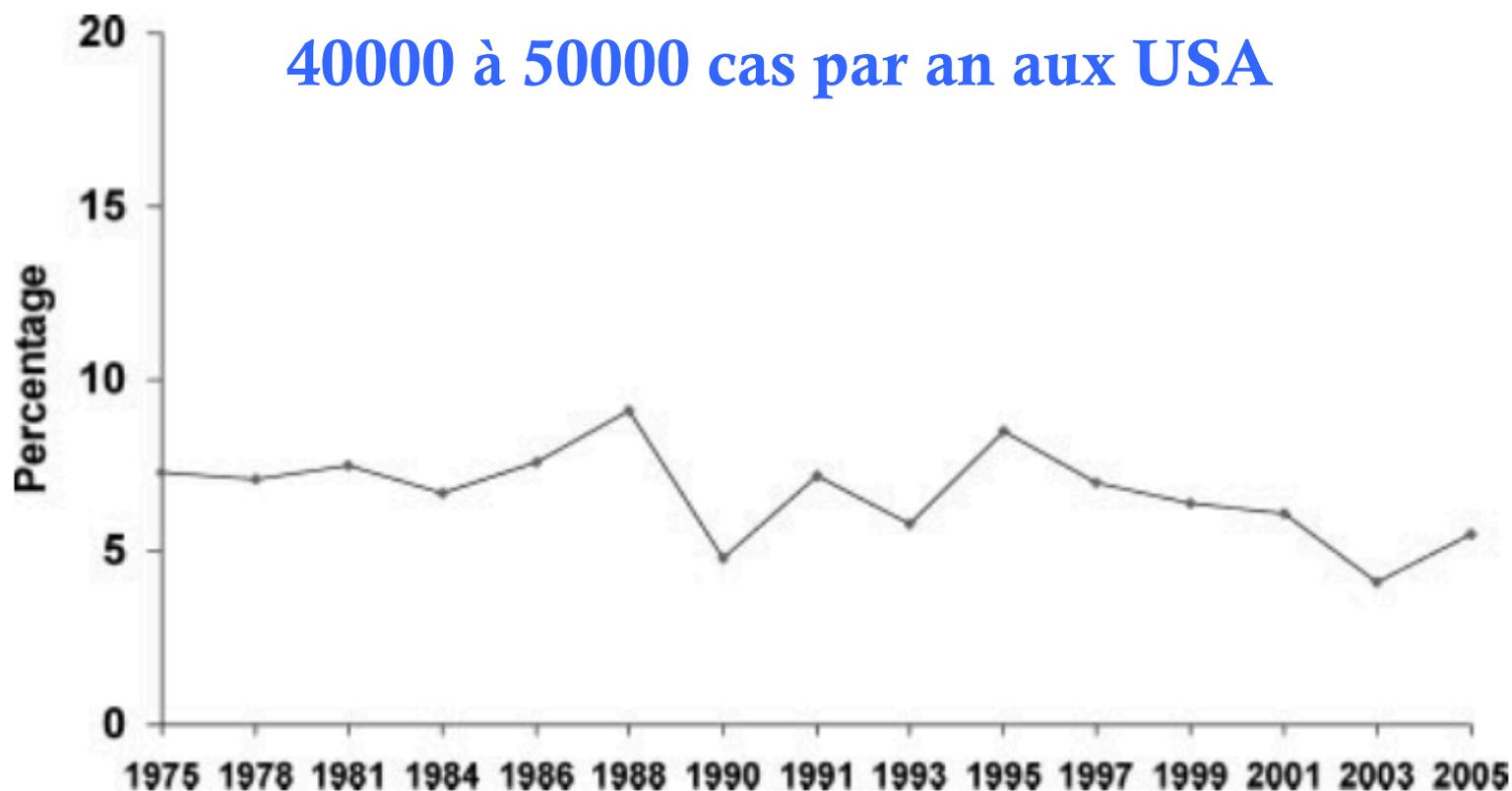
Données essentiellement sur le choc cardiogénique post syndrome coronarien aigu (SCA)

# Constellation d'étiologies



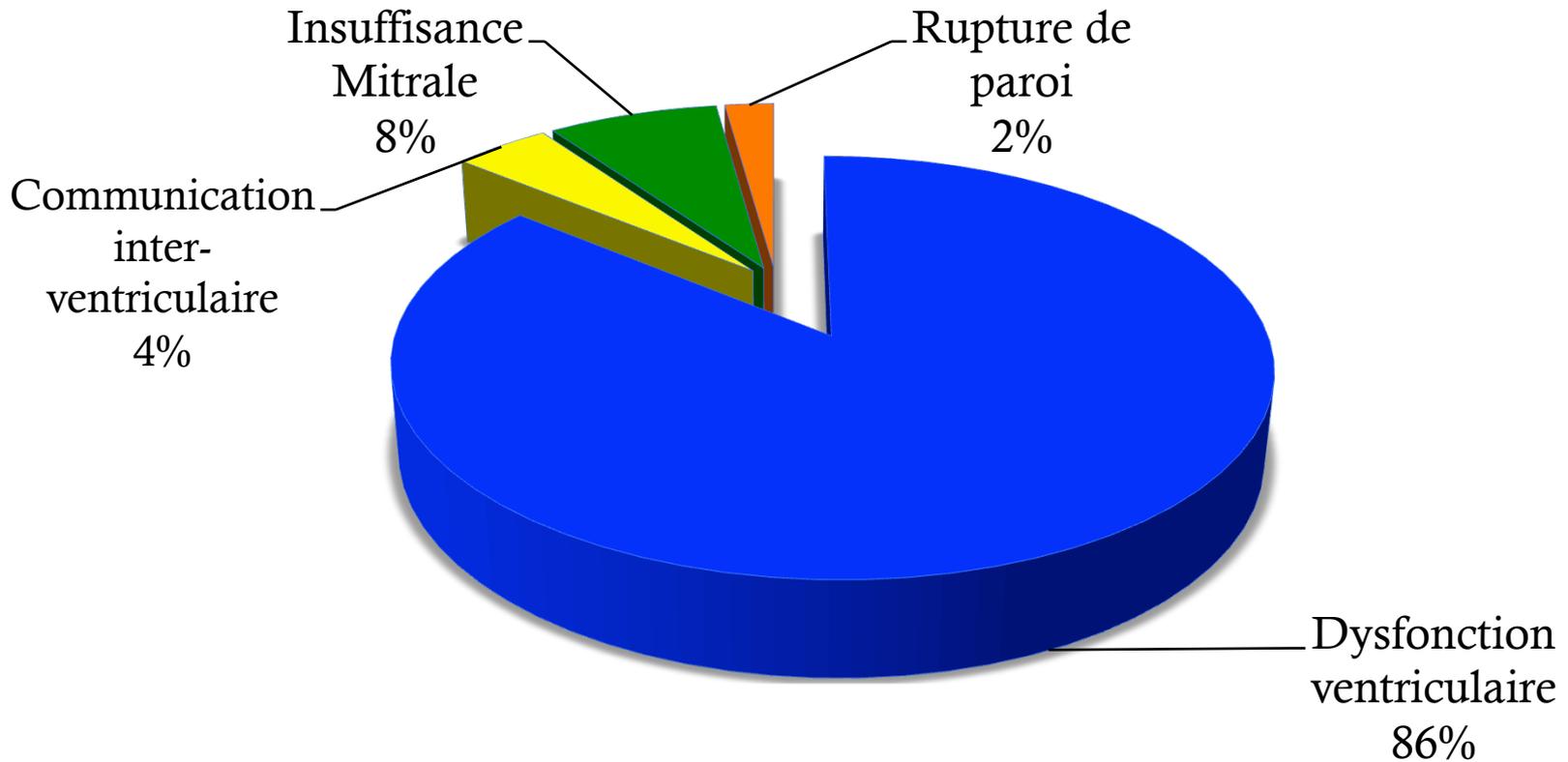
*Aucune donnée épidémiologique de qualité...*

# Incidence

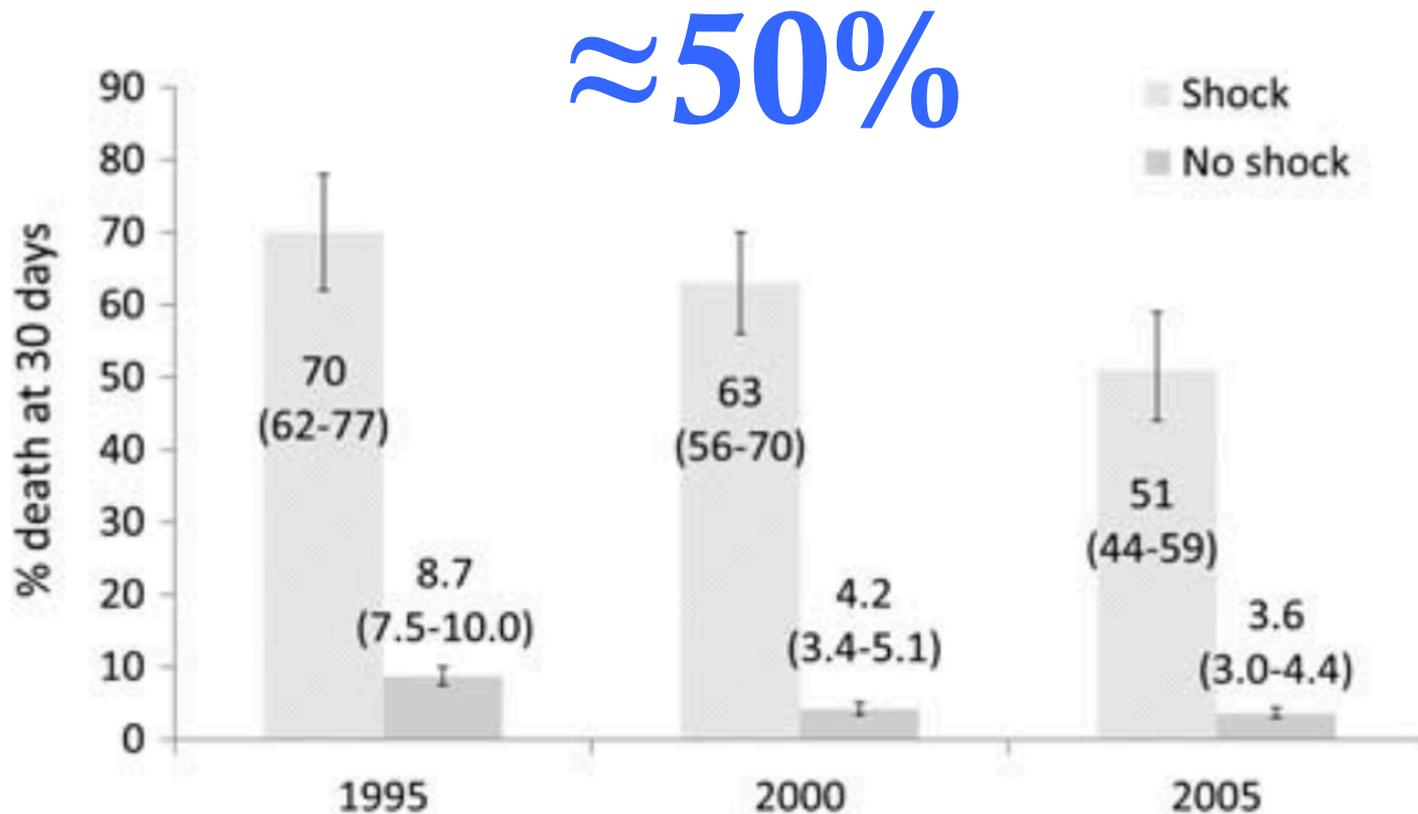


Goldberg RJ et al. **Circulation** 2005; 119:1211-1219

# Etiologies au sein du SCA



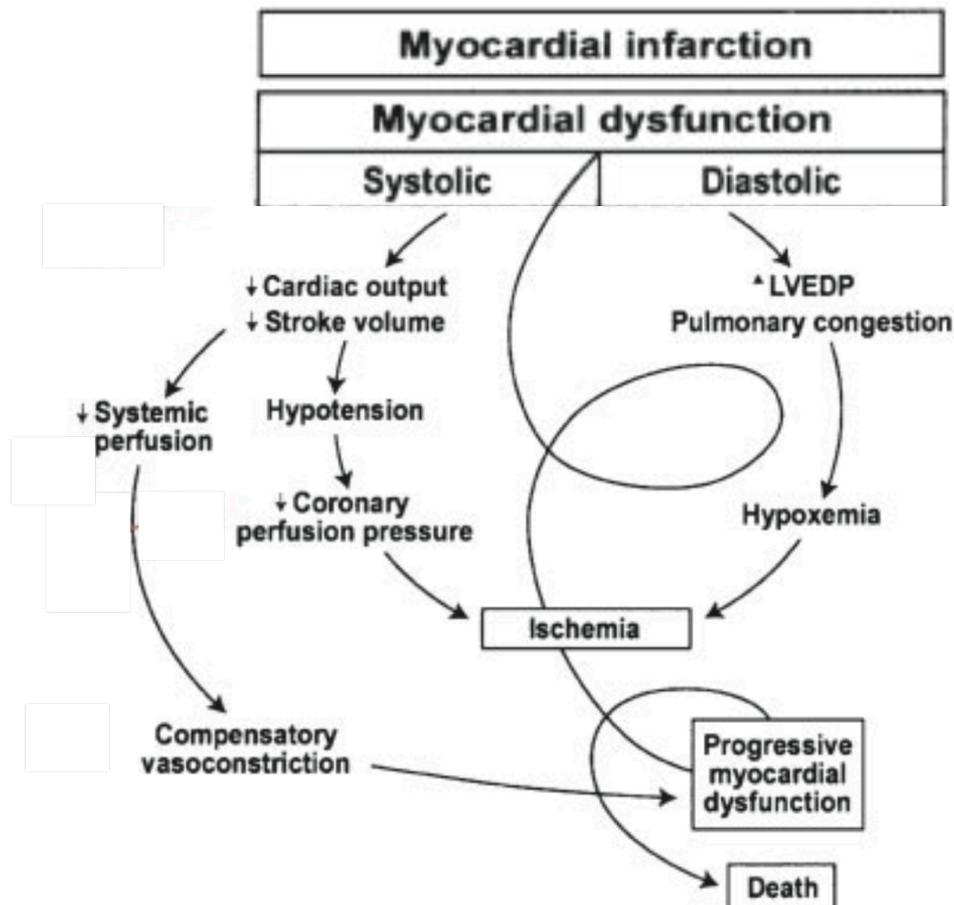
# Mortalité



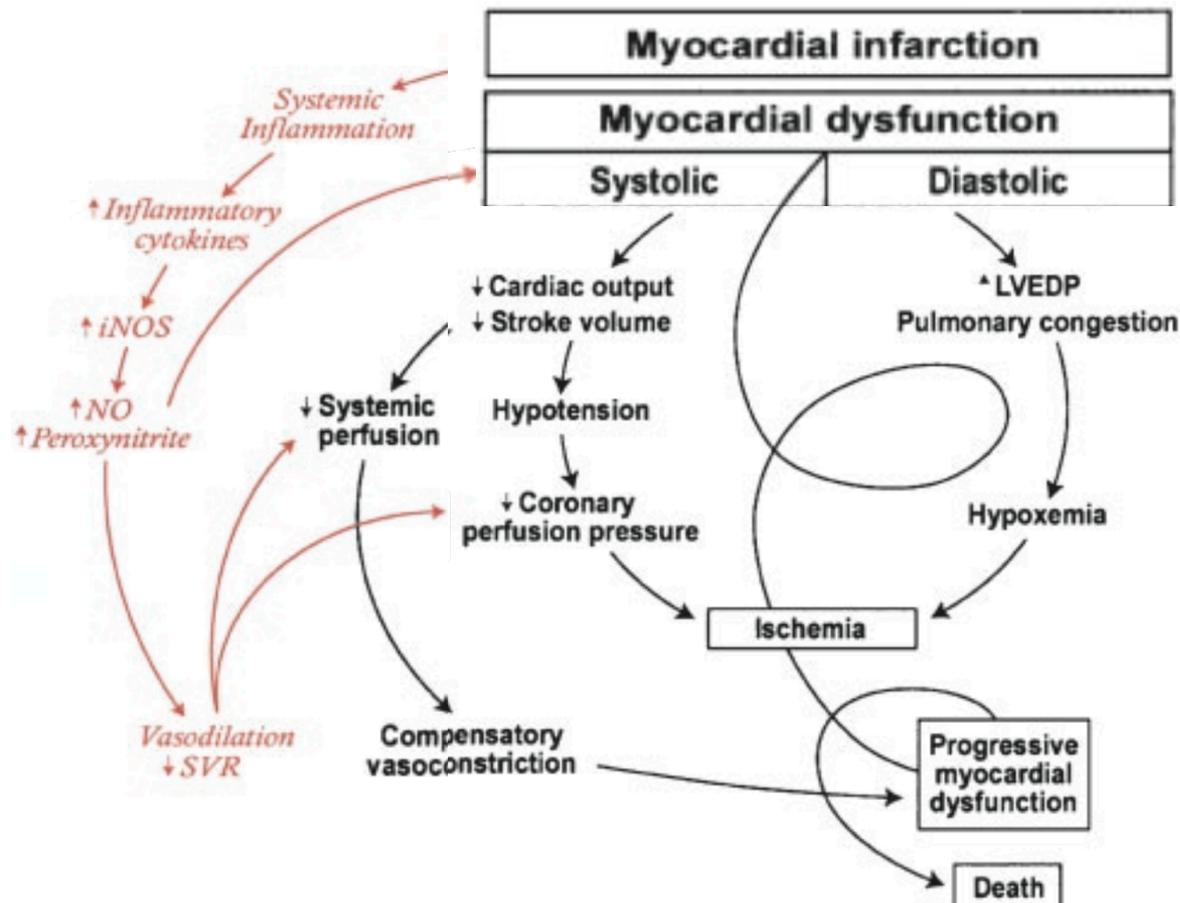
# Physiopathologie

Le paradigme du choc cardiogénique

# Physiopathologie classique



# Physiopathologie inflammatoire

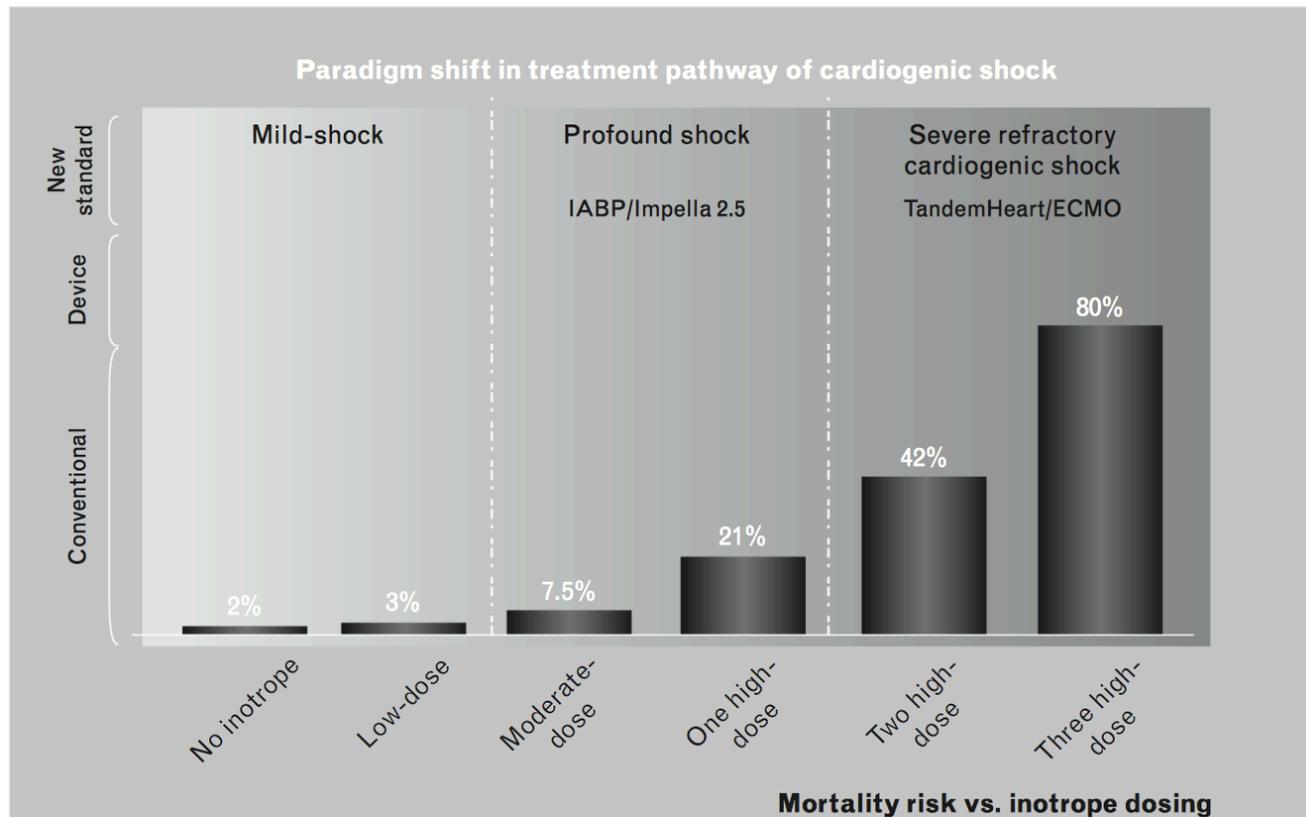


# Confirmée par les données cliniques

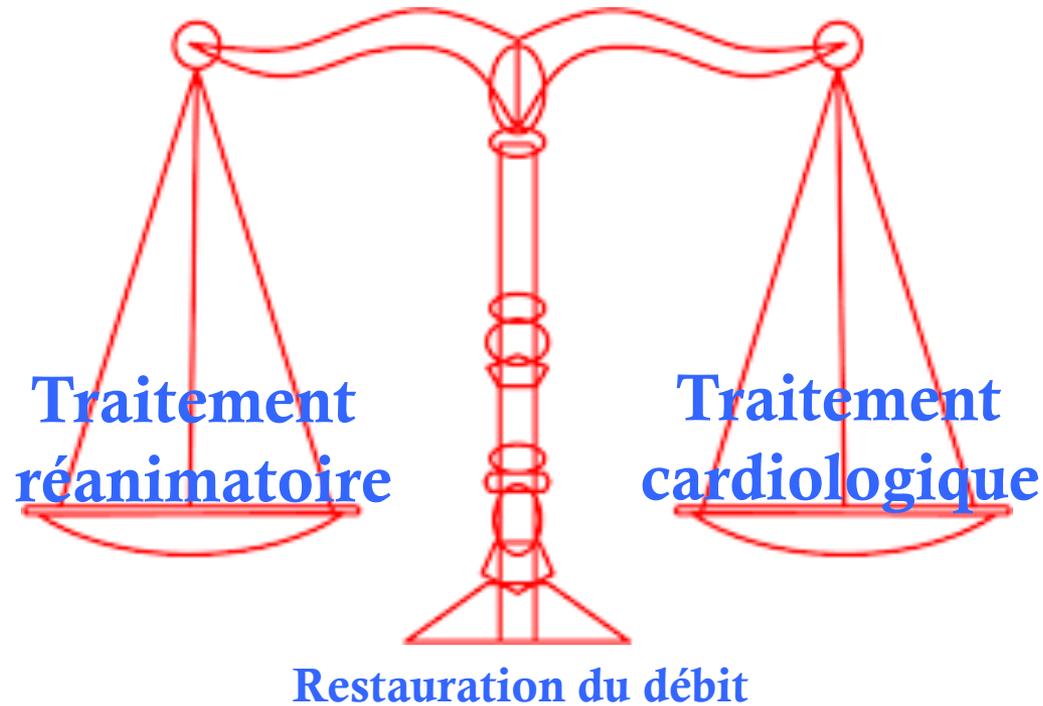


Measurement	Nonhypotensive Cardiogenic Shock	Classic Shock	Hypotension without Hypoperfusion	P Value*
	Mean $\pm$ SD (Number of Patients)			
Heart rate (beats/min)	94 $\pm$ 27 (46)	95 $\pm$ 26 (892)	100 $\pm$ 22 (74)	0.28
Systolic blood pressure (mm Hg)	104 $\pm$ 34 (47)	86 $\pm$ 21 (897)	97.6 $\pm$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

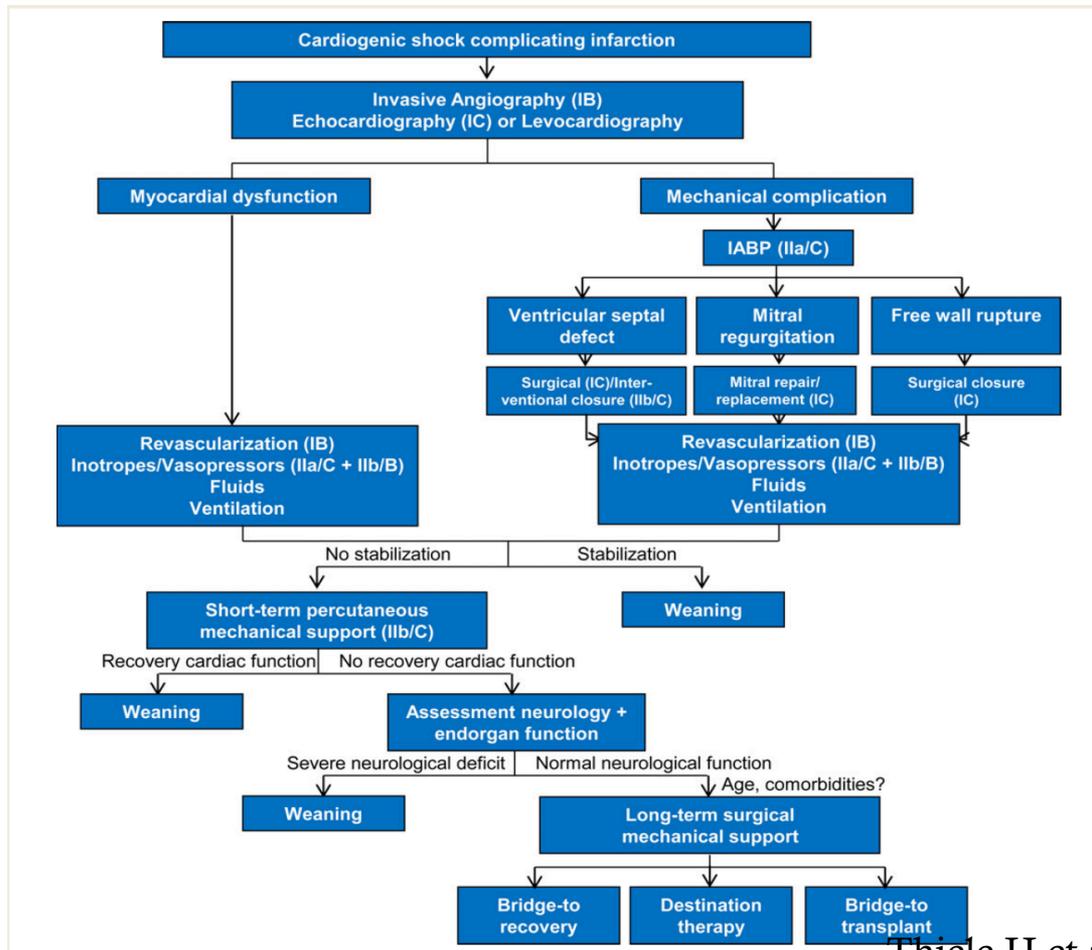
# Du choc modéré au choc réfractaire



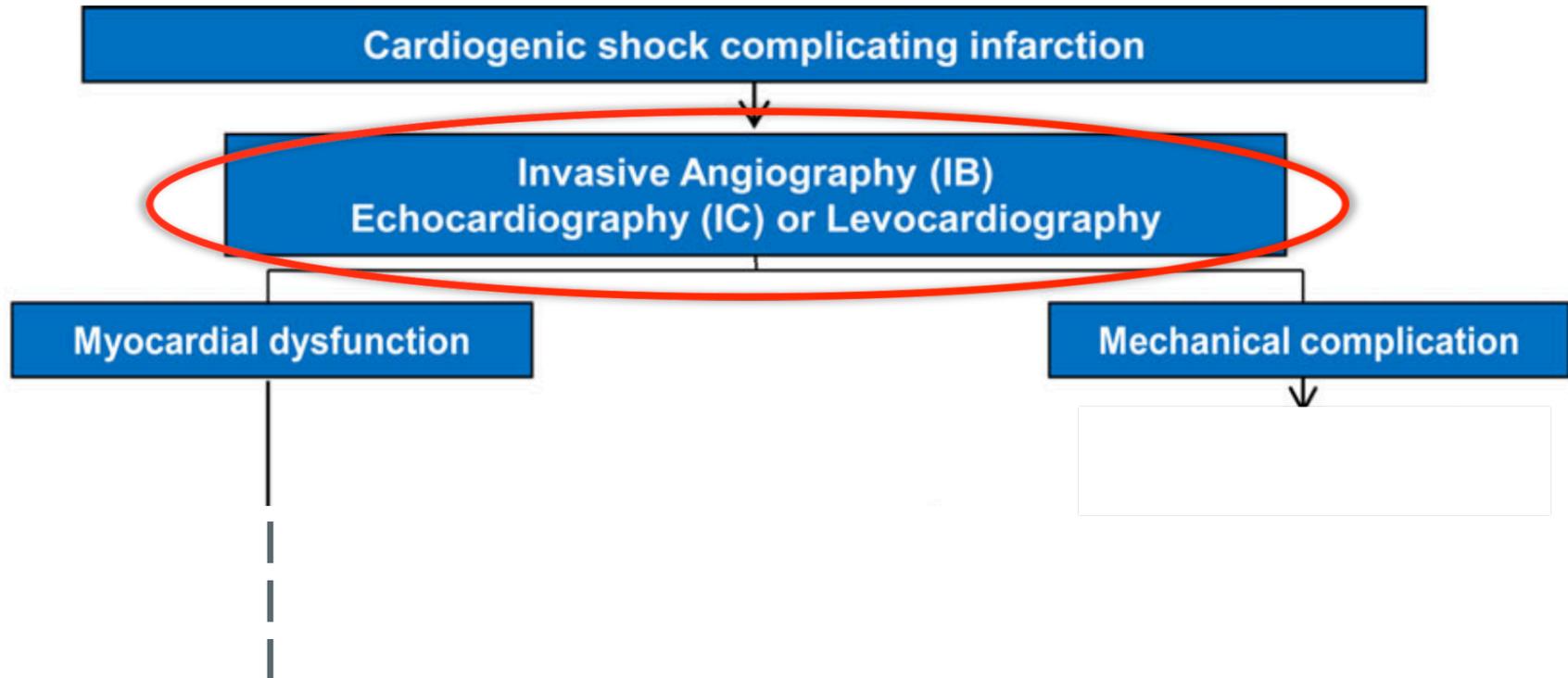
# Prise en charge



# Diagramme de prise en charge



# Diagramme de prise en charge: la coronarographie



# Revascularisation coronarographique

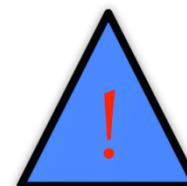
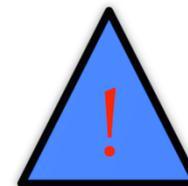


**TABLE 4. MORTALITY AMONG STUDY PATIENTS.\***

OUTCOME AND SUBGROUP	REVASCULARIZATION	MEDICAL THERAPY	DIFFERENCE BETWEEN GROUPS (95% CI)	RELATIVE RISK (95% CI)	P VALUE
	percent (number in subgroup)		percent		
30-day mortality					
Total	46.7 (152)	56.0 (150)	-9.3 (-20.5 to 1.9)	0.83 (0.67 to 1.04)	0.11
Age <75 yr	41.4 (128)	56.8 (118)	-15.4 (-27.8 to -3.0)	0.73 (0.56 to 0.95)	0.01†
Age ≥75 yr	75.0 (24)	53.1 (32)	+21.9 (-2.6 to 46.4)	1.41 (0.95 to 2.11)	
6-mo mortality‡					
Total	50.3 (151)	63.1 (149)	-12.8 (-23.2 to -0.9)	0.80 (0.65 to 0.98)	0.027
Age <75 yr	44.9 (127)	65.0 (117)	-20.1 (-31.6 to -7.1)	0.70 (0.56 to 0.89)	0.003†
Age ≥75 yr	79.2 (24)	56.3 (32)	+22.9 (0.7 to 46.6)	1.41 (0.97 to 2.03)	

**Ou thrombolyse si <3h des symptômes et  
>120 min de la coronarographie...**

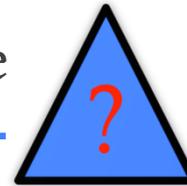
Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>Urgent</b> coronary angiography (<2 hours) is recommended in patients at very high ischaemic risk (refractory angina, with associated heart failure, cardiogenic shock, life-threatening ventricular arrhythmias, or haemodynamic instability).	I	C
In patients with time from symptom onset >12 hours, primary PCI is indicated in the presence of continuing ischaemia, life-threatening arrhythmias or if pain and ECG changes have been stuttering.	I	C
Primary PCI is indicated for patients with severe acute heart failure or cardiogenic shock due to STEMI independent from time delay of symptom onset.	I	B



# Quel monitoring hémodynamique initial proposer?

- *Débatu...*

- Cathéter artériel
- ScVO<sub>2</sub> continue ou discontinue
- Pression Veineuse Centrale ←



- Invasif?:

- Cathétérisme de Swan et Ganz

- L'intermédiaire :

- *Thermodilution transpulmonaire et*
- *analyse du contour de l'onde de pouls*

Débit  
cardiaque

Adéquation  
VO<sub>2</sub>/DO<sub>2</sub>

Cecconi M et al. **Intensive care Med** 2014;40:1795–1815

Vincent JL et al. **N Engl J Med** 2013;369:1726-34

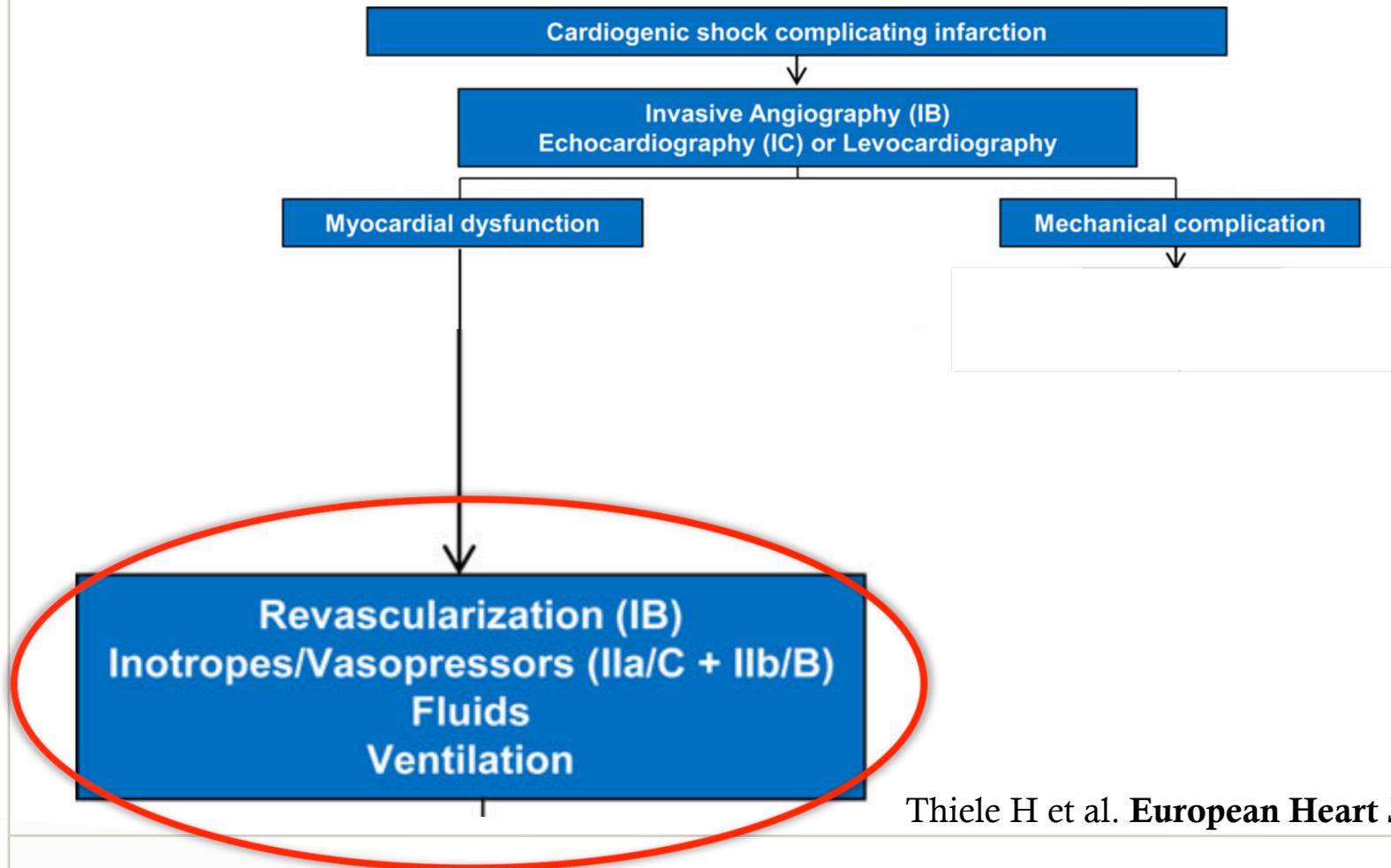
De Backer D et al. **Curr Heart Fail Rep** 2015

# Choix d'une technique?

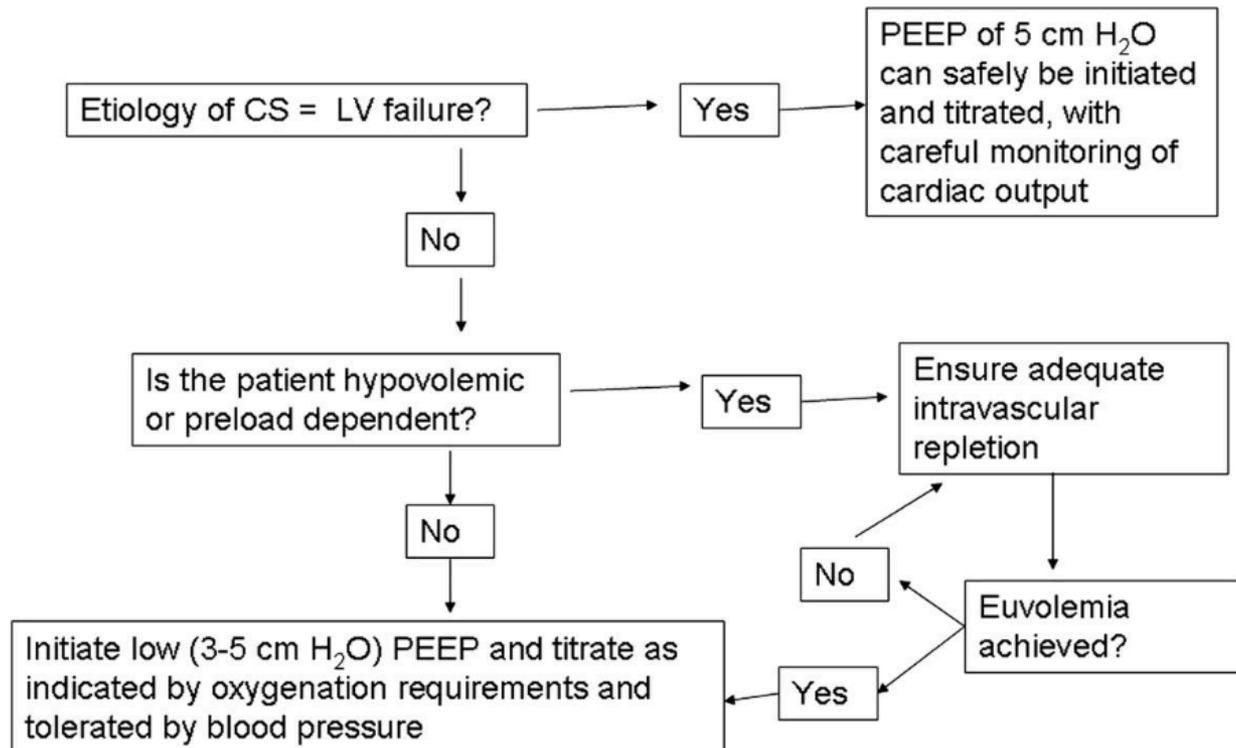
**Cathéter artériel**



# Diagramme de prise en charge: soins de support



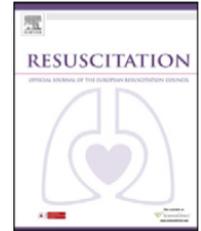
# Ventilation mécanique



# Ventilation mécanique

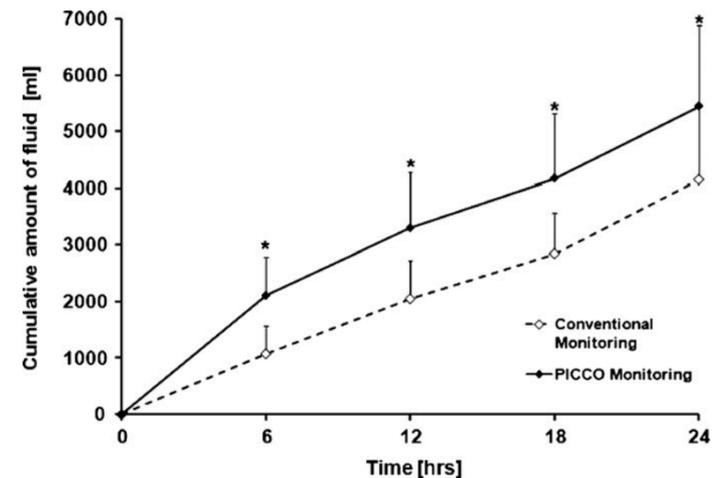
Study	n	Description of study	Patient groupings	Definition of LV dysfunction	Amount of PEEP (cm H <sub>2</sub> O)	Cardiopulmonary changes with PEEP
Grace and Greenbaum <sup>38</sup>	21	Medical ICU; titration of PEEP to maximal CO	Divided by PCWP ( $\leq 12$ , 14–18, $\geq 19$ )	AMI, CS or CHF requiring MV	0–8	CO increase in 12/13 of patients with PCWP $\geq 19$
Mathru <i>et al.</i> <sup>54</sup>	290	Surgical ICU, post CABG; MV by CMV, IMV or IMV +PEEP	Divided by EF and LVEDP	EF <60% (mean 34%) and LVEDP >16 Torr (mean 19)	5	Improvement in RAP, PCWP, CI, SI
Dongelmans, 1986 <sup>10</sup>	121	Surgical ICU, post CABG; MV with high versus low PEEP	High (10) versus Low (5) PEEP	None provided	5–10	Improved lung compliance, PaO <sub>2</sub> and decreased need for supplemental O <sub>2</sub> on discharge, but longer duration of MV
Malbouisson <i>et al.</i> <sup>55</sup>	10	Surgical ICU, post CABG; recruitment manoeuvres with high PEEP	–	Requirement of inotropic support for CS (CI <2.5)	Up to 40	Improved PaO <sub>2</sub> /FIO <sub>2</sub> , reduced intrapulmonary shunting, no decrease in MAP or CI
Kontoyannis <i>et al.</i> <sup>39</sup>	28	Medical ICU; patients with myocardial infarction complicated by CS requiring IABP	IABP alone versus IABP plus elective MV+PEEP	Systolic blood pressure <80 mm Hg with end organ damage	10	Improved ability to wean mechanical support (90% vs 56%), PCWP, CI, UO and discharge survival (80% vs 28%)

# Expansion volémique



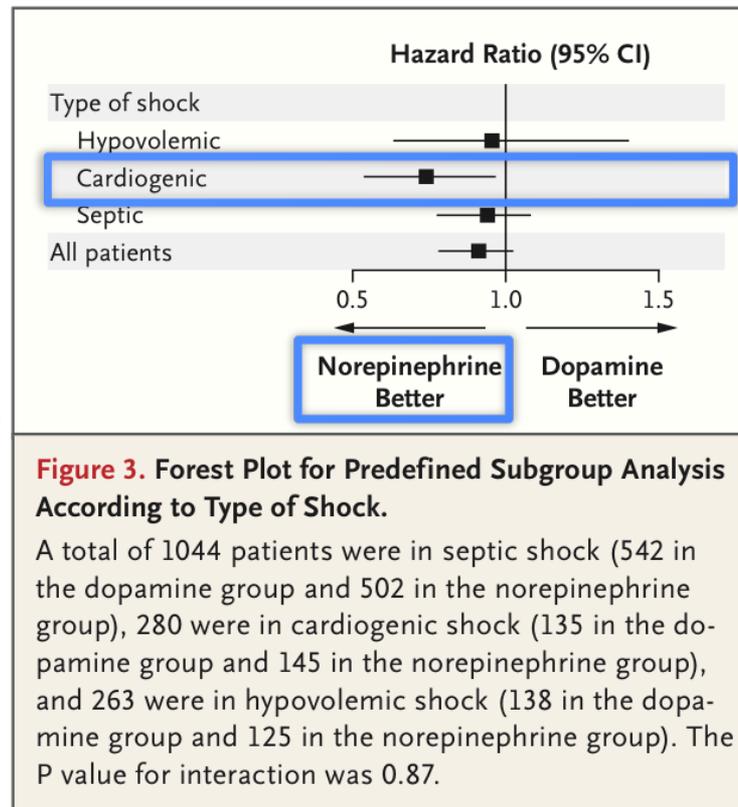
- Fondamentale
- Découle de la physiopathologie inflammatoire
- Concept « d'ischémie-reperfusion »

- *Aucune data sur le choc  
cardiogénique*



Adler C et al. **Resuscitation** 2013;84:194–199

# Traitement vasopresseur



PAM 65-70 mmHg  
?

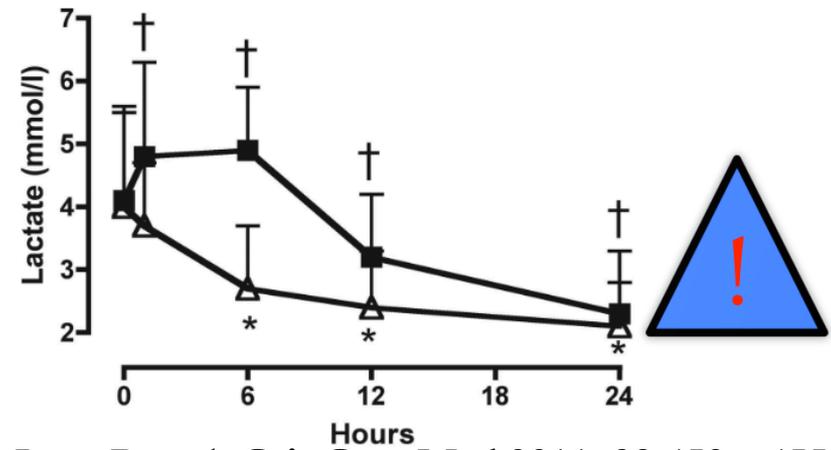
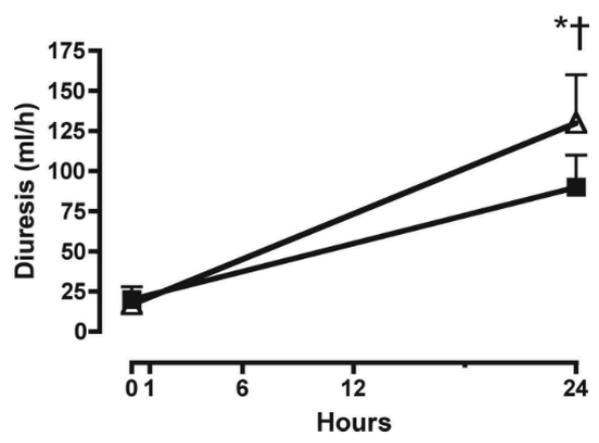
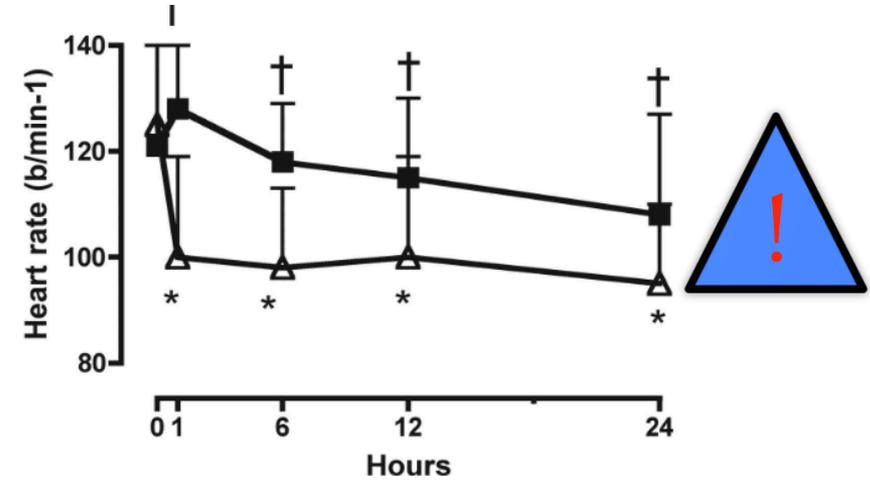
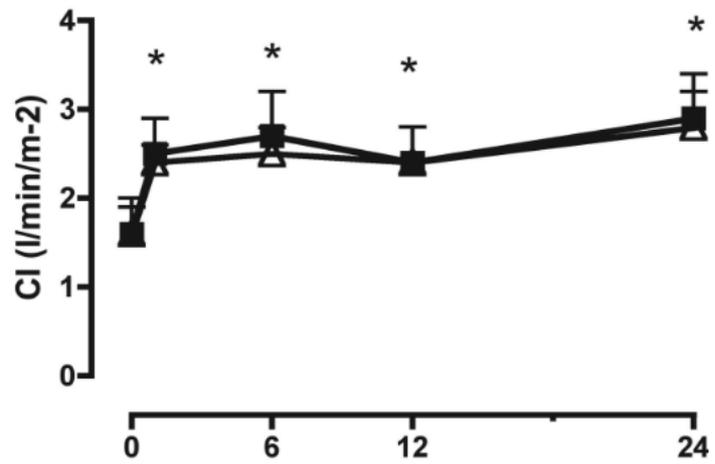
# Traitement inotrope : la dobutamine



- Inotrope de premier intention, à faible posologie

Characteristic	IABP (n=301)	Control (n=299)	p
Catecholamines; n/total (%)			
Dopamine	15/298 (5.0)	11/297 (3.7)	0.43
Norepinephrine	220/298 (73.8)	222/297 (74.8)	0.80
Epinephrine	76/298 (25.5)	80/297 (26.9)	0.69
Dobutamine	160/298 (53.7)	156/297 (52.5)	0.78
Catecholamine dosages (µg/kg per minute); median (IQR)			
Dopamine	4.1 (2.9-7.7)	4.2 (3.6-8.3)	0.76
Norepinephrine	0.3 (0.1-1.2)	0.4 (0.1-1.1)	0.73
Epinephrine	0.3 (0.1-1.3)	0.3 (0.2-1.4)	0.59
Dobutamine	10.2 (4.9-20.6)	9.0 (4.8-17.6)	0.25
Duration of catecholamines (days), median (IQR)	3.0 (1.0-5.0)	3.0 (1.0-6.0)	0.81

# Noradrénaline + Dobutamine vs Adrénaline

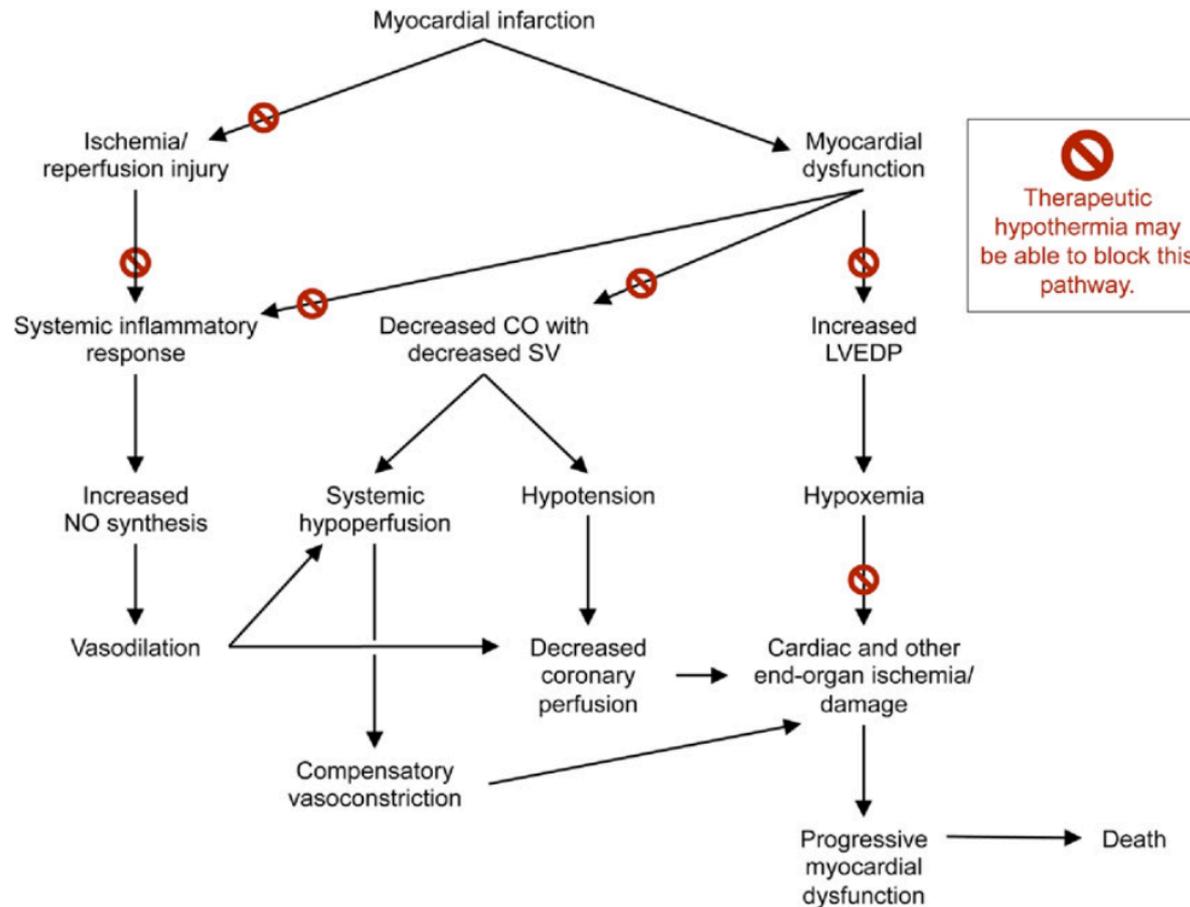


# Traitement inotrope : levosimendan et corotrope

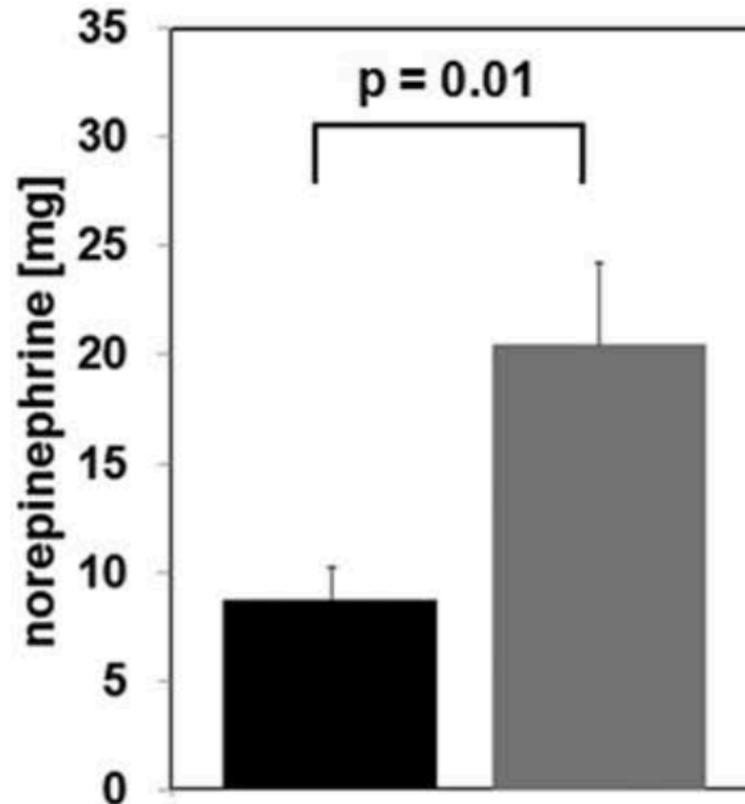


- Pas en première intention
- 4605 références => 4 études incluses
- Levosimendan vs. Dobutamine vs. Enoximone ou placebo
- Amélioration du débit cardiaque
- Aucune différence hémodynamique, mortalité et durée d'hospitalisation

# Intérêt de l'hypothermie ?



# Intérêt de l'hypothermie?



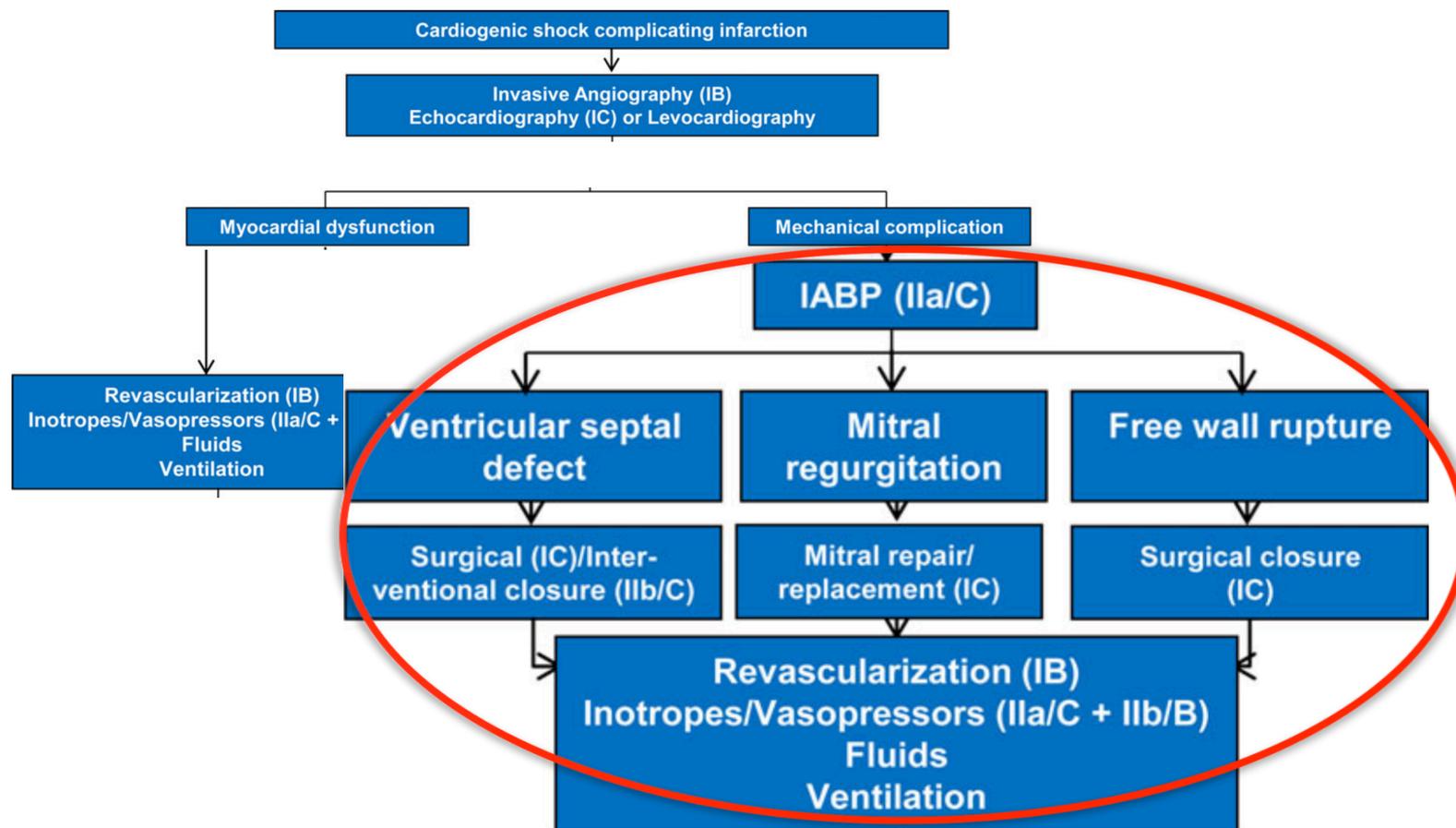
# Les autres soins de support

- Traitements anticoagulant et anti-thrombotique selon les recommandations
- Taux d'hémoglobine  $>9$  g/l en cas de choc cardiogénique post syndrome coronarien aigu
  - Discutable Rao SV et al. **JAMA** 2004;292:1555-1562
- Contrôle de la température en particulier dans les choc cardiogénique post arrêt cardiaque Levy B et al. **Réanimation** 2014;23:548-577

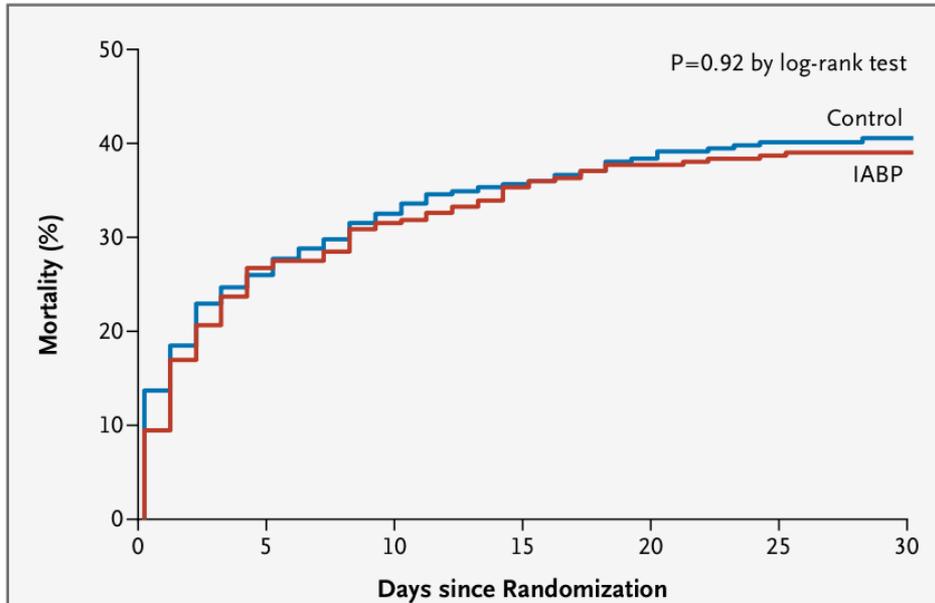
# Assistance circulatoire percutanée

*Quand penser que le traitement médical est insuffisant ?*

# Diagramme de prise en charge: En cas de complication mécanique



# La contre pulsion intra aortique



- Mortalité plus faible qu'attendue

**Figure 1. Time-to-Event Curves for the Primary End Point.**

Time-to-event curves are shown through 30 days after randomization for the primary end point of all-cause mortality. Event rates represent Kaplan-Meier estimates.

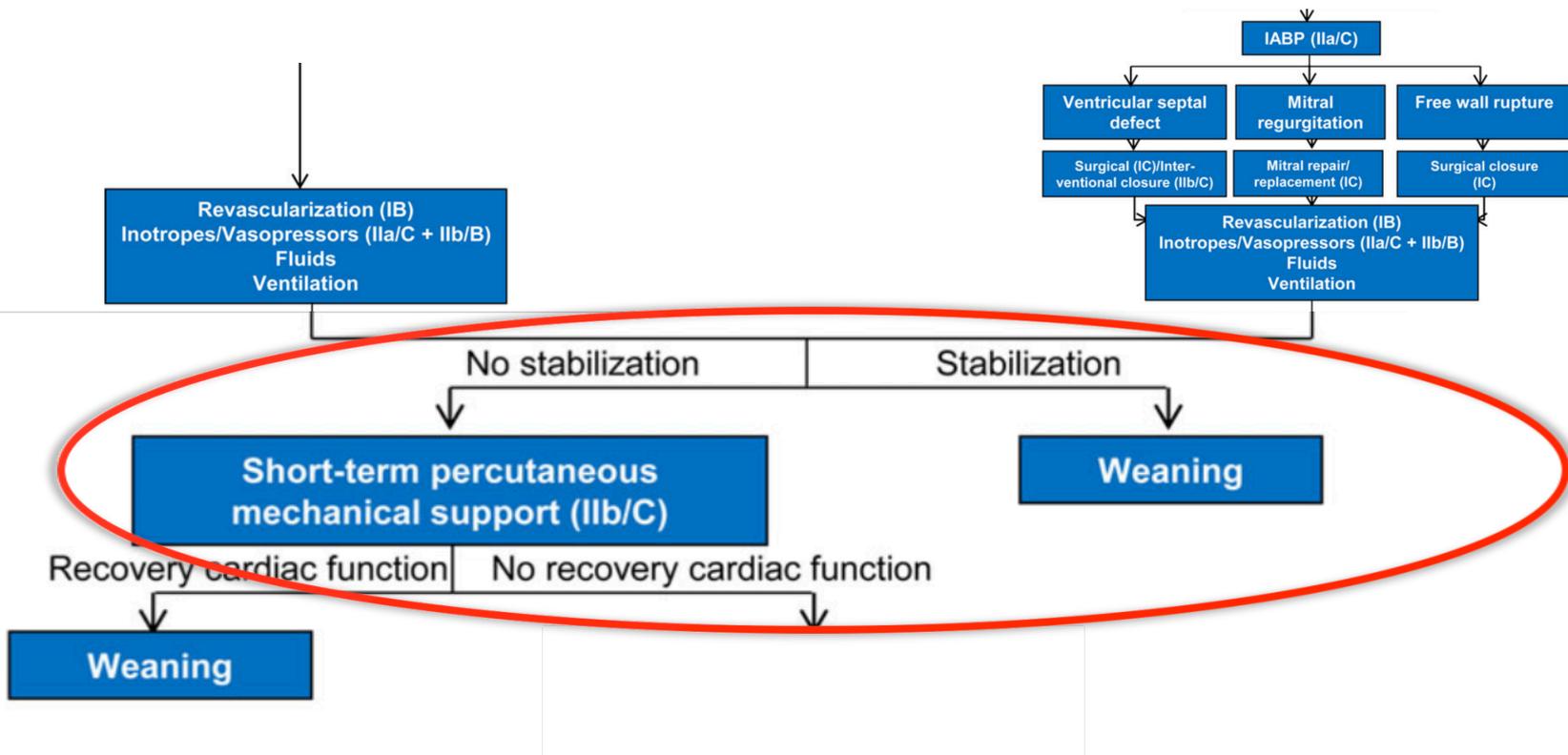
# Contre pulsion intra-aortique

## Synthèse

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Routine use of IABP in patients with cardiogenic shock is not recommended.	III	A
IABP insertion should be considered in patients with haemodynamic instability/cardiogenic shock due to mechanical complications.	IIa	C
Patients with mechanical complication after acute myocardial infarction require immediate discussion by the Heart Team.	I	C



# Diagramme de prise en charge: Cas du choc réfractaire



# Critères de choc réfractaire

- Choc cardiogénique ne répondant pas au traitement médical bien conduit:
  - Augmentation non contrôlée des posologies de vasopresseurs
  - Signes cliniques de profond bas débit
  - Confirmé par l'échocardiographie ou par le monitoring invasif

# Quand implanter ?

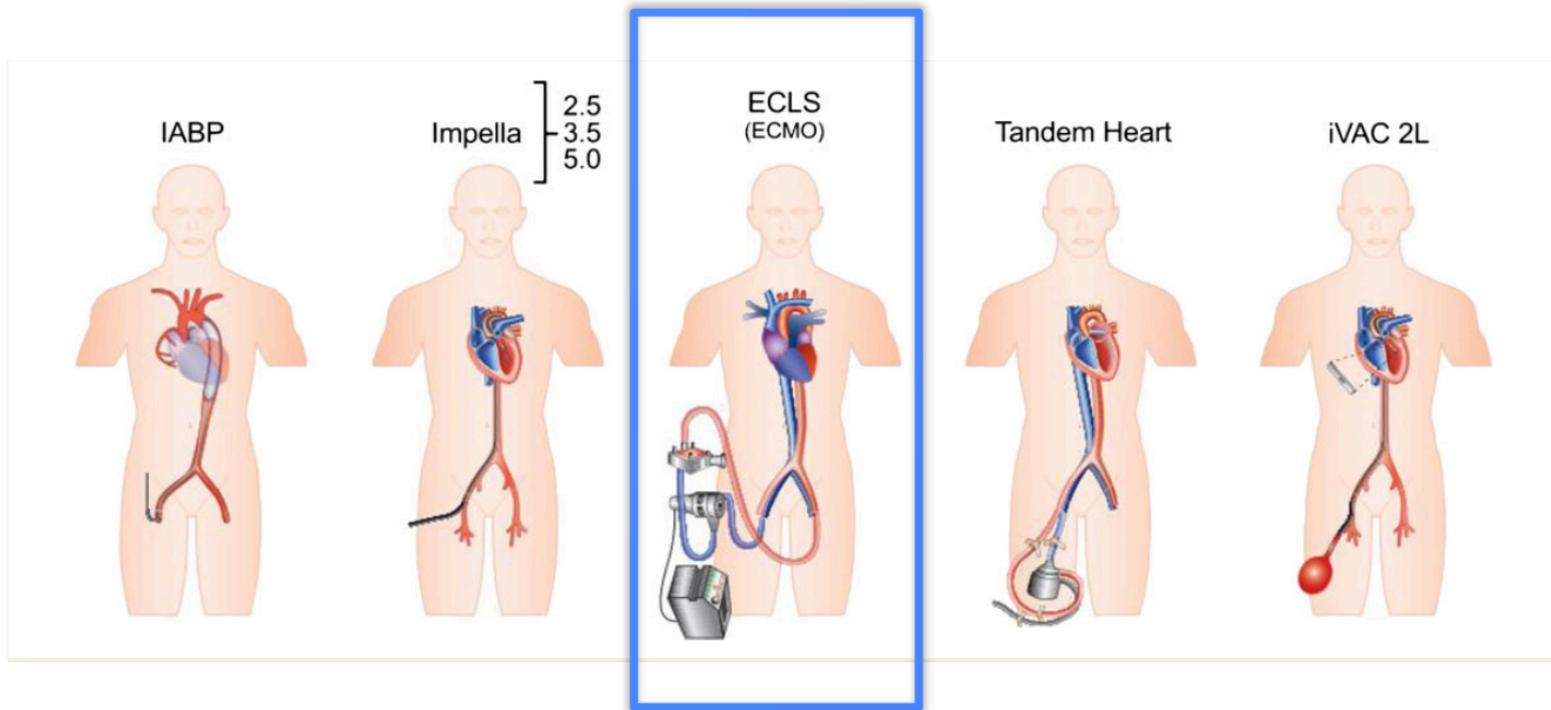
- *Avant l'installation de*
  - *L'insuffisance rénale*
  - *L'insuffisance hépatique*

Factor	OR (95% CI)	p
Female sex	3.89 (1.06–14.22)	.04
Myocarditis	0.13 (0.02–0.78)	.03
ECMO under CPR	20.68 (1.09–392.03)	.04
Prothrombin activity <50%	3.93 (1.11–13.85)	.03
24-hr urine output <500 mL	6.52 (1.87–22.74)	.003

OR, odds ratio; CI, confidence interval; CPR, cardiopulmonary resuscitation; ECMO, extracorporeal membrane oxygenation.

**=> *Précoce***

# Quelle technique?

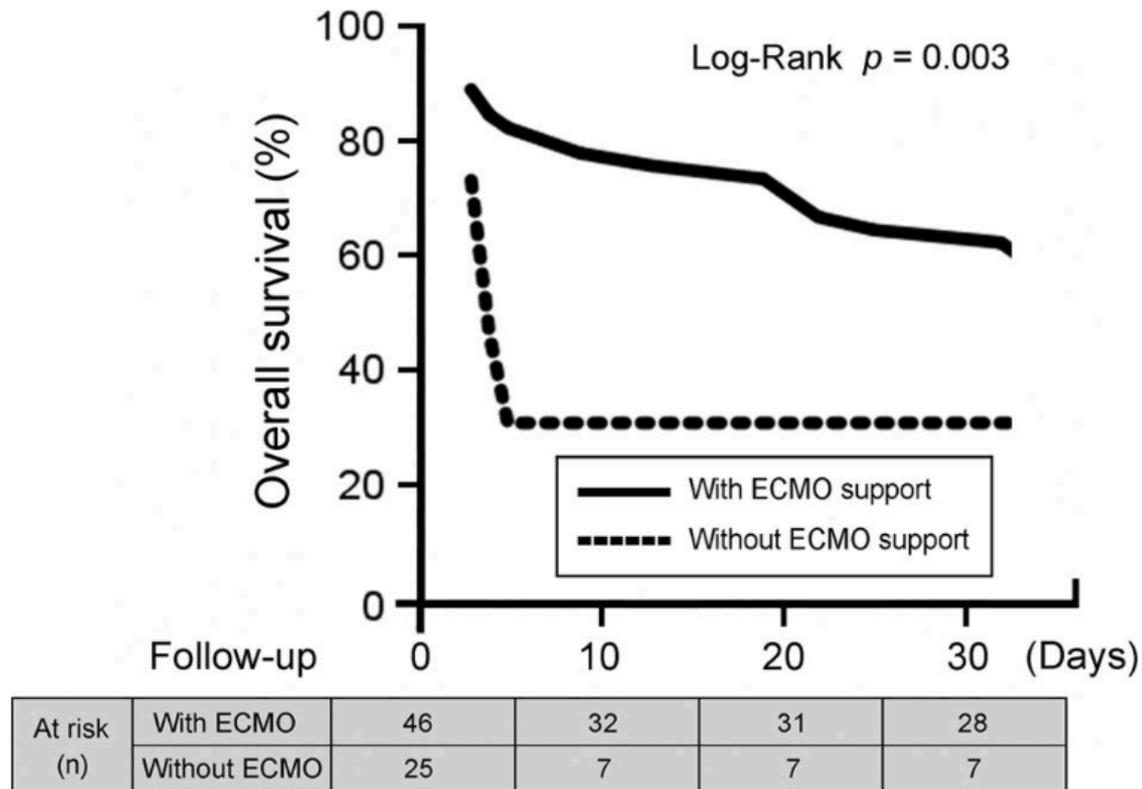


# Quelle technique?

	<b>iVAC 2L®</b>	<b>TandemHeart™</b>	<b>Impella® 5.0</b>	<b>Impella® 2.5</b>	<b>Impella® CP</b>	<b>ECLS (multiple systems)</b>
Catheter size (F)	11 (expandable)	—	9	9	9	
Cannula size (F)	17	21 venous 12–19 arterial	21	12		17–21 venous 16–19 arterial
Flow (L/min)	Max 2.8	Max. 4.0	Max. 5.0	Max. 2.5	3.7–4.0	Max. 7.0
Pump speed (rpm)	Pulsatile, 40 mL/beat	Max. 7500	Max. 33 000	Max. 51 000	Max. 51 000	Max. 5000
Insertion/ Placement	Percutaneous (femoral artery)	Percutaneous (femoral artery + vein for left atrium)	Peripheral surgical (femoral artery)	Percutaneous (femoral artery)	Percutaneous (femoral artery)	Percutaneous (femoral artery + vein)
LV unloading	+	++	++	+	+	–
Anticoagulation	+	+	+	+	+	+
Recommended duration of use	– 21 days	– 14 days	10 days	10 days	10 days	– 7 days
CE-certification	+	+	+	+	+	+
FDA	–	+	+	+	+	+
Relative costs	++	+++++	++++	+++	++++	+(+)

*Coeur droit et gauche*

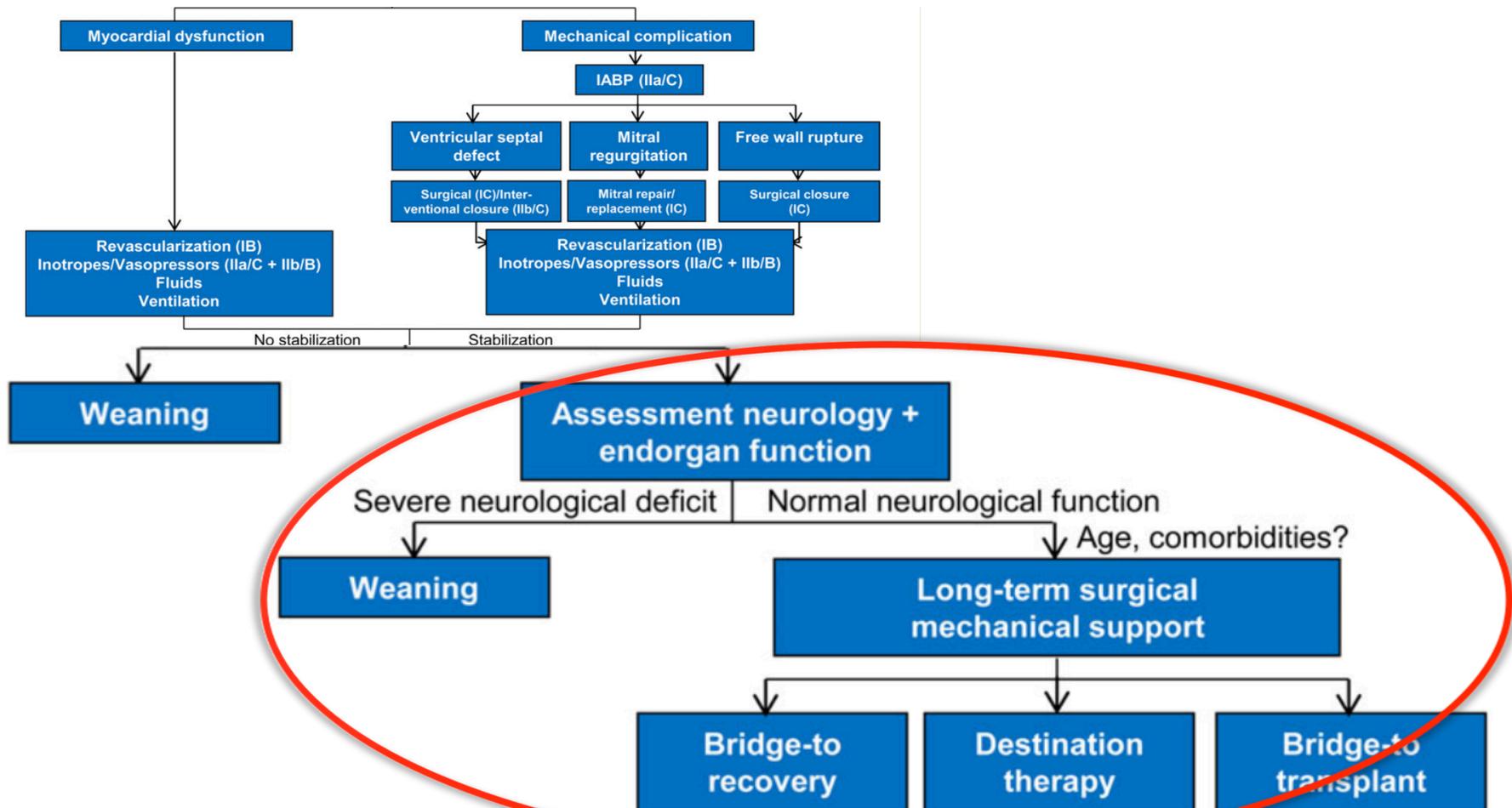
# Des résultats prometteurs à confirmer



# Recommendation IIb/c

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Short-term mechanical circulatory support in ACS patients with cardiogenic shock may be considered.	IIb	C

# Diagramme de prise en charge: Bridge to



# Filiarisation de la prise en charge du choc cardiogénique

# RFE choc cardiogénique

N°SOS choc  
cardiogénique

SAMU/SMUR

Réanimation

Rythmologie

Patient

Coronarographie

Chirurgie  
cardiaque

# Perspectives

# Nombreuses

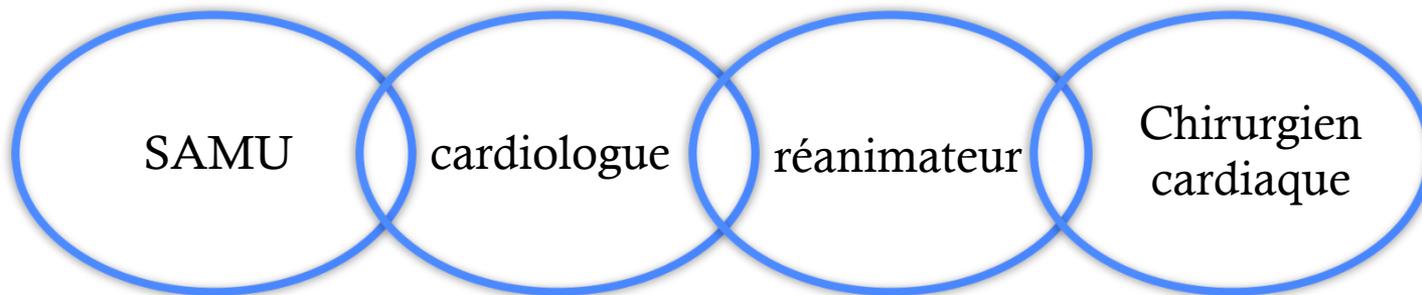
- Revascularisation multiple :CULPRIT-SHOCK trial NCT01927549
- Hypothermie (NCT01890317)
- Catecholamines OPTIMACC (NCT01367743)
- Critical Illness-Related Corticosteroid Insufficiency

Tol MM et al. J Crit Care 2014;29: 470.e1-6

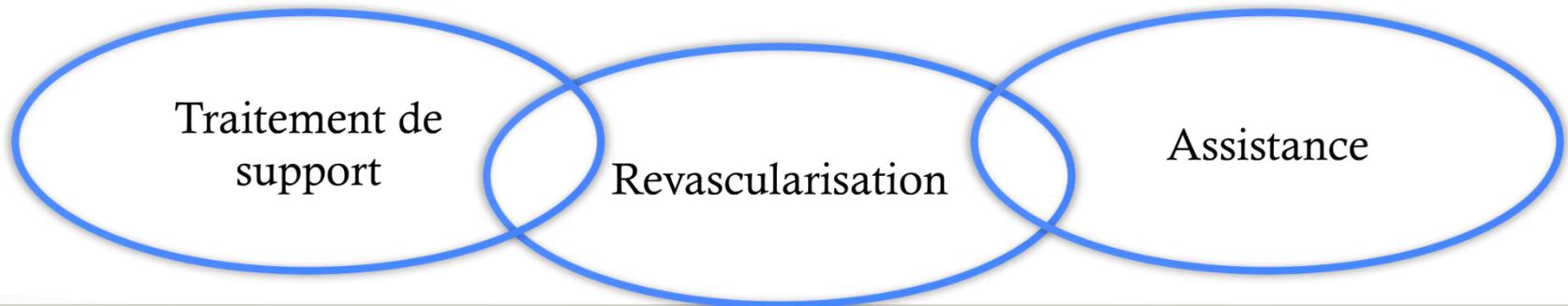
- ECMOveino-artérielle (Anchor)
- Immunomodulateur de l'inflammation

# Le choc cardiogénique

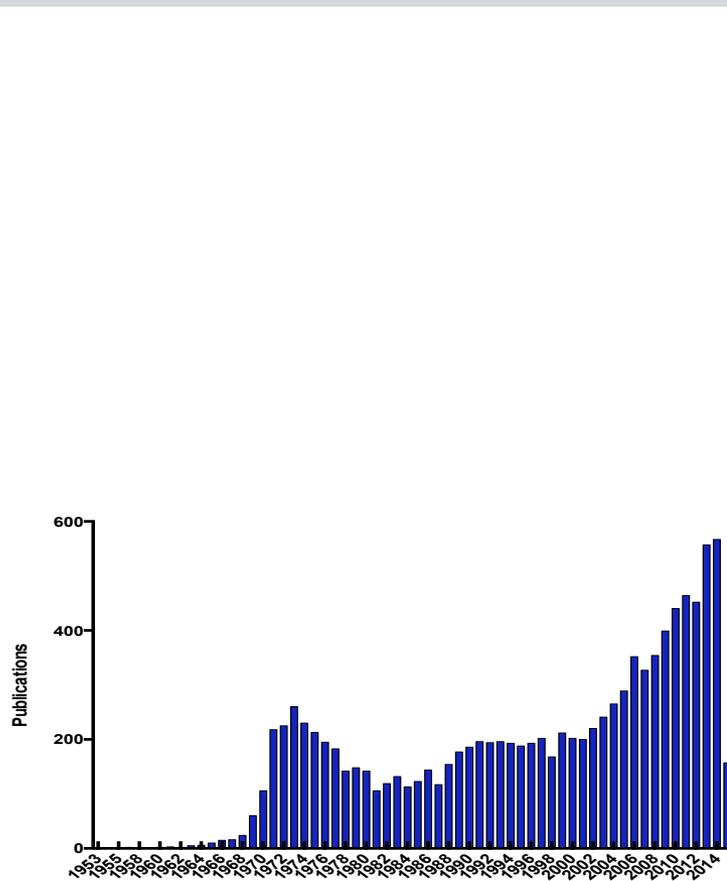
- Prise en charge multidisciplinaire dans une unité de lieu:



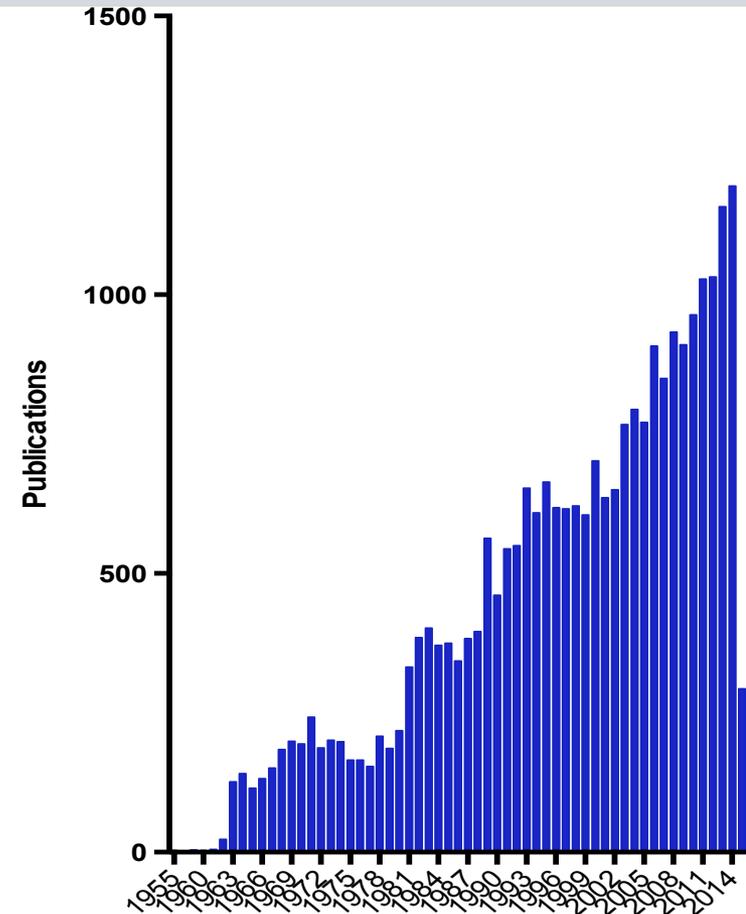
- Et multimodale dans une même unité de temps:



# Une littérature en devenir?



CHOC CARDIOGENIQUE



CHOC SEPTIQUE