

# Arrêt cardiaque traumatique

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# Objectifs pédagogiques

- Conduite à tenir devant un ACR traumatique:
  - à l'arrivée de l'équipe médicale
  - pendant le transport
- Perspectives d'avenir pour l'ACR traumatique
- Prévention de l'ACR chez les traumatisés, un enjeu de temps



# Liens d'intérêts

Aucun



# Référence bibliographique

Resuscitation 95 (2015) 148–201

Contents lists available at [ScienceDirect](#)

 **Resuscitation**  EUROPEAN  
RESUSCITATION  
COUNCIL

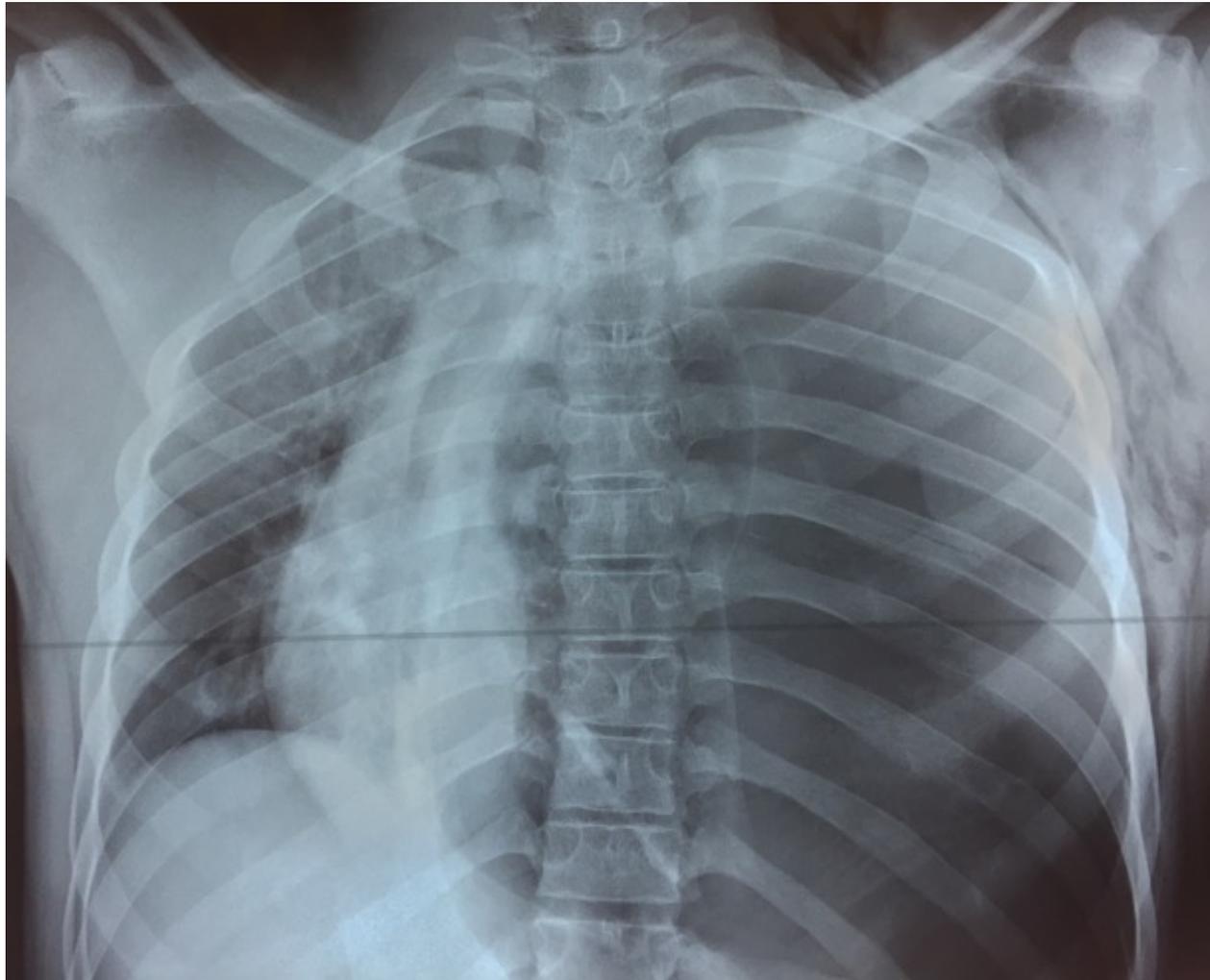
[journal homepage: www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)

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European Resuscitation Council Guidelines for Resuscitation 2015  
Section 4. Cardiac arrest in special circumstances 

# Objectif

*Plus jamais çà*



# Les messages clefs

**H**émorragie

**O**xygénation

**T**amponnade

*Péricardique*

*Pneumothorax*

Exsuffler  
Masser

Est-ce fréquent ?



# Epidémiologie

## Incidence



**10.359** traumatisés *dont 94% fermés*

*Primaire  
ISS ≥ 16 ou ICU  
Transférés à l'hôpital*

**757** ACR

**7%**

**415** RCP

préhospitalières

**538** RCP

intra-hospitalières

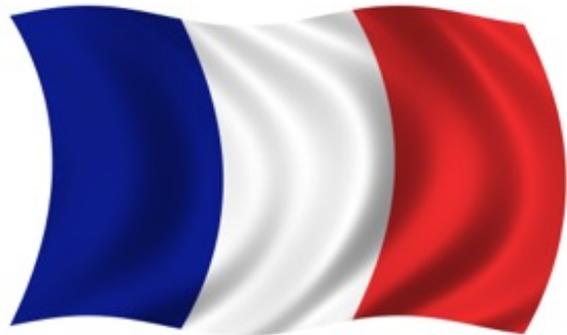
**196** RCP

pré et intra-hospitalières



# Epidémiologie

## *Incidence*



**1.075** traumatisés *dont 90% fermés*



**4%**

**47** ACR préhospitaliers

CRITICAL CARE MEDICINE

### Comparison of the Prognostic Significance of Initial Blood Lactate and Base Deficit in Trauma Patients

Mathieu Raux, M.D., Ph.D., Yannick Le Manach, M.D., Ph.D., Tobias Gauss, M.D., Romain Baumgarten, M.D., Sophie Hamada, M.D., Anatole Harrois, M.D., Ph.D., Bruno Riou, M.D., Ph.D., for the TRAUMABASE® Group\*



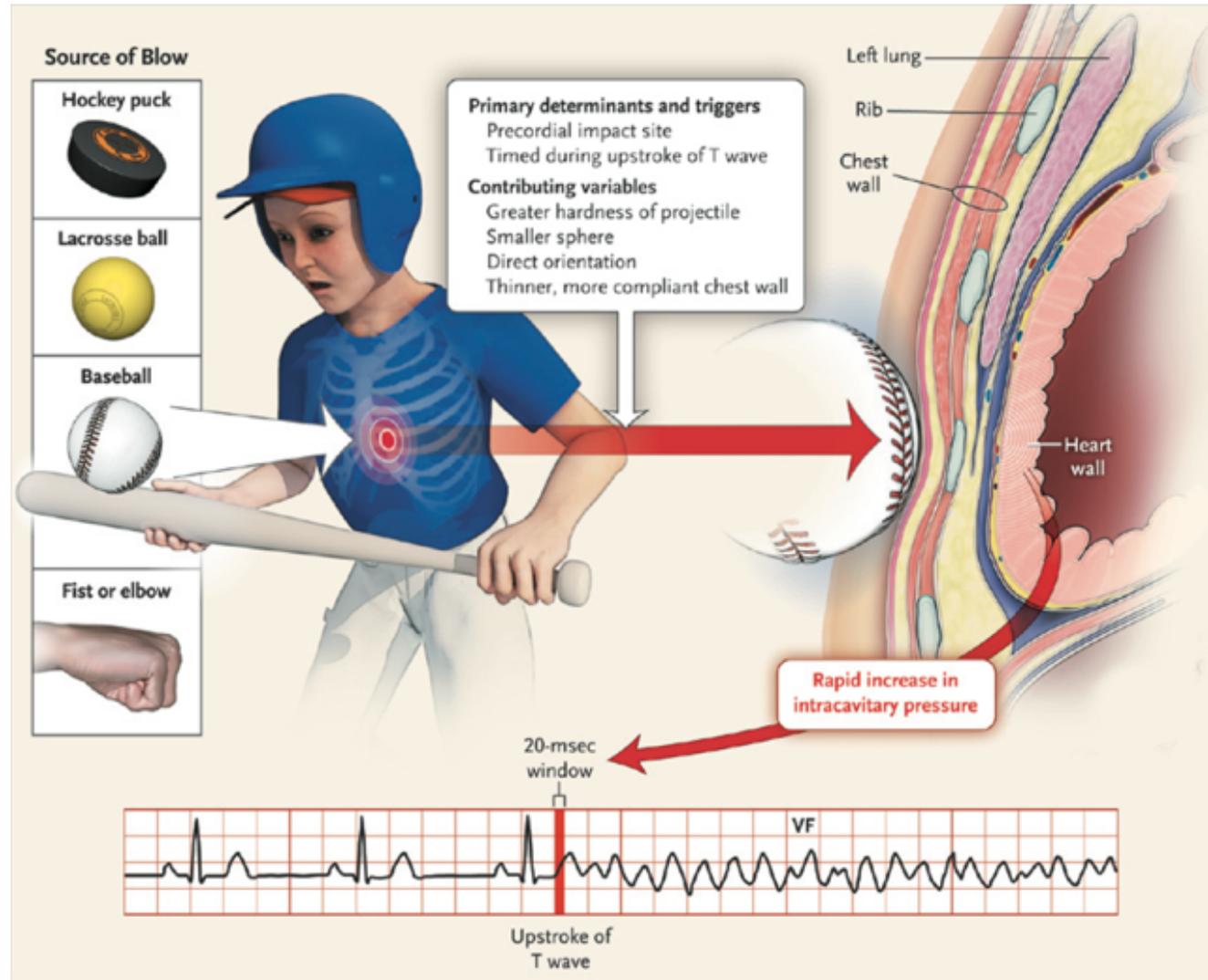
Raux, *Anesthesiology* 2017

Quels en sont les  
mécanismes ?



# Etiologies

## *Commotio cordis*

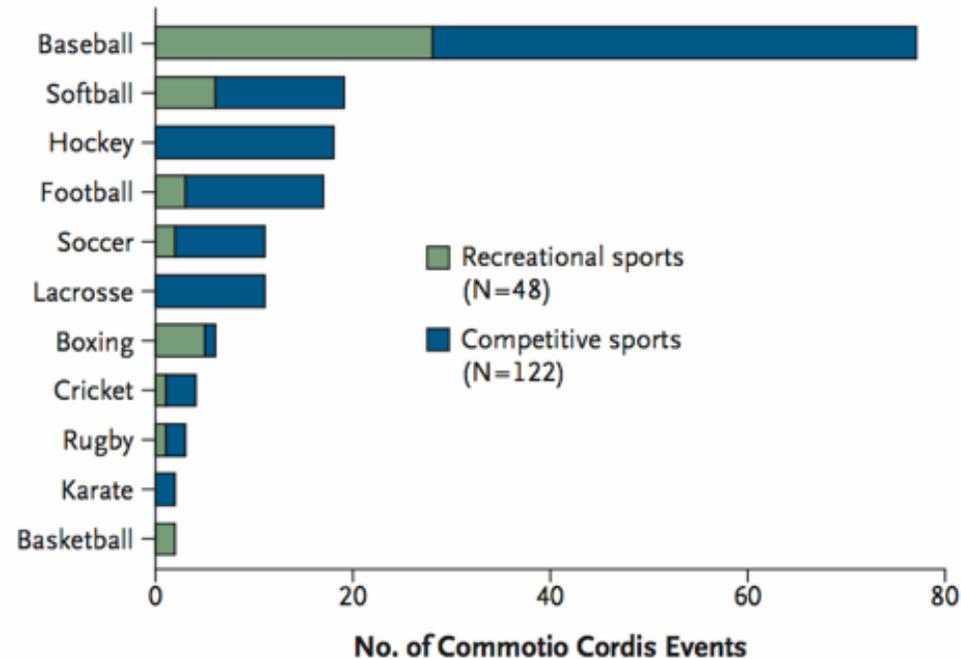


Maron, *NEJM* 2010



# Etiologies

## *Commotio cordis*



- 224 cas répertoriés
- Mauvais pronostic par défaut de diagnostic
- 15 à 25 % de survie malgré cœur sain

# Etiologies

## *Lésions anatomiques*



- Registre 2010 – 2013 France

**Table 1** Epidemiological and clinical description of the population (n=88)

Sex (M)	70 (79%)
Age (years)	38 (23–52)
Blunt	77 (88%)
SAPS II	76 (63–87)
ISS	36 (25–50)
Presenting with CA at EMS arrival	42 (58%)
First documented rhythm asystole	71 (80%)
No flow time (min)	0 (0–5)
Low flow time (min)	10.0 (5.5–20.0)
Total dose of epinephrine during CPR (mg)	3 (1–6)
Presenting with persistent CA on hospital admission	10 (11%)
Lactate on hospital admission (mmol/L)	9.7 (5.7–15.0)
Suspected cause of arrest	
Haemorrhage	34 (39%)
Traumatic brain injury	22 (25%)
Hypoxia	9 (10%)
Other or unknown	23 (26%)

Data are number (percentage) or median (IQR 25–75).

No flow and low flow times are the times without chest compressions before CPR and CPR duration until return of spontaneous circulation.

CA, cardiac arrest; CPR, cardiopulmonary resuscitation; ISS, Injury Severity Score; SAPS, Simplified Acute Physiology Score.



# Etiologies

## *Lésions anatomiques*

- Registre 1994 – 2004 Royaume Uni
- 871 arrêts cardiaques traumatiques
  - Traumatisme fermé **63%**
  - Asphyxie **20%**
  - Traumatisme pénétrant **13%**
  - Médical suivi de trauma **4%**



# Etiologies

## *Lésions anatomiques*

- Militaire

**Table 2**

Characteristics of TCRA by category of outcome.

		All Patients (N = 52)	No ROSC (N = 38)	ROSC (N = 14)	Survivors (N = 4)
Cause of arrest					
Exsanguination	Number (%)	42 (81%)	30 (79%)	12 (86%)	3 (75%)
Brain injury	Number (%)	7 (13%)	6 (16%)	1 (7%)	0
Airway obstruction	Number (%)	1 (2%)	1 (3%)	0	0
Cardiac tamponade	Number (%)	1 (2%)	0	1 (7%)	1 (25%)
C-Spine injury	Number (%)	1 (2%)	1 (3%)	0	0

# Etiologie

*Pour faire simple*



**H**émorragie

**O**xygénation

**T**amponnade

*Péricardique*

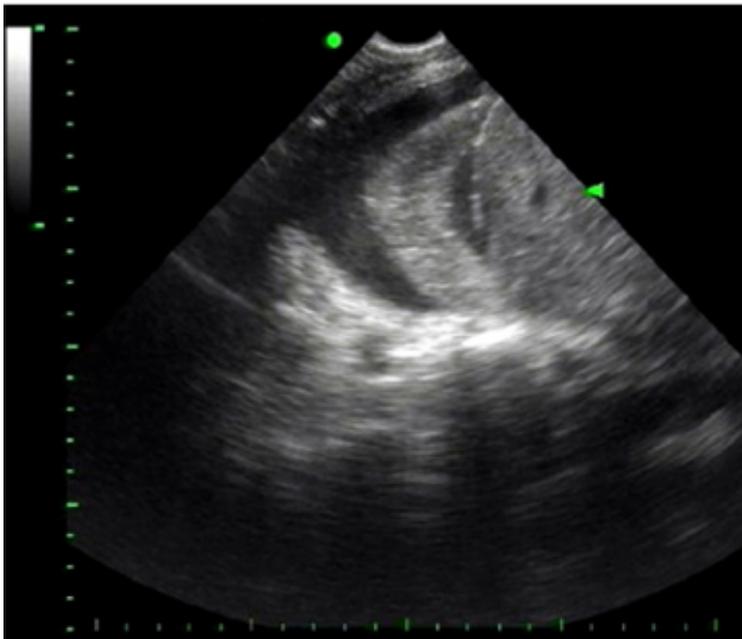
*Pneumothorax*

**6-20%**

Mistry, *Emerg Med J* 2009

# Etiologie

## *Hémorragie*



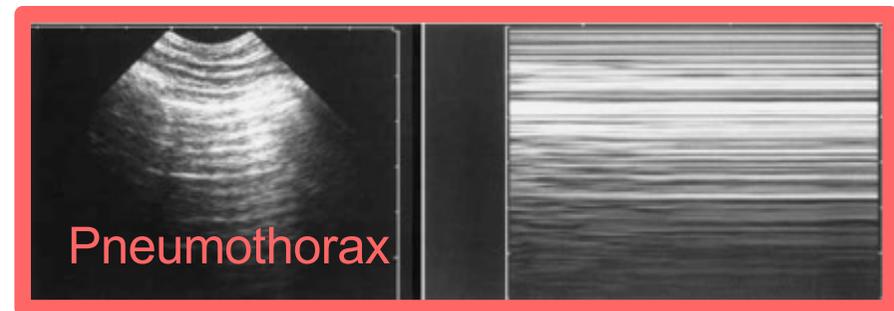
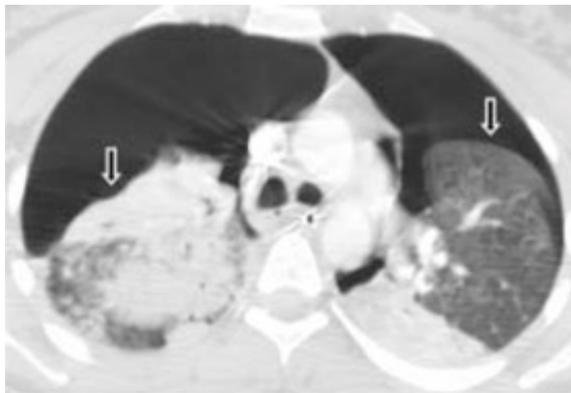
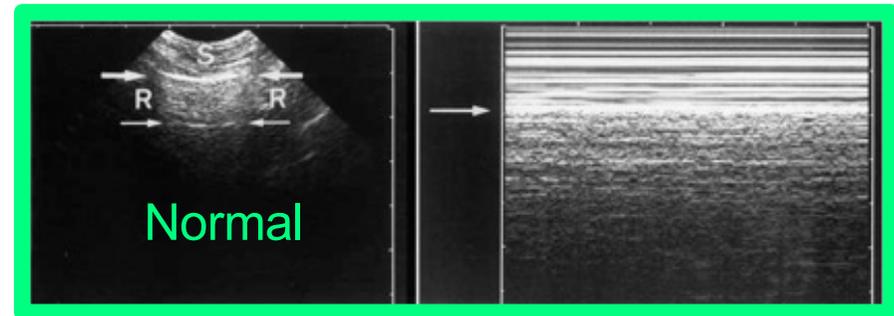
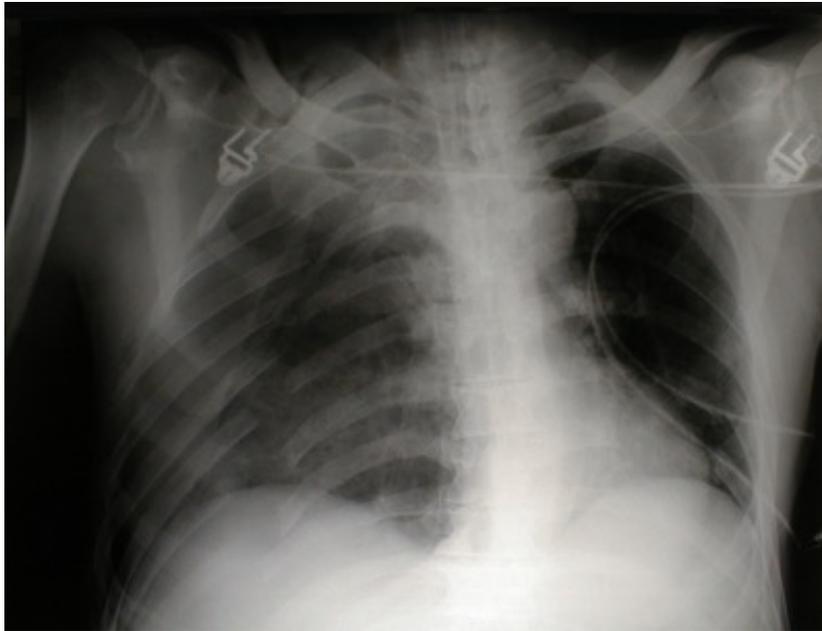
# Etiologie

## *Hypoxémie*



# Etiologie

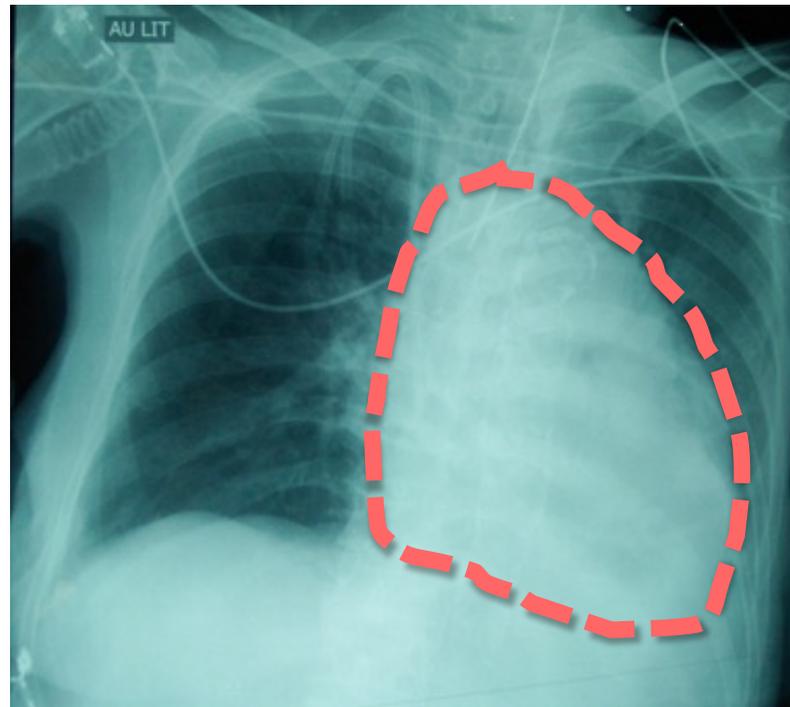
## *Tamponnade gazeuse*



Beigelman, *J Radiol* 2008

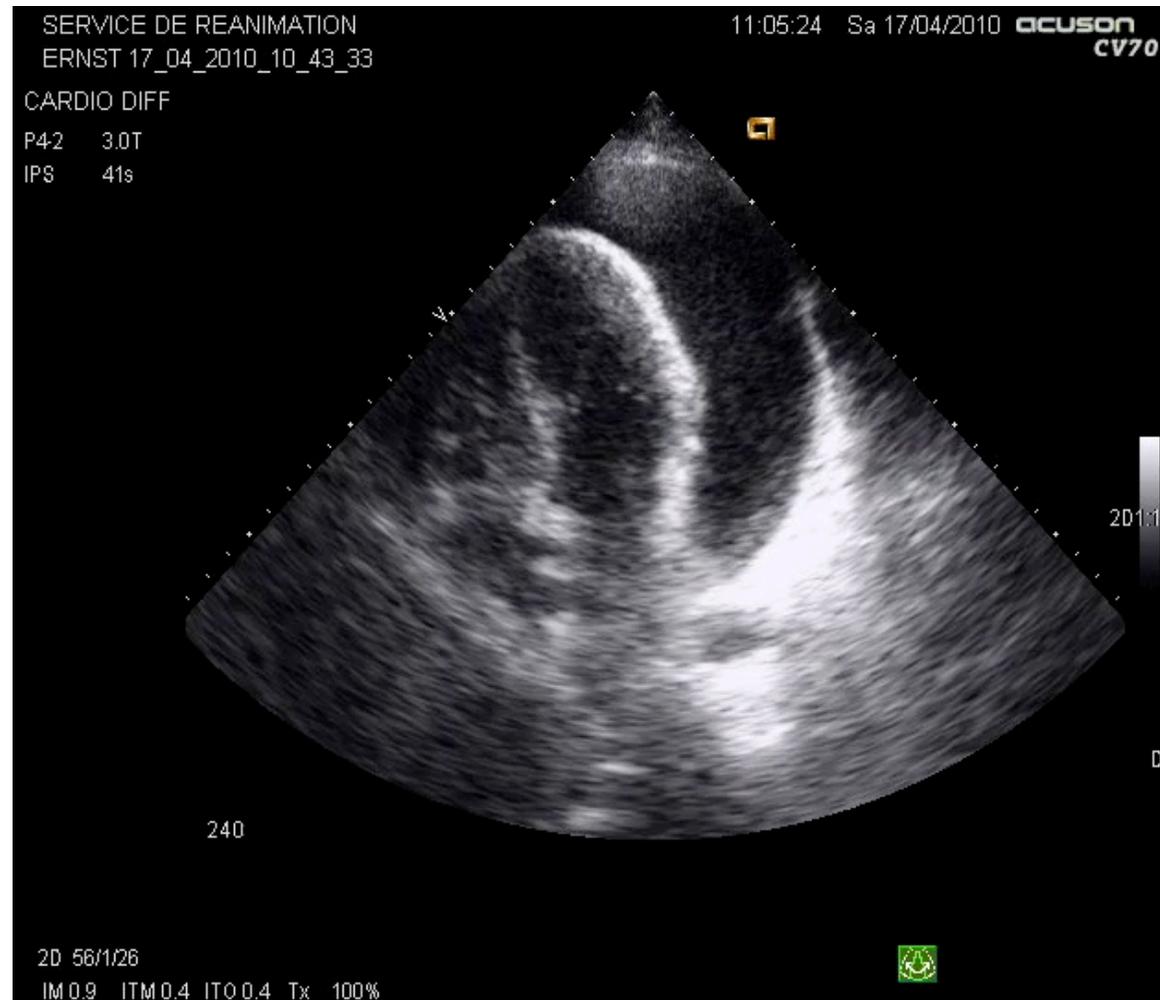
# Etiologie

## *Tamponnade liquidienne*



# Etiologie

## *Tamponnade liquidienne*



Vidéo Dr ARBELOT, Pitié Salpêtrière



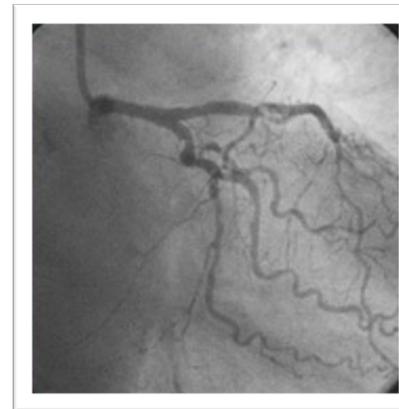
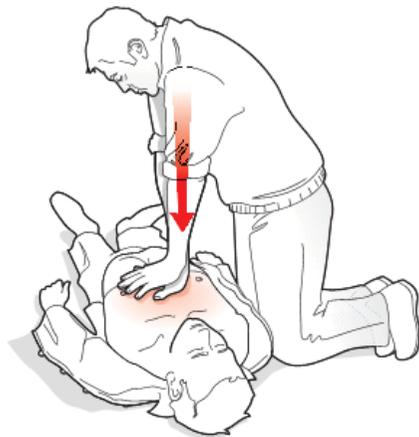
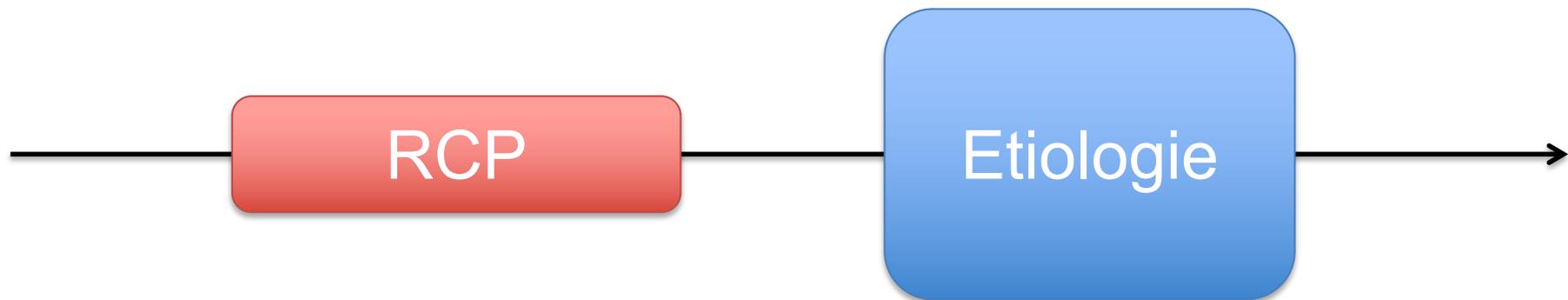
Comment réanime-t-on  
un AC traumatique  
en préhospitalier ?



# Réanimation de l'arrêt cardiaque

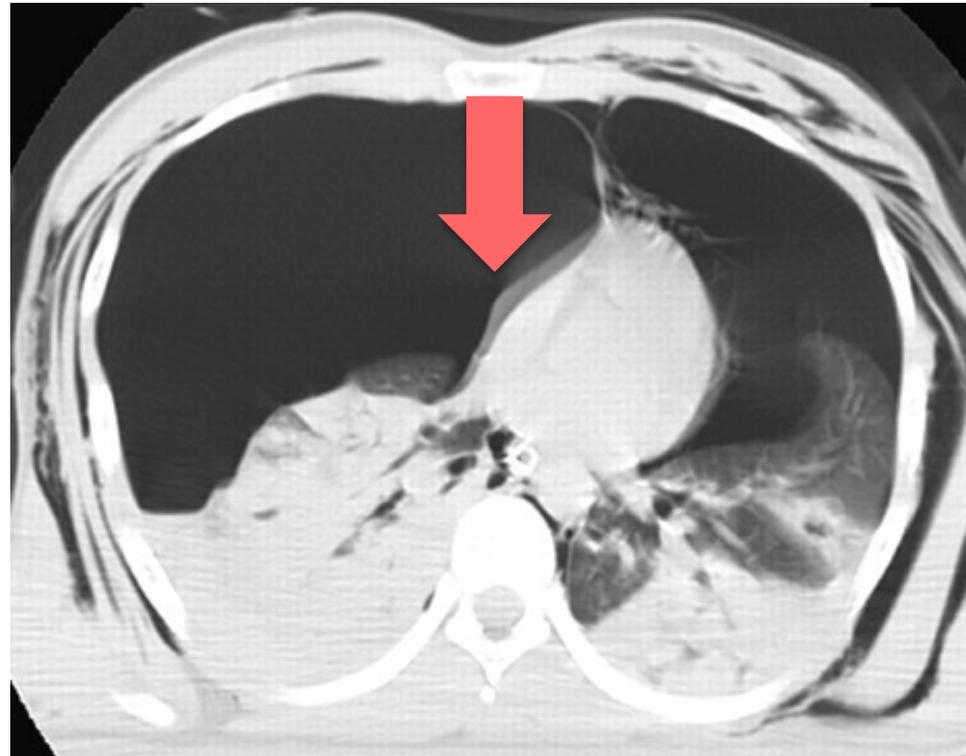
## *Cadre général*

### AC **par tamponnade**



# Réanimation de l'arrêt cardiaque

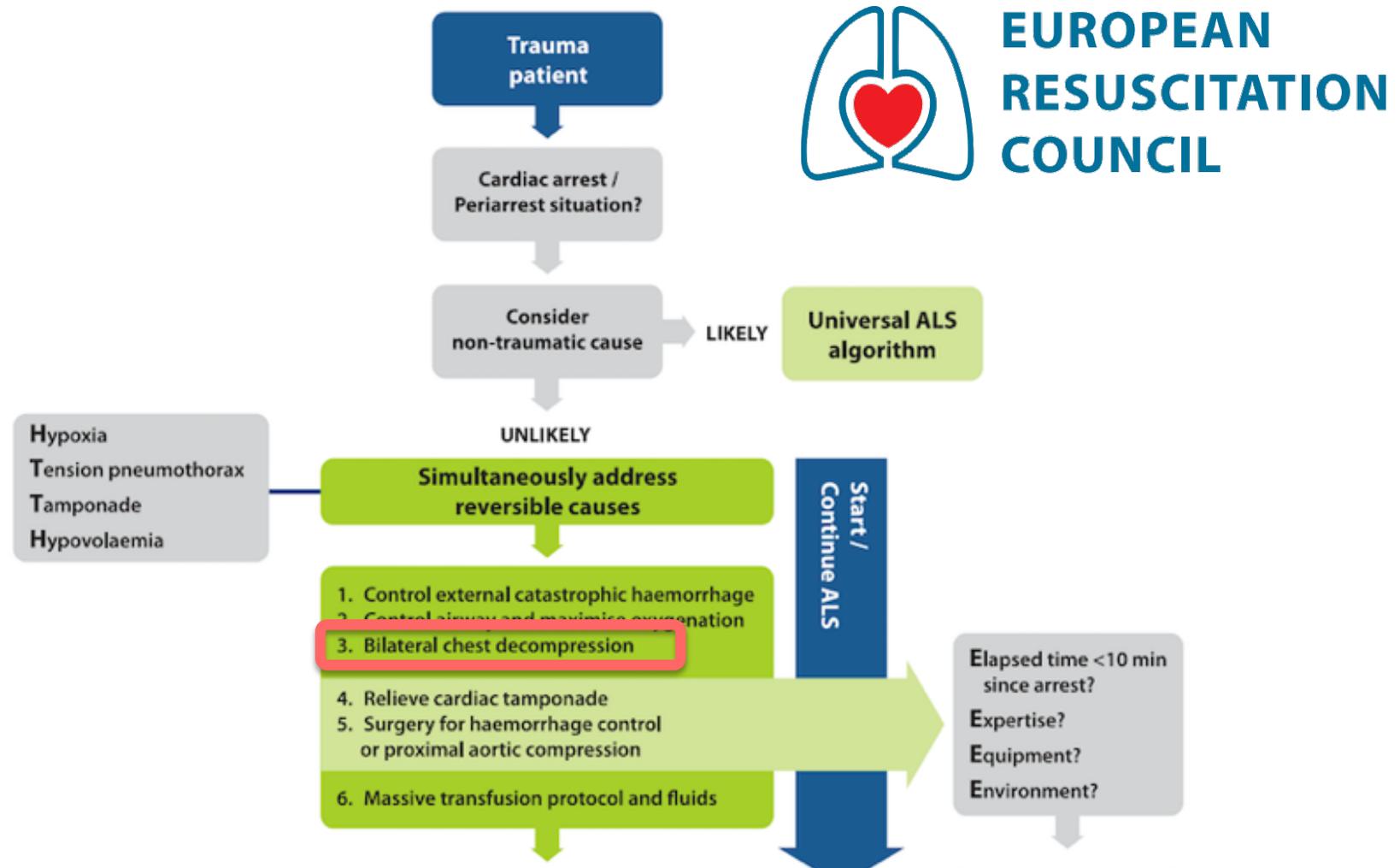
*Exsufflez d'abord*



RCP inefficace

# Réanimation de l'arrêt traumatique

## Algorithme de base



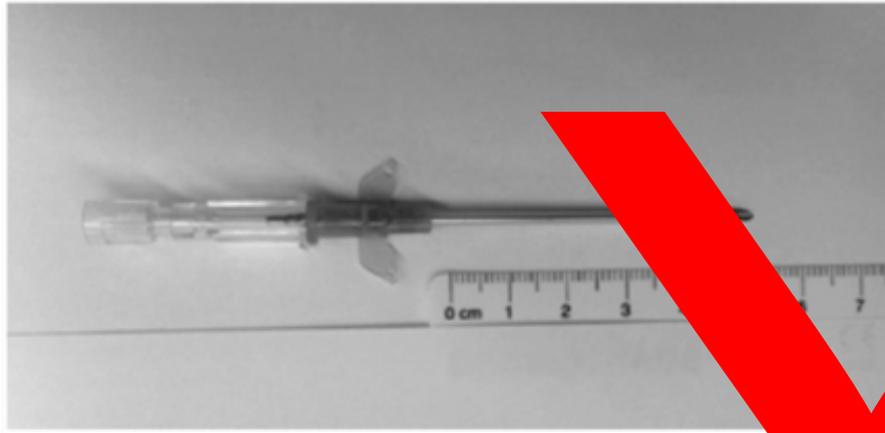
# Réanimation de l'arrêt traumatique

## *Thoracostomie*



# Réanimation de l'arrêt traumatique

## Thoracostomie



Cathlon = échec

		1st ICS (%)	4th ICS (%)	<i>p</i>
CWT > 5 cm	Right	24.6	5.7	<0.001
	Left	23.8	4.1	<0.001
	Bilat	24.2	4.9	<0.001

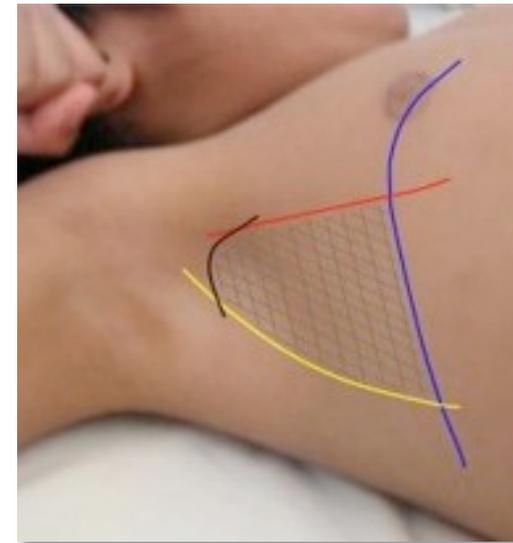
Lamblin, *Mil Med* 2014

# Réanimation de l'arrêt traumatique

## *Thoracostomie*

### Thoracostomie

- Bilatérale
- Incision
  - Ligne axillaire*
  - Supra mamelonnaire*
- Franchissement de la plèvre au doigt
- Pas de drain thoracique !



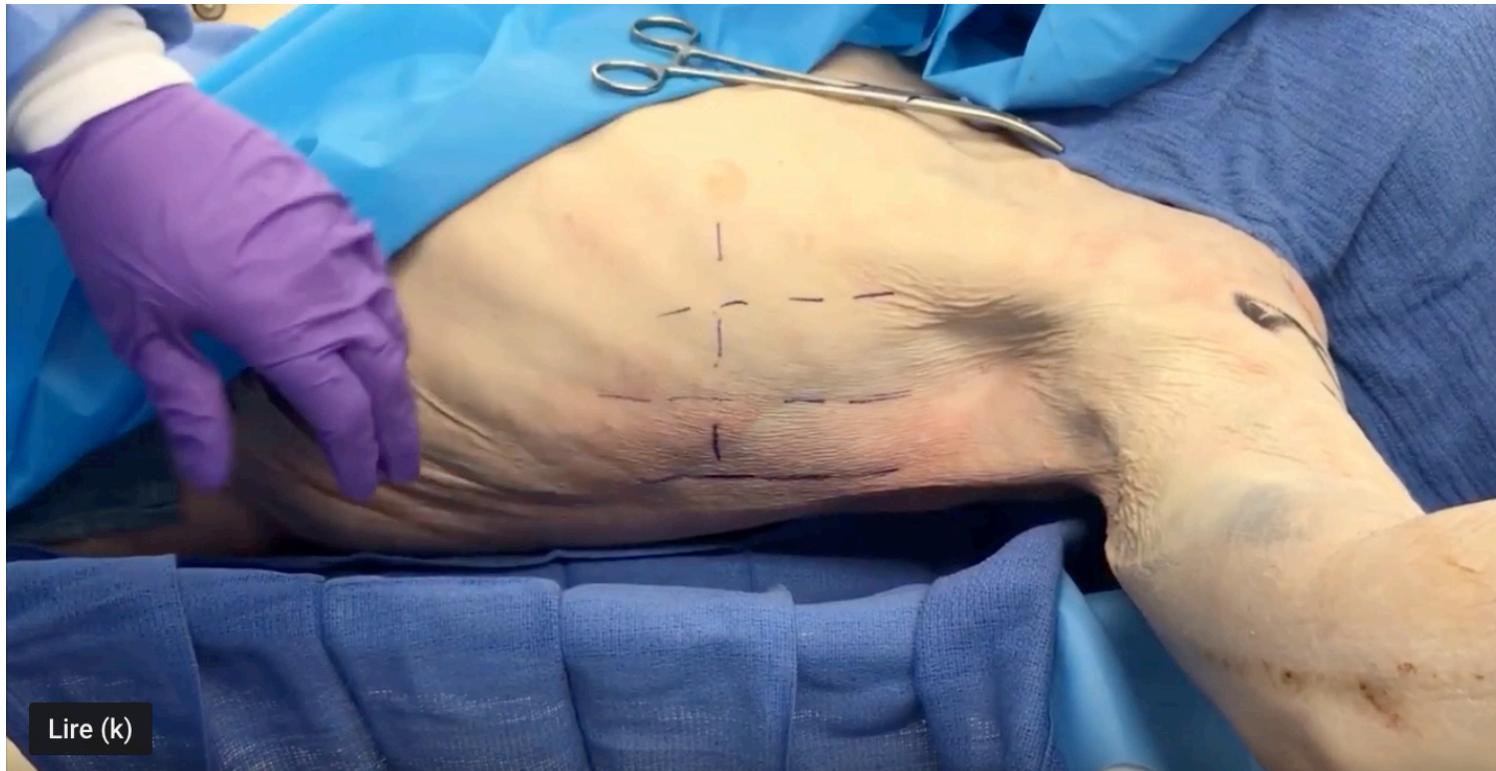
[citerahiadesgenettes.hautetfort.com](http://citerahiadesgenettes.hautetfort.com)

Deakins, *J Trauma* 1995  
Truhlar, *Resuscitation* 2015



# Réanimation de l'arrêt traumatique

## *Thoracostomie*

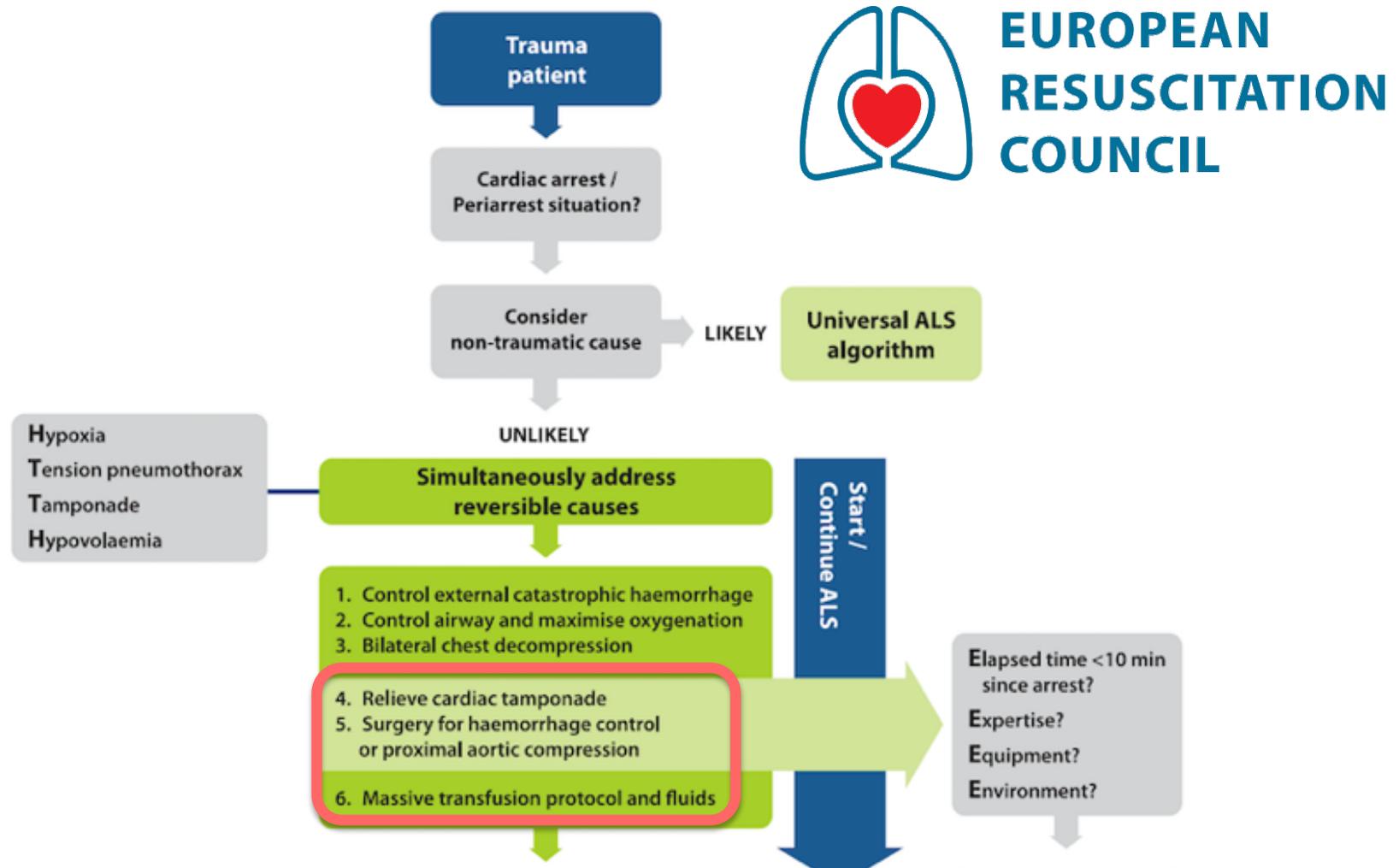


<https://www.youtube.com/watch?v=1GZPLOpU2DQ>



# Réanimation de l'arrêt traumatique

## Algorithmes de base



Truhlar, *Resuscitation* 2015

# Réanimation de l'arrêt traumatique

## *Transfert rapide à l'hôpital*

### Pre-hospital:

- Perform only life-saving interventions
- Immediate transport to appropriate hospital

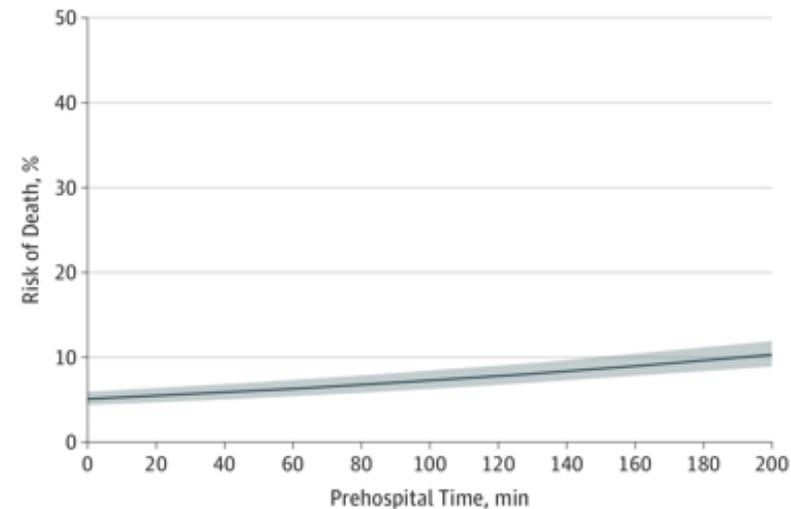
### In-hospital:

- Damage control resuscitation
- Definitive haemorrhage control



**EUROPEAN  
RESUSCITATION  
COUNCIL**

Truhlar, *Resuscitation* 2015

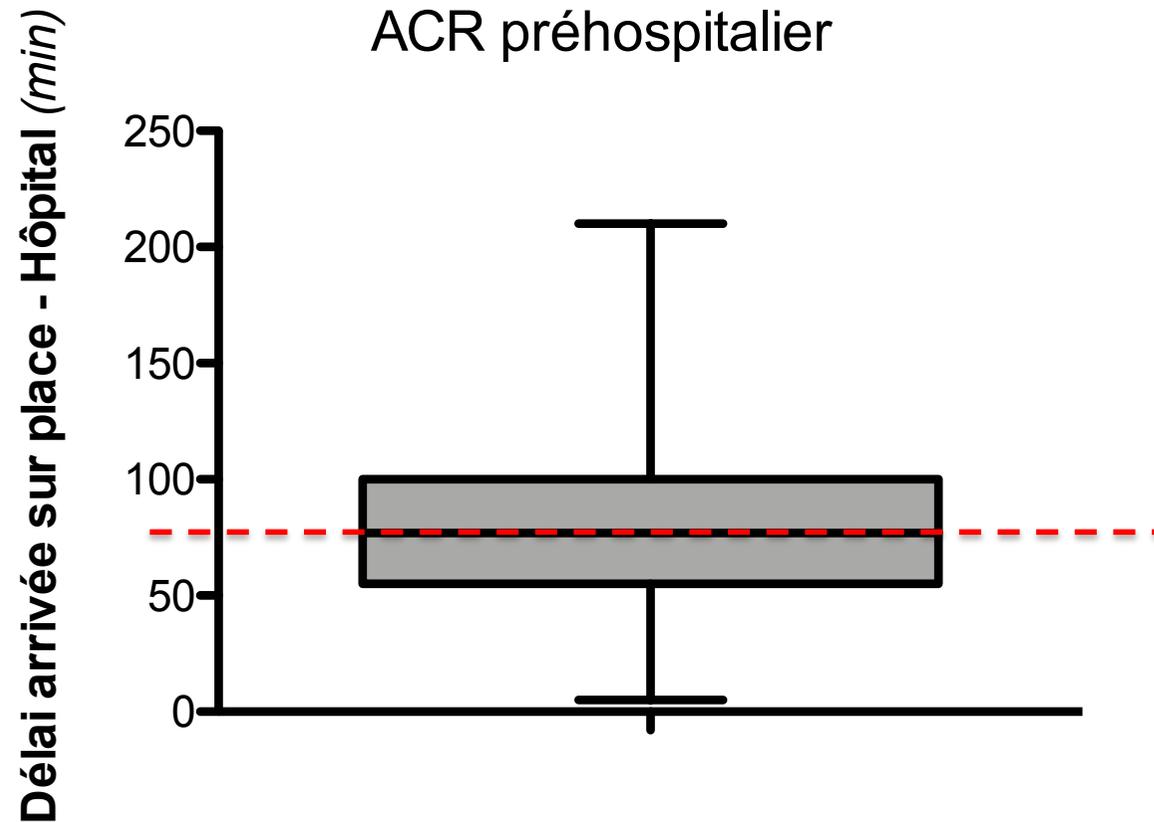


Gauss, *JAMA Surgery* 2019

# Réanimation de l'arrêt traumatique

*La réalité...*

251 traumatisés en ACR



Raux, données personnelles

Que faire pendant le transport vers l'hôpital ?



# Pendant le transport

## *Se limiter aux mesures de sauvetage*

### Pre-hospital:

- Perform only life-saving interventions
- Immediate transport to appropriate hospital

### In-hospital:

- Damage control resuscitation
- Definitive haemorrhage control



RCP



Défibrillation



Autotransfusion



# A l'hôpital



# A l'hôpital

## *Thoracotomie de ressuscitation*

- Transfert immédiat au bloc opératoire si:

Arrêt devant témoin

Persistance de signes de vie (ECG, pupilles)

Traumatisme pénétrant

Délai d'acheminement  $\leq 10$  min

- Taux de survie variable 1 à 31%



**EUROPEAN  
RESUSCITATION  
COUNCIL**

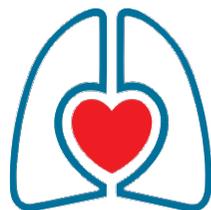
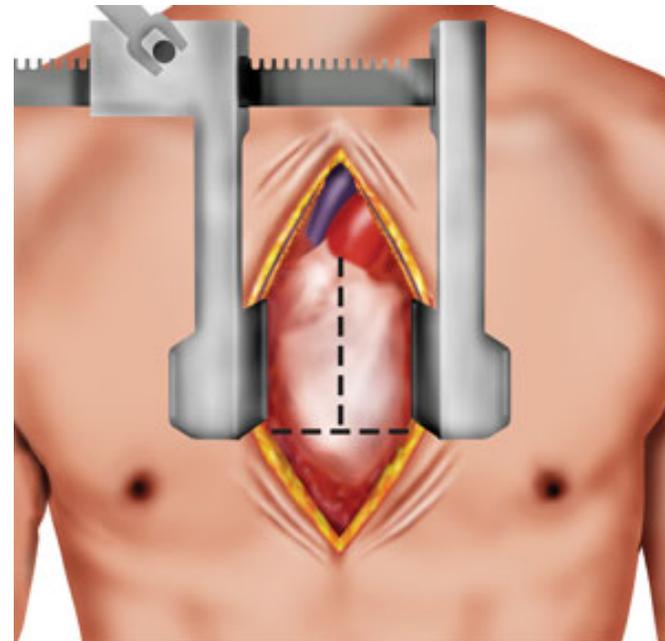
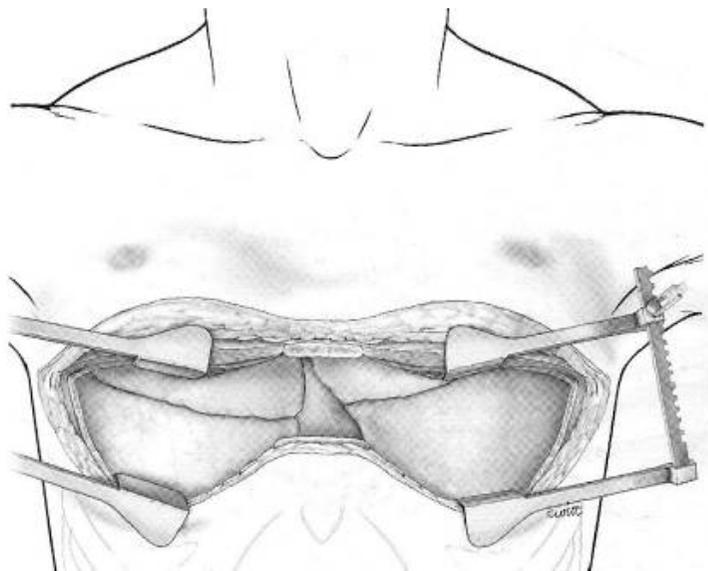
Truhlar, *Resuscitation* 2015



# A l'hôpital

## *Thoracotomie de ressuscitation*

### Thoracotomie



**EUROPEAN  
RESUSCITATION  
COUNCIL**

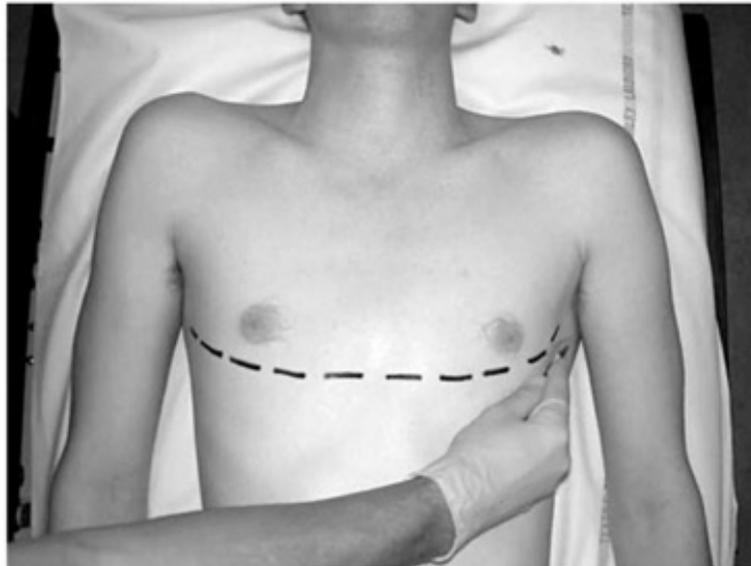
*Wise, Emerg Med J 2005*  
*Truhlar, Resuscitation 2015*

**MÉDECINE  
SORBONNE  
UNIVERSITÉ**

# A l'hôpital

## *Thoracotomie de ressuscitation*

### Thoracotomie



Wise, *Emerg Med J* 2005  
Truhlar, *Resuscitation* 2015



**EUROPEAN  
RESUSCITATION  
COUNCIL**

# A l'hôpital

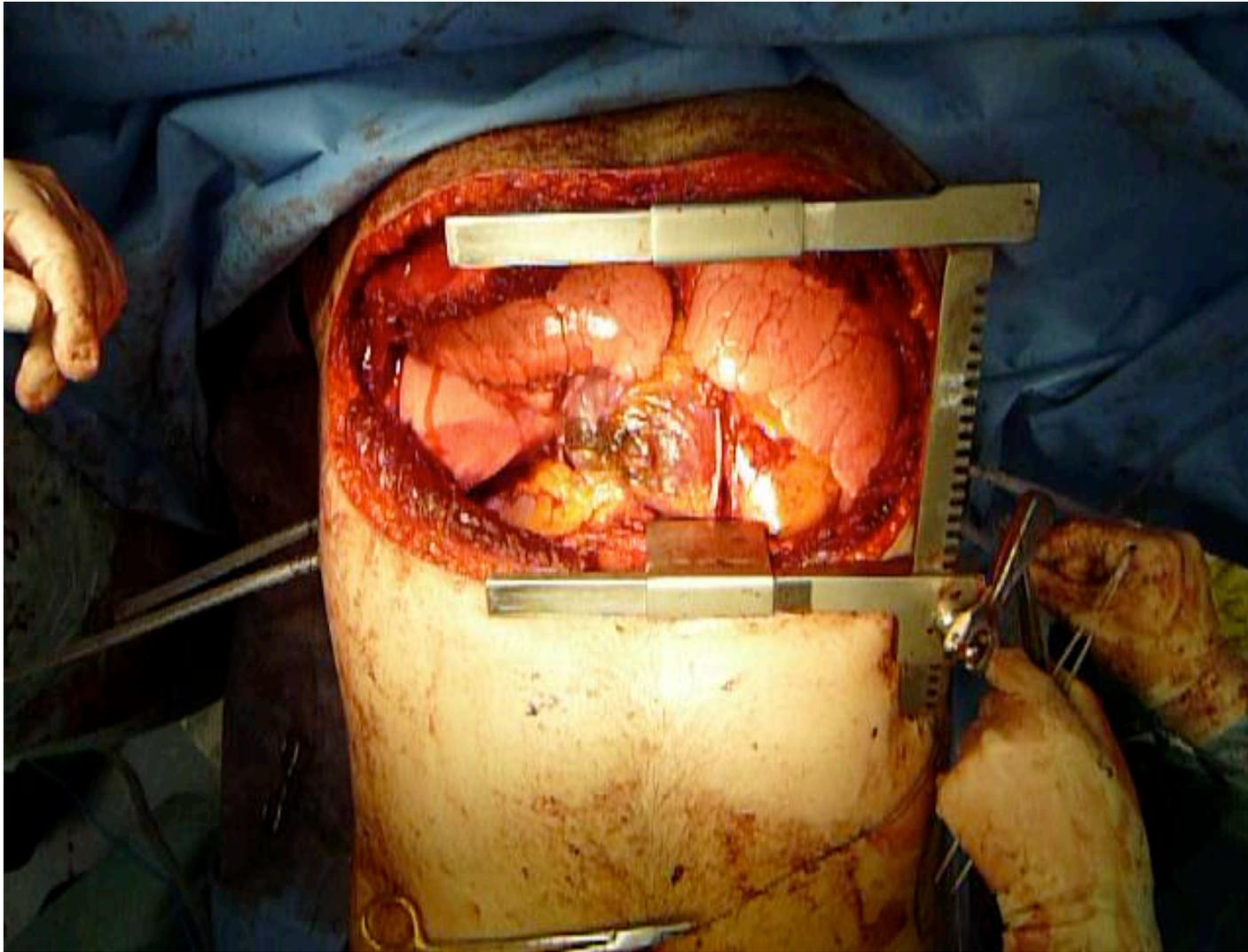
## *Thoracotomie de ressuscitation*

### Péricardotomie



# A l'hôpital

## *Thoracotomie de ressuscitation*



Vidéo Dr DABAN, HIA Percy



Quel pronostic ?



# Pronostic *UK*

“Allocation of resources to *[traumatic cardiac arrest]* patients is not an insular medical issue, but a broad concern for our society, and **society should decide if the cost of futility is excessive**”



# Pronostic France

Variables	Trauma Group (n = 268)	95% CI	Medical Group (n = 2642)	95% CI	p Value
Return of spontaneous circulation	91 (34.0)	28.3–39.6	797 (30.2)	28.4–31.9	.20
Admission to hospital	80 (29.9)	24.4–35.7	623 (23.6)	22.0–25.2	.02
Discharge from hospital	6 (2.2)	0.5–4.0	73 (2.8)	2.1–3.4	.62
Discharge with favorable neurologic outcome	2 (33.3)	4.3–77.7	37 (50.7)	38.1–61.9	.70

CI, confidence interval.

Data are number (%). Favorable neurologic outcome was defined by cerebral performance categories scores 1 (no impairment) or 2 (moderate neurologic impairment).

Même pronostic que l'arrêt « médical »



# Pronostic Chez nous

**Table 2** Comparison between survivors and deceased patients

	Survivors to discharge (N=10)	Deceased patients (N=78)	p Value
Age (years)	32 (23–38)	39 (25–53)	0.35
Presenting with CA at EMS arrival	6 (60%)	35 (45%)	0.5
No flow time (min)	1 (0–5)	0 (0–5)	0.8
Low flow time (min)	6 (2–10)	10 (9–21)	0.01
Total dose of epinephrine (mg)	1 (0–2)	3 (1–6)	0.07
Suspected cause of arrest			
Hypoxia	4 (40%)	5 (6%)	0.008
Haemorrhage	3 (30%)	31 (40%)	
Traumatic brain injury	2 (20%)	24 (31%)	
Comotio cordis	1 (10%)	0	
Penetrating trauma	1 (10%)	10 (13%)	1.0

Data are number (percentage) and median (IQR 25–75).  
No flow and low flow times are the times without chest compressions before CPR and CPR duration until return of spontaneous circulation.  
CA, cardiac arrest; CPR, cardiopulmonary resuscitation.

**11 % IC<sub>95</sub>(6;19)  
de survie**



# Pronostic

*Bon si...*

## **Si traumatisme pénétrant**

- Thoracique
- Tamponnade
- Arme blanche
- Lésion unique

## **Si signes de vie**

- Réactivité pupillaire
- Mouvements spontanés
- Activité ECG organisée > 40 bpm



# Pronostic

*Bon si...*

Arrêt **intra-hospitalier** devant médecin expérimenté

Identification et traitement de **cause curable**

- Exsufflation de pneumothorax suffocant
- Péricardotomie



# Pronostic

*Mauvais si...*

## **Pas de réanimation si :**

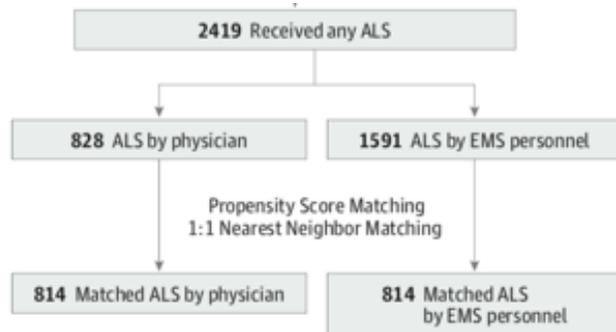
- **Pas de signe de vie** depuis 15 minutes
- Traumatisme majeur **incompatible avec la survie**

## **Interrompre la réanimation en l'absence :**

- De RACS malgré le traitement de la cause
- D'activité cardiaque détectable en échocardiographie

# Pronostic

## *Le bénéfice de la médicalisation*



**Table 4. Outcomes of Patients With Traumatic OHCA by the Type of ALS Professional in the Propensity Score-Matched Cohort**

Outcome	Favorable Outcomes, No. (%)		RR (95% CI)	P Value
	ALS by Physician (n = 814)	ALS by EMS Personnel (n = 814)		
Prehospital ROSC	87 (10.7)	57 (7.0)	1.53 (1.11-2.10)	.009
<b>1-mo Overall survival</b>	<b>24 (3.0)</b>	<b>12 (1.5)</b>	<b>2.00 (1.01-3.97)</b>	<b>.04</b>
Neurologic outcome (CPC 1 or 2)	7 (0.9)	0	NA	.008
CPC 1	5 (0.6)	0	NA	NA
CPC 2	2 (0.3)	0	NA	NA
CPC 3	6 (0.7)	3 (0.4)	NA	NA
CPC 4	10 (1.2)	8 (1.0)	NA	NA
CPC 5	791 (97.2)	803 (98.6)	NA	NA

Fukuda, *JAMA Surg* 2018



# Conclusion



# Conclusion

## *Ce qu'il faut retenir*

### 1. Les étiologies à avoir en tête

**H**ypovolémie

**O**xygénation

**T**amponnade (pneumothorax, hémopéricarde)

1. Tu exsuffles

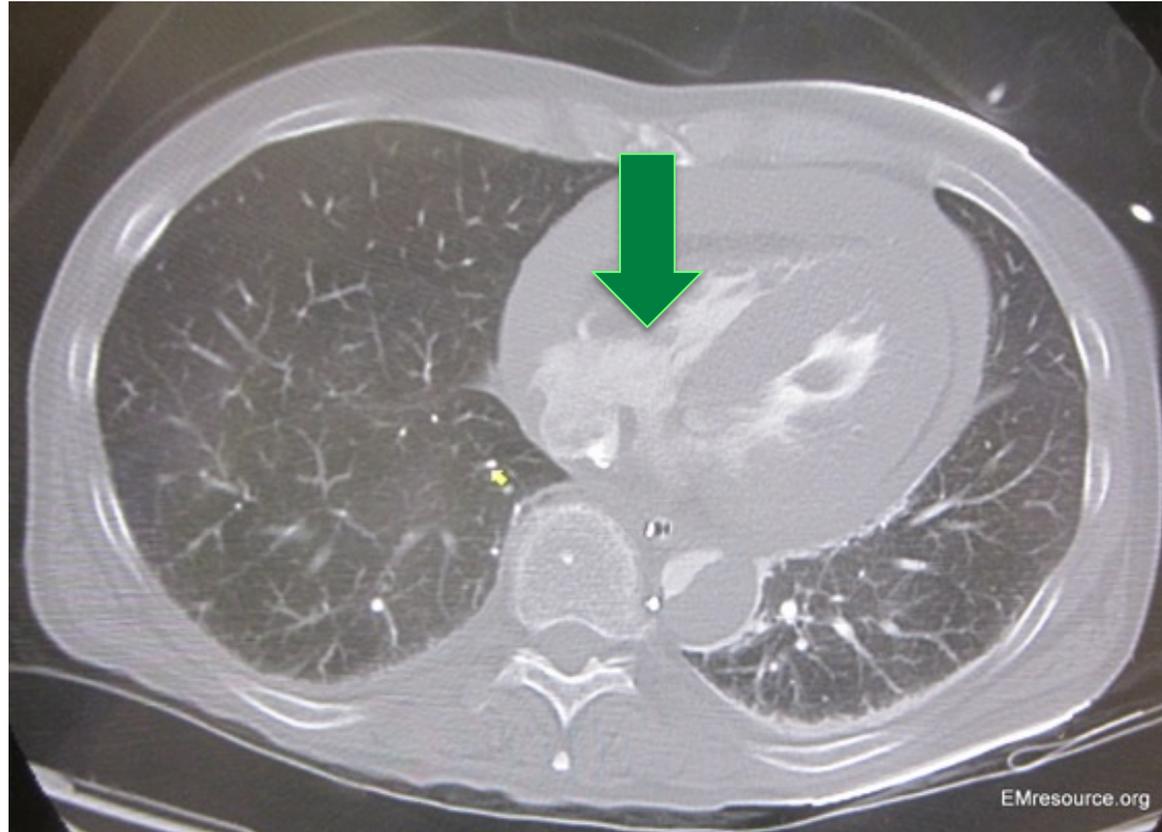
2. Tu masses



Pour discuter



# Pour discuter *Hémopéricarde*



RCP efficace

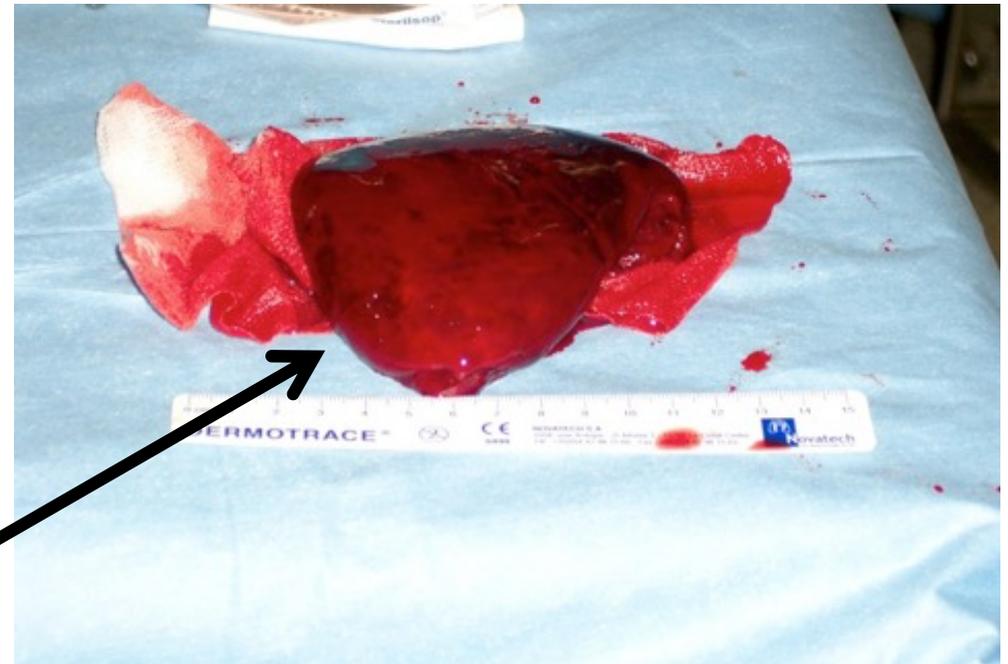
# Pour discuter

## *Hémopéricarde*

- Pas de place pour la péricardocentèse



*Gao, World J Surg 2004*  
*Soar, Resuscitation 2010*



Çà ne passe pas  
dans l'aiguille de  
ponction

*Truhlar, Resuscitation 2015*

