Quelles Cibles thérapeutiques pour la prise en charge du choc septique?

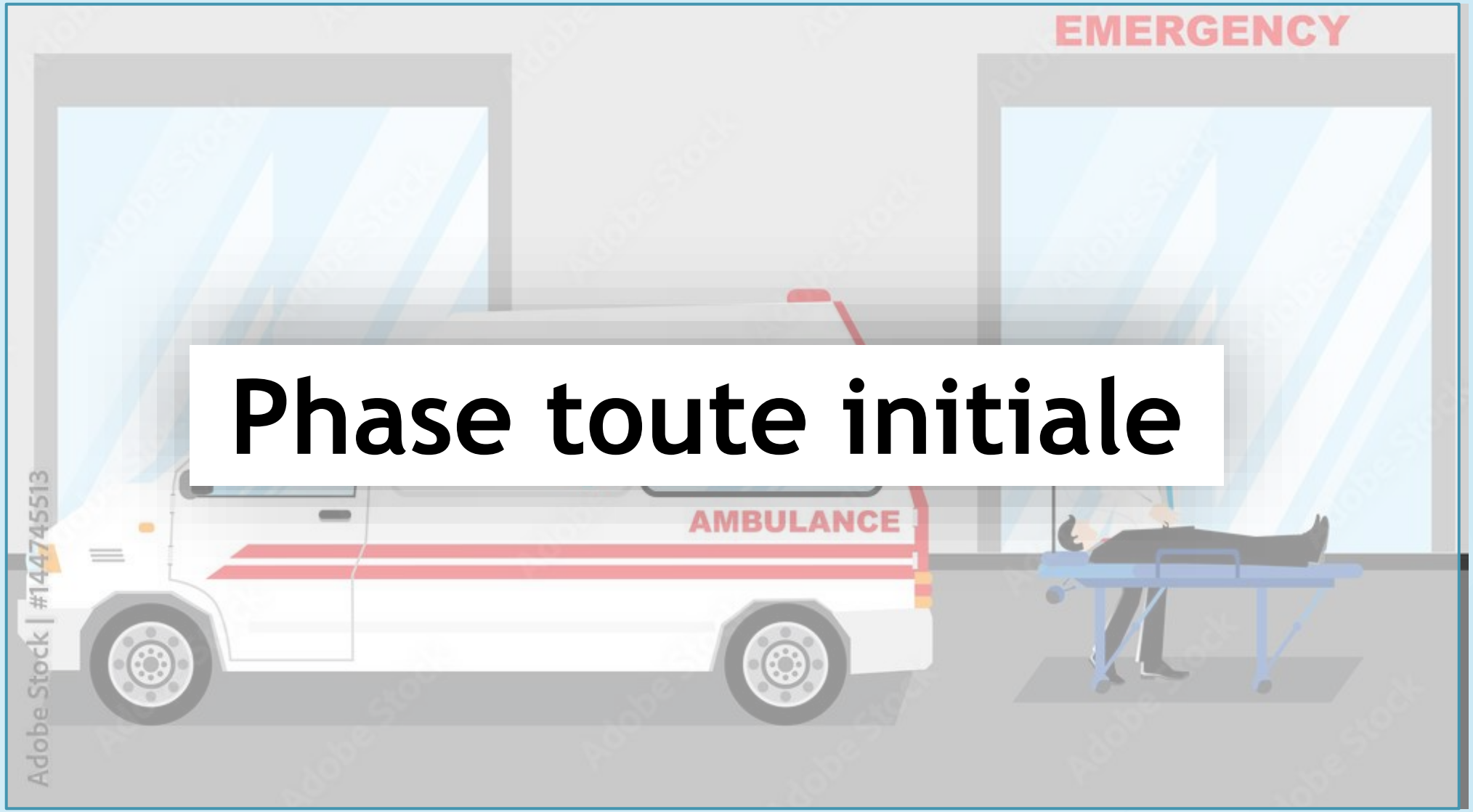
Olfa Hamzaoui

Service de Médecine Intensive-Réanimation polyvalente

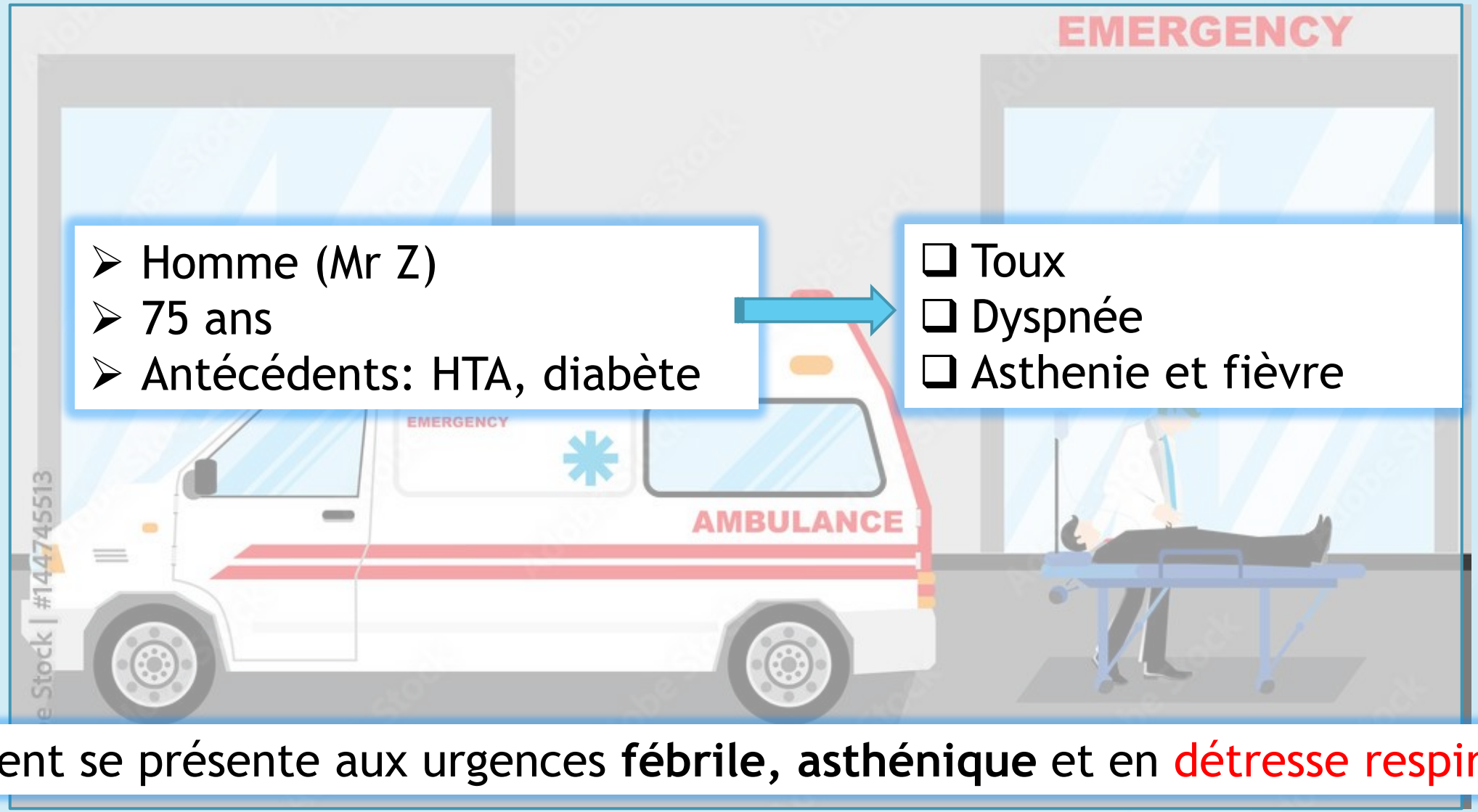
CHU et Université de Reims

Conflicts of Interest

- I have received honoraria from Baxter
- I have received honoraria as a consultant AOP Orphan
- I have no conflicts of interest relevant to the content of this presentation



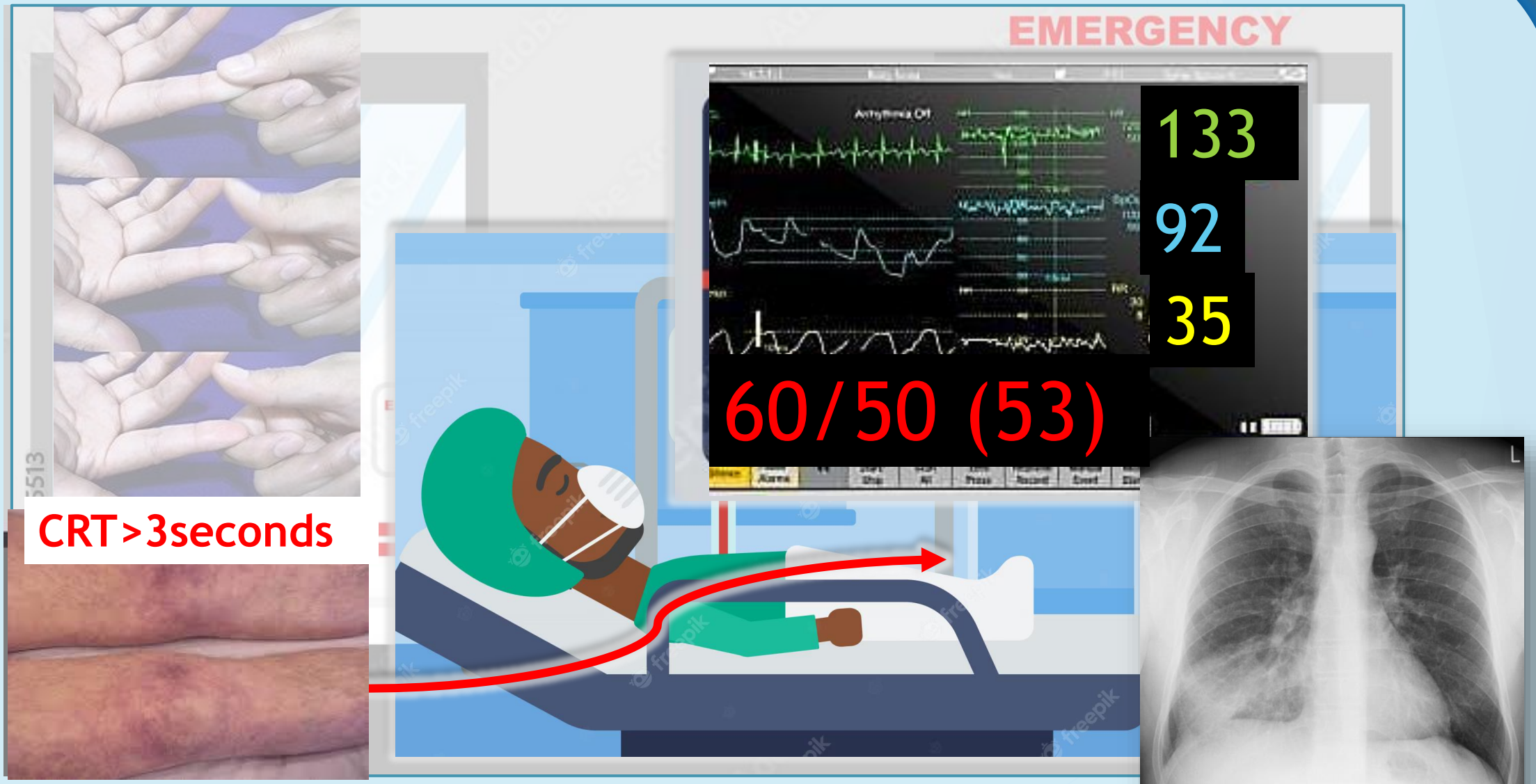
Phase toute initiale



- Homme (Mr Z)
- 75 ans
- Antécédents: HTA, diabète

- ❑ Toux
- ❑ Dyspnée
- ❑ Asthenie et fièvre

Le patient se présente aux urgences **fébrile, asthénique** et en détresse respiratoire


EMERGENCY
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92
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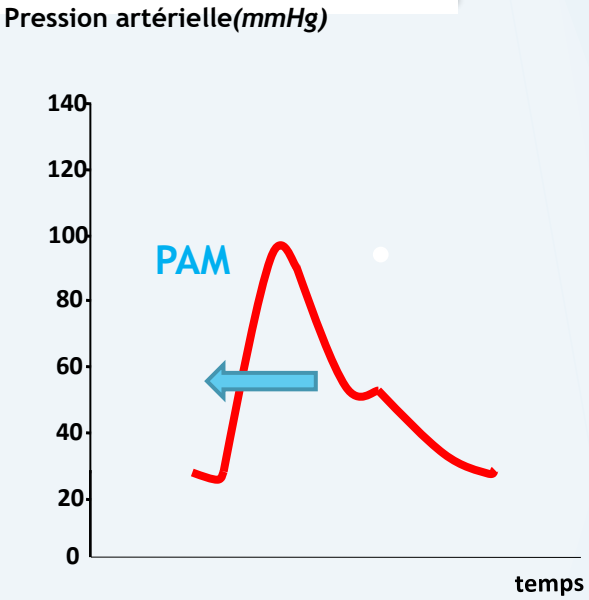
60/50 (53)
CRT>3seconds

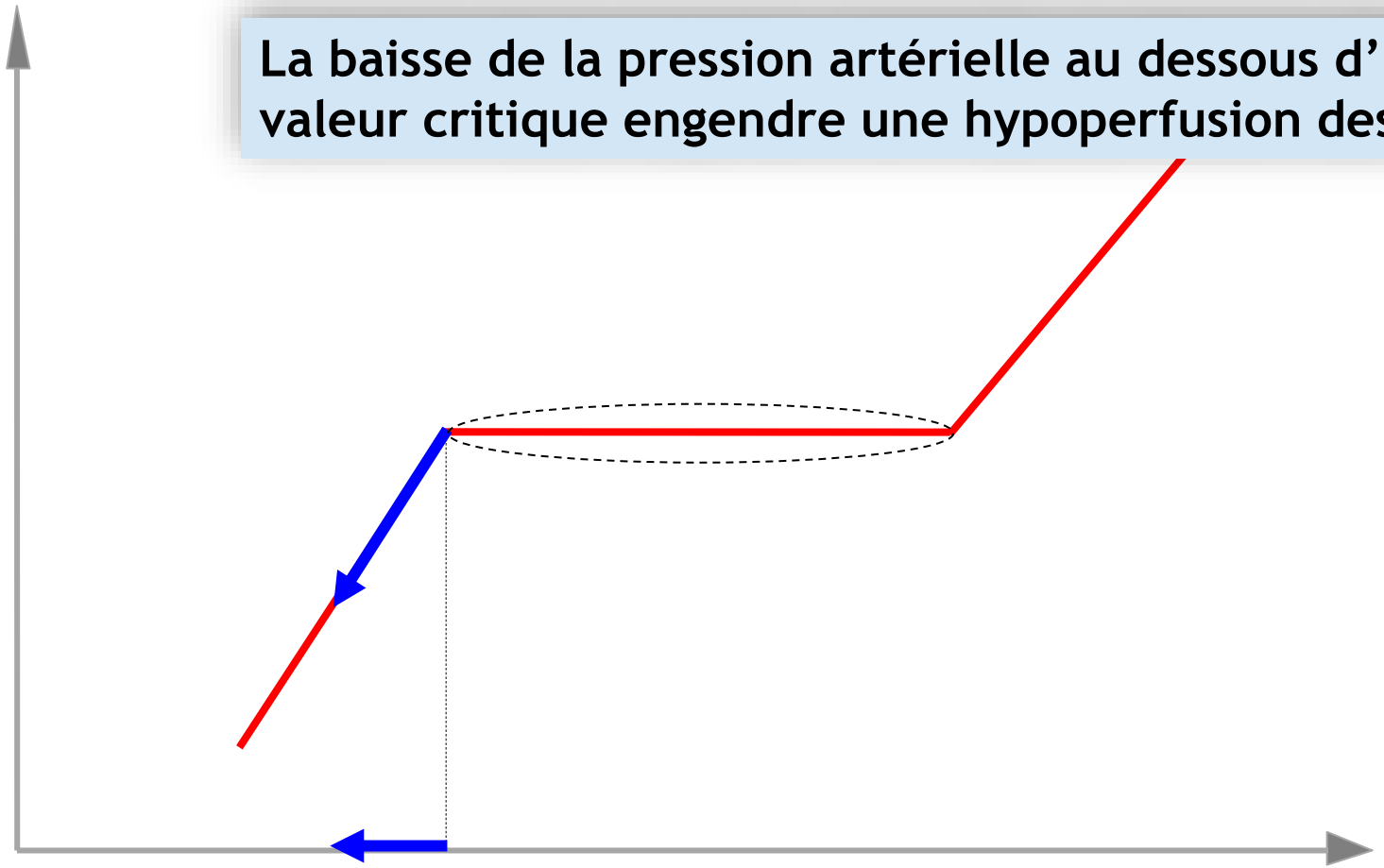
Cibles thérapeutiques: Macrocirculation

1 La pression artérielle moyenne



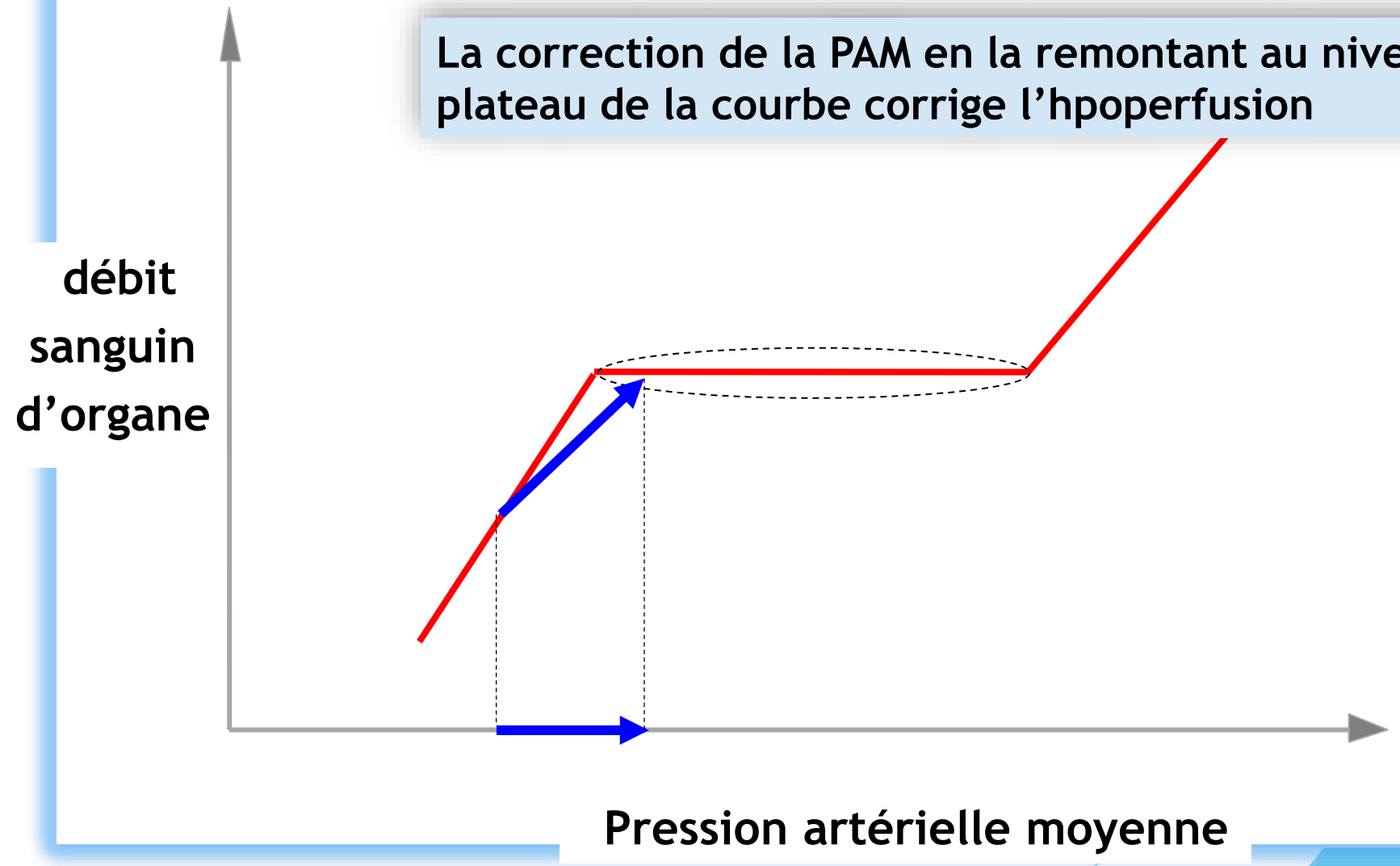
Autoregulation du débit sanguin

La baisse de la pression artérielle au dessous d'une valeur critique engendre une hypoperfusion des organes



Autoregulation du débit sanguin

La correction de la PAM en la remontant au niveau du plateau de la courbe corrige l'hpoperfusion

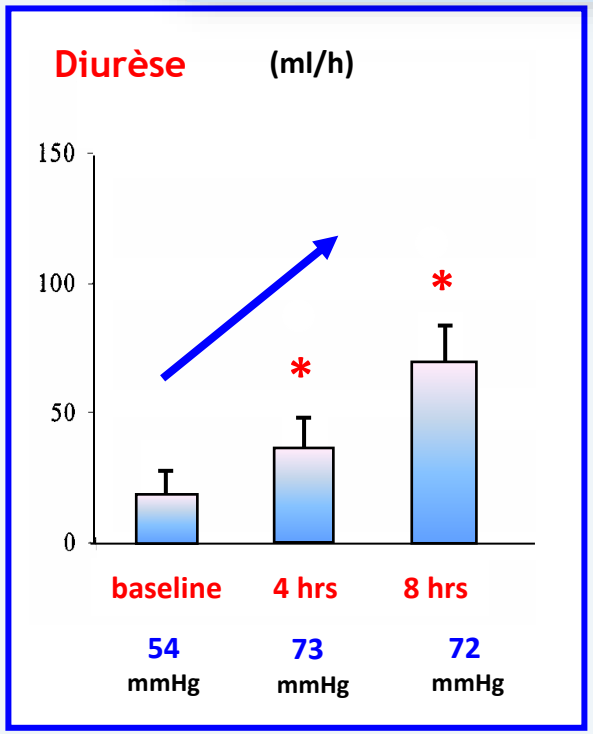


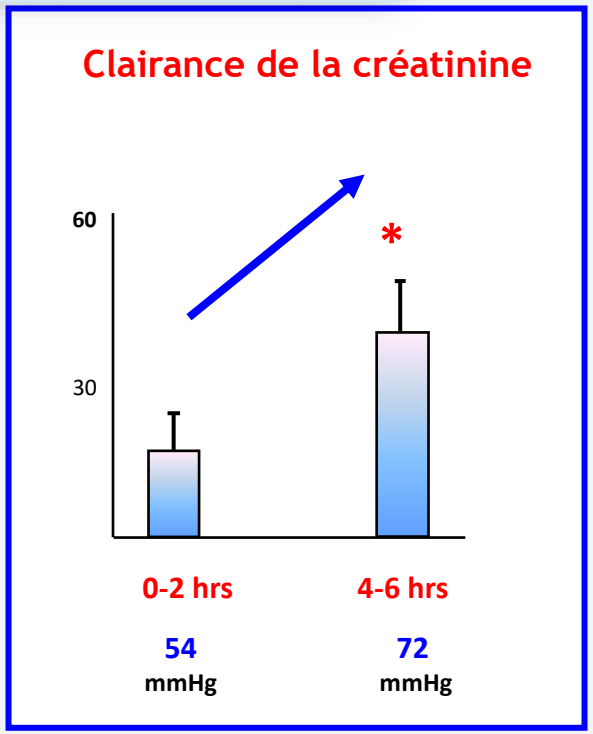
Terlipressin or norepinephrine in hyperdynamic septic shock: A prospective, randomized study*

Jacques Albanèse, MD; Marc Leone, MD; Anne Delmas, MD; Claude Martin, MD, FCCM

Crit Care Med 2005; 33:1897–1902

Probable effet Pression



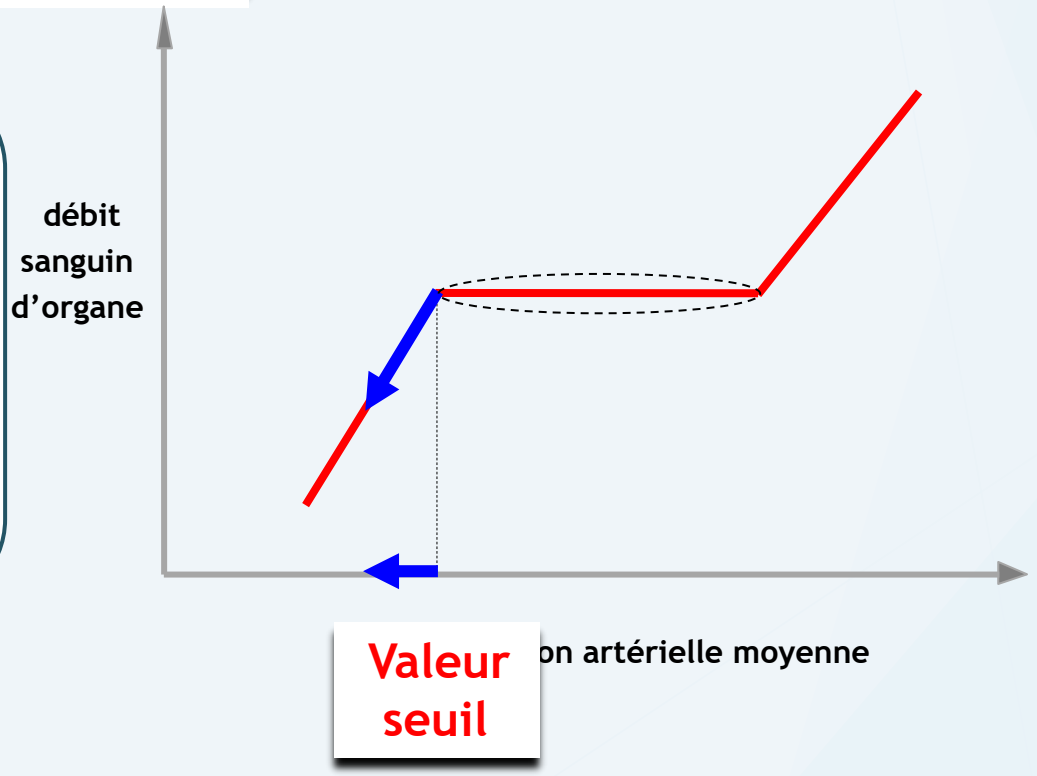


Le débit cardiaque était inchangé

Cibles thérapeutiques: Macrocirculation

1 La pression artérielle moyenne

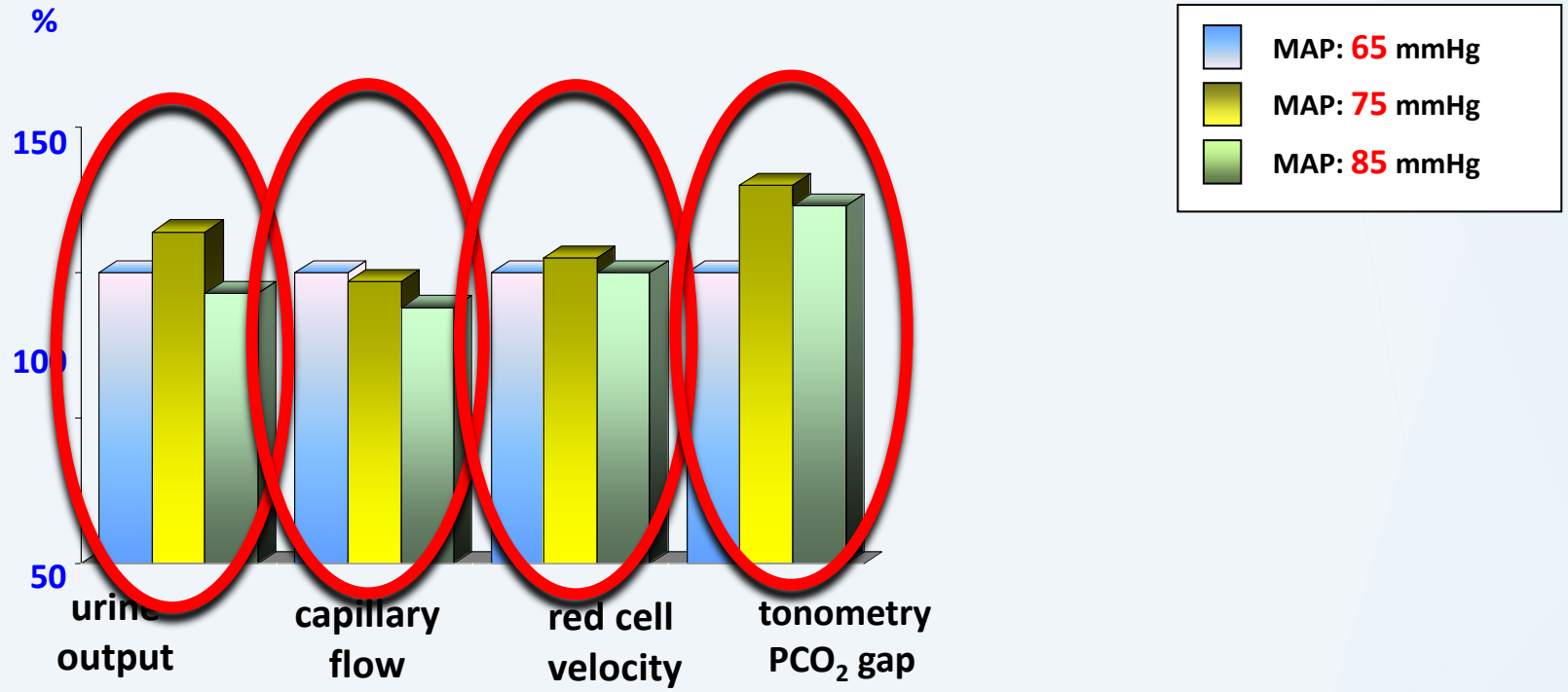
Quelle valeur seuil ?



Effects of perfusion pressure on tissue perfusion in septic shock

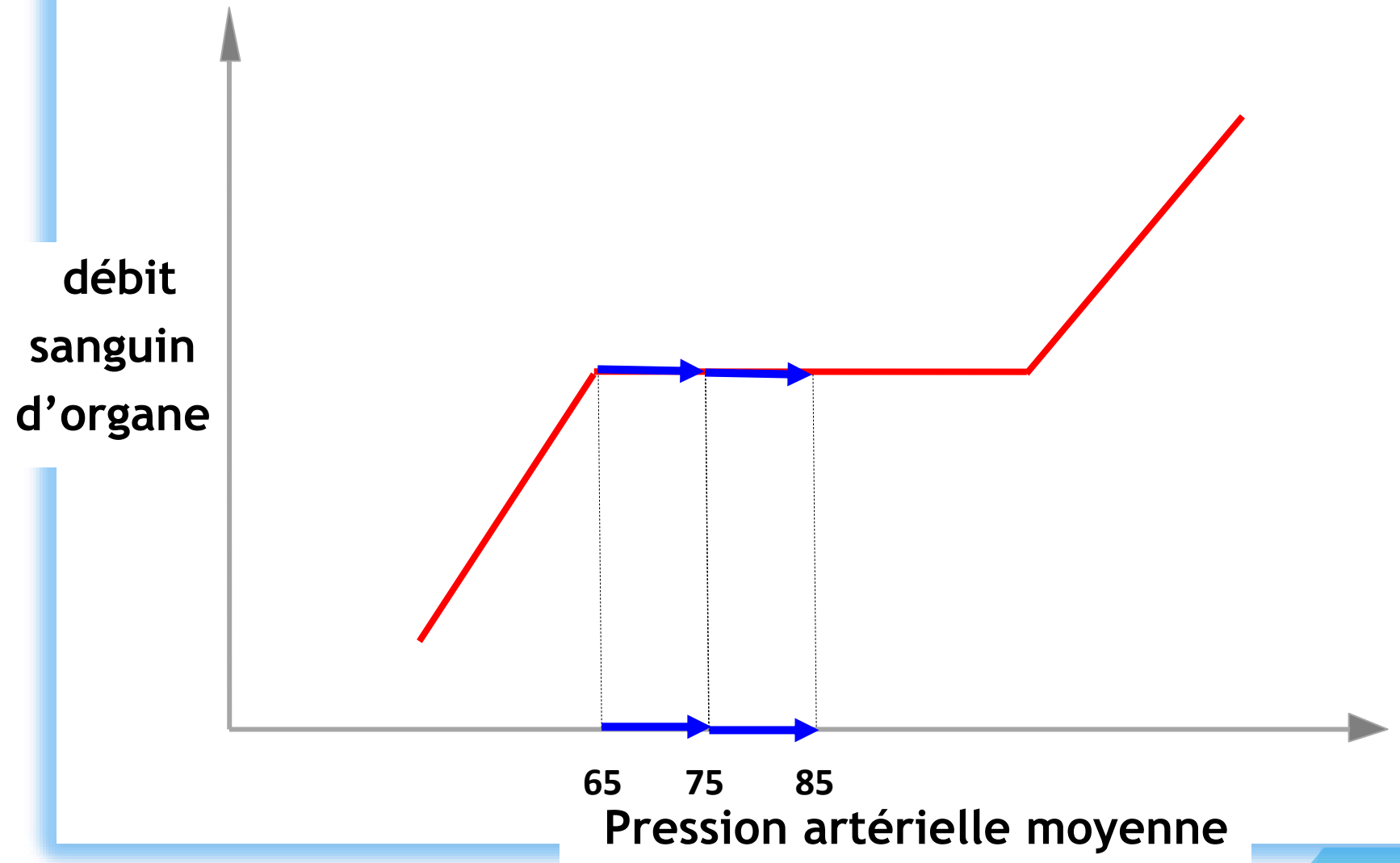
David LeDoux, MD; Mark E. Astiz, MD, FCCM; Charles M. Carpati, MD; Eric C. Rackow, MD, FCCM

Crit Care Med 2000; 28:2729–2732



Au-delà de **65mmHg** de **PAM**, plus d'effet sur la perfusion périphérique

Autoregulation du débit sanguin



Intensive Care Med (2005) 31:1066–1071
DOI 10.1007/s00134-005-2688-z

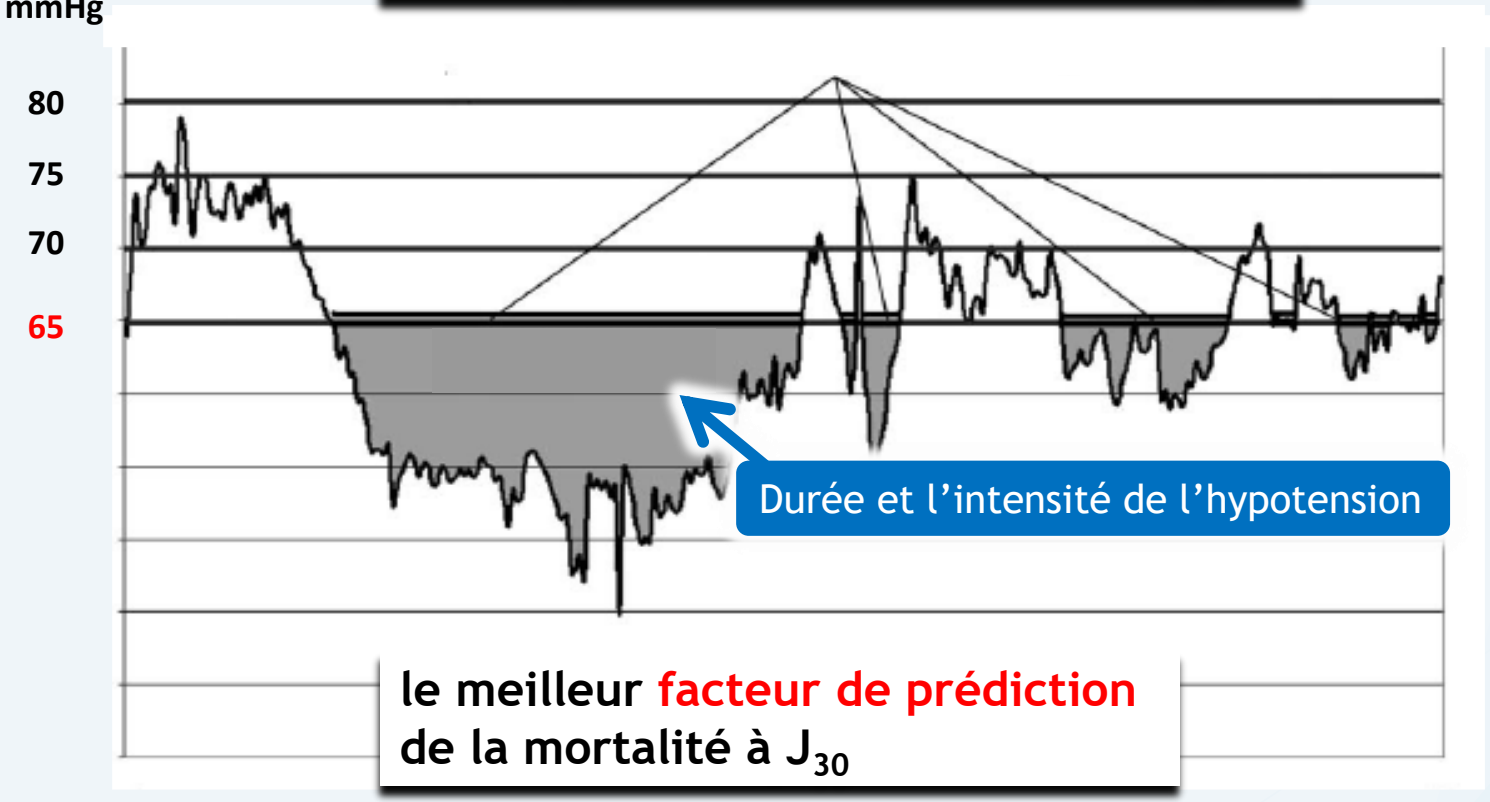
ORIGINAL

Marjut Varpula
Minna Tallgren
Katri Saukkonen
Liisa-Maria Voipio-Pulkki
Ville Pettilä

Hemodynamic variables related to outcome in septic shock

Cohorte Retrospective
111 patients en choc septique
Mortalité à J30

Durée passée sous PAM 65 mmHg



le meilleur facteur de prédiction de la mortalité à J_{30}

GUIDELINES

Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021

Intensive Care Med (2021) 47:1181–1247

MEAN ARTERIAL PRESSURE

MODERATE

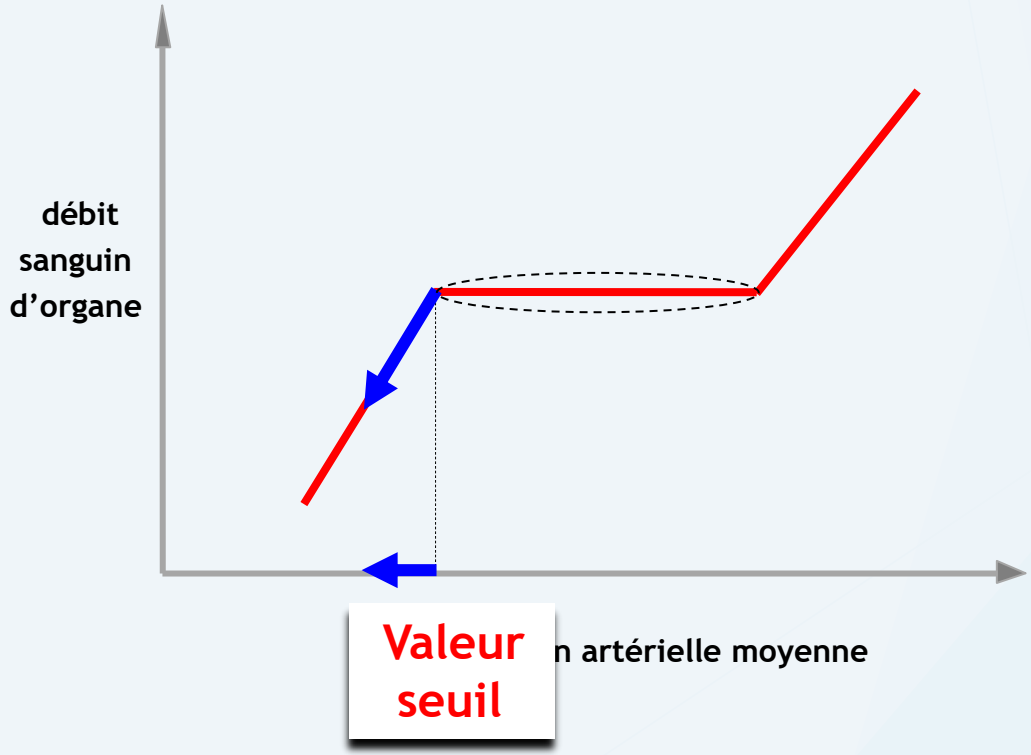
9 For adults with septic shock on vasopressors, we **recommend** an initial target mean arterial pressure (MAP) of 65 mm Hg over higher MAP targets.

Cibles thérapeutiques: Macrocirculation

1 La pression artérielle moyenne

Quelle valeur seuil ?

Est-elle la même chez tous les patients?

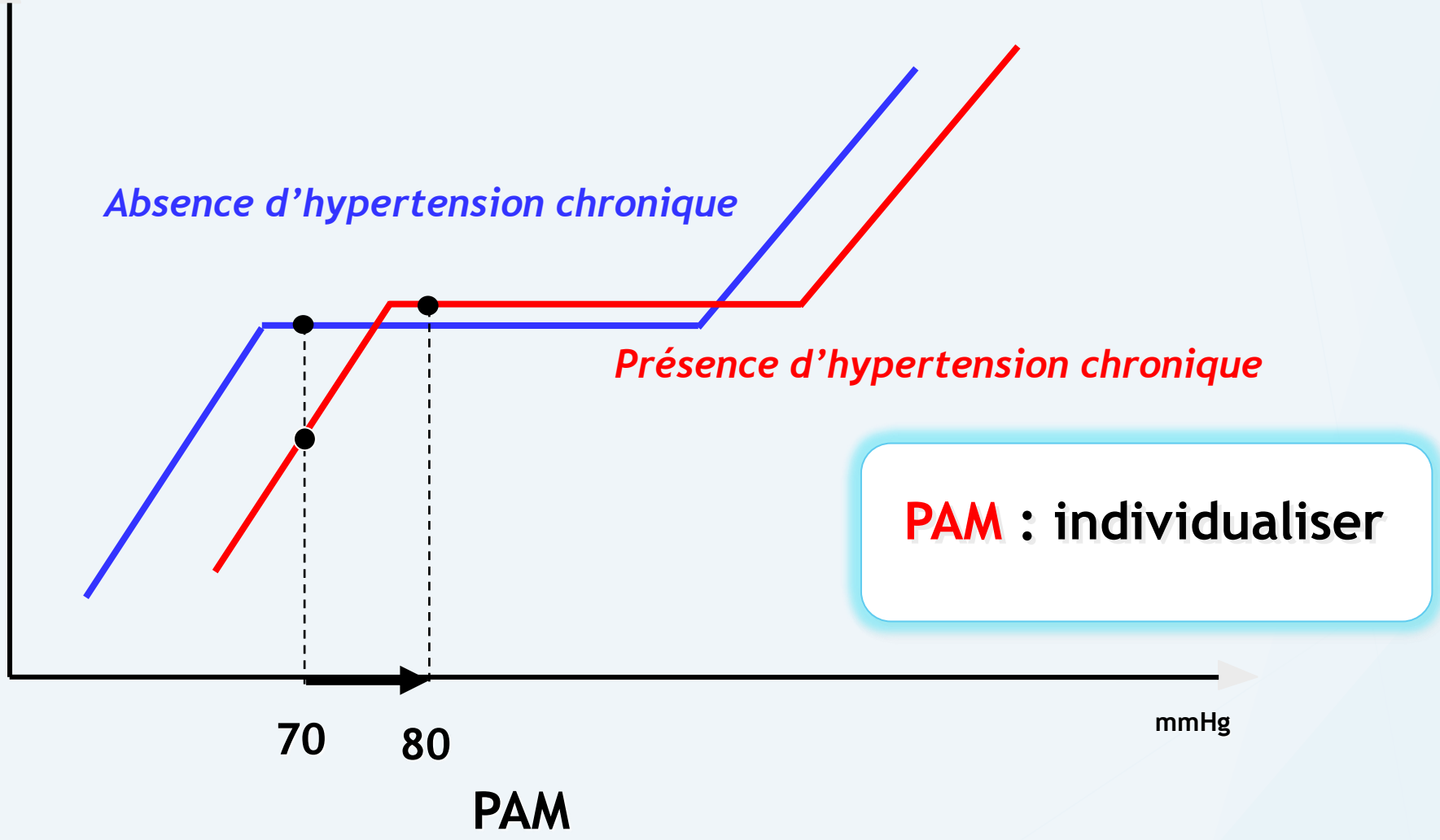


Autoregulation of Brain Circulation in Severe Arterial Hypertension

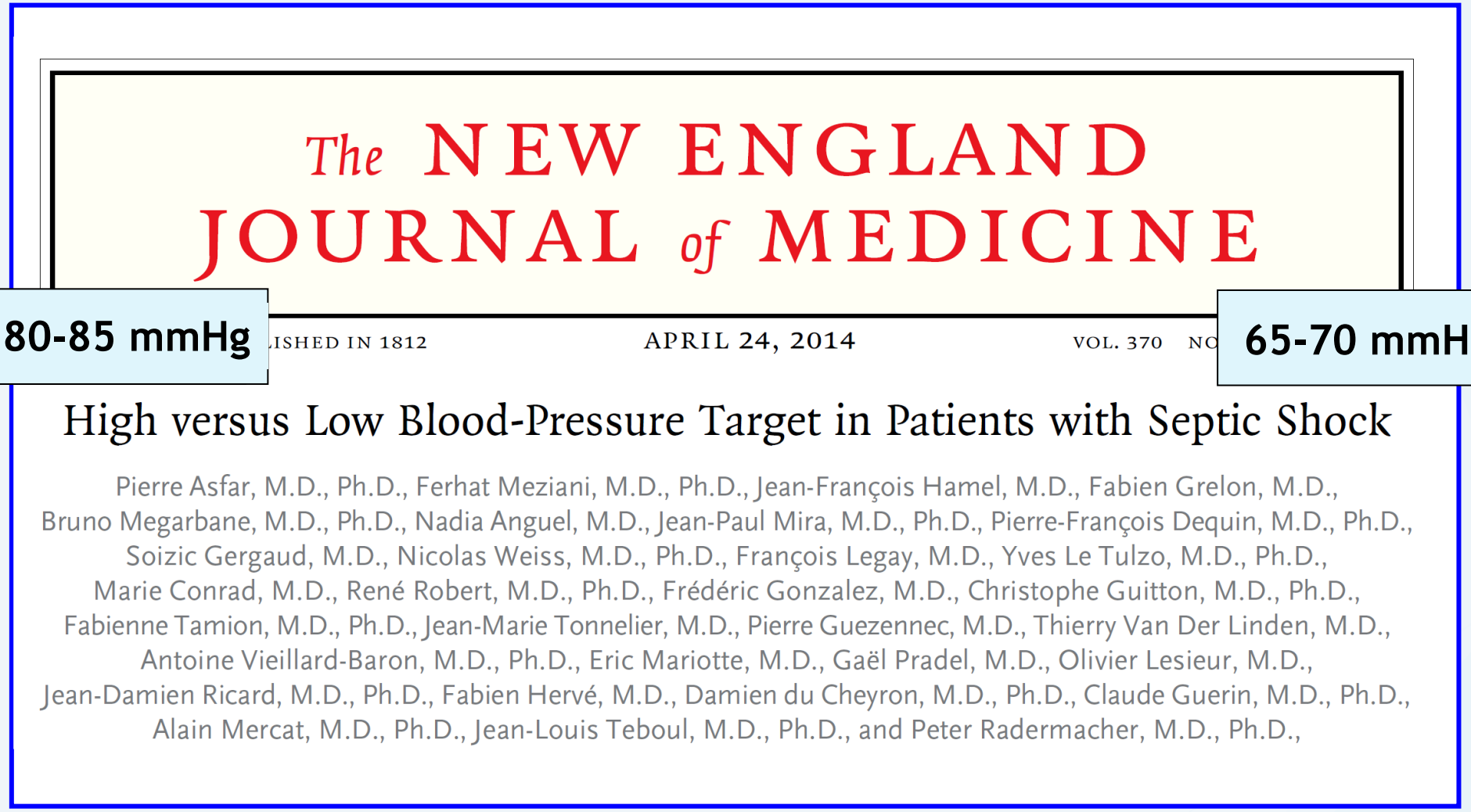
S. STRANDGAARD, J. OLESEN, E. SKINHØJ, N. A. LASSEN

British Medical Journal, 1973, 1, 507–510

débit sanguin des organes



PAM : individualiser



The NEW ENGLAND JOURNAL of MEDICINE

ISHED IN 1812 APRIL 24, 2014 VOL. 370 NO

High versus Low Blood-Pressure Target in Patients with Septic Shock

Pierre Asfar, M.D., Ph.D., Ferhat Meziani, M.D., Ph.D., Jean-François Hamel, M.D., Fabien Grelon, M.D., Bruno Megarbane, M.D., Ph.D., Nadia Anguel, M.D., Jean-Paul Mira, M.D., Ph.D., Pierre-François Dequin, M.D., Ph.D., Soizic Gergaud, M.D., Nicolas Weiss, M.D., Ph.D., François Legay, M.D., Yves Le Tulzo, M.D., Ph.D., Marie Conrad, M.D., René Robert, M.D., Ph.D., Frédéric Gonzalez, M.D., Christophe Guitton, M.D., Ph.D., Fabienne Tamion, M.D., Ph.D., Jean-Marie Tonnelier, M.D., Pierre Guezennec, M.D., Thierry Van Der Linden, M.D., Antoine Vieillard-Baron, M.D., Ph.D., Eric Mariotte, M.D., Gaël Pradel, M.D., Olivier Lesieur, M.D., Jean-Damien Ricard, M.D., Ph.D., Fabien Hervé, M.D., Damien du Cheyron, M.D., Ph.D., Claude Guerin, M.D., Ph.D., Alain Mercat, M.D., Ph.D., Jean-Louis Teboul, M.D., Ph.D., and Peter Radermacher, M.D., Ph.D.,

80-85 mmHg

65-70 mmHg

388 pts

388 pts

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Variable	Low-Target Group (N=388)	High-Target Group (N=388)	P Value
Primary outcome: death at day 28 — no. (%)*	132 (34.0)	142 (36.6)	0.57
Secondary outcomes — no./total no. (%)			
Death at day 90†	164 (42.3)	170 (43.8)	0.74
Survival at day 28 without organ support‡	241 (62.1)	235 (60.6)	0.66
Doubling of plasma creatinine	161 (41.5)	150 (38.7)	0.42
No chronic hypertension	71/215 (33.0)	85/221 (38.5)	0.32
Chronic hypertension	90/173 (52.0)	65/167 (38.9)	0.02
Renal-replacement therapy from day 1 to day 7	139 (35.8)	130 (33.5)	0.50
No chronic hypertension	66/215 (30.7)	77/221 (34.8)	0.36
Chronic hypertension	73/173 (42.2)	53/167 (31.7)	0.046
Atrial fibrillation	11 (2.8)	26 (6.7)	0.02
Ventricular fibrillation or tachycardia	15 (3.9)	22 (5.7)	0.24
Digital ischemia	9 (2.3)	10 (2.6)	0.82
Mesenteric ischemia	9 (2.3)	9 (2.3)	1.00
Bleeding	42 (10.8)	31 (8.0)	0.22

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		Low MAP	High MAP	p value
AF — no. (%)	All	11 (2.8)	26 (6.7)	0.02
	Chronic hypertension –	2 (0.9)	11 (5.0)	0.02
	Chronic hypertension +	9 (5.2)	15 (9.0)	0.21

Contrairement aux patients sans HTA chronique,

pas de **différence** en termes d'incidence **d'arythmie**

chez les **patients avec HTA chronique** randomisés dans le groupe stratégie PAM élevée

Current use of vasopressors in septic shock

Thomas W. L. Scheeren[1*], Jan Bakker[2,3,4,5], Daniel De Backer[6], Djillali Annane[7], Pierre Asfar[8], E. Christiaan Boerma[9], Maurizio Cecconi[10], Arnaldo Dubin[11], Martin W. Dünser[12], Jacques Duranteau[13], Anthony C. Gordon[14], Olfa Hamzaoui[15], Glenn Hernández[16], Marc Leone[17], Bruno Levy[18], Claude Martin[17], Alexandre Mebazaa[19], Xavier Monnet[20,21], Andrea Morelli[22], Didier Payen[23], Rupert Pearse[24], Michael R. Pinsky[25], Peter Radermacher[26], Daniel Reuter[27], Bernd Saugel[28], Yasser Sakr[29], Mervyn Singer[30], Pierre Squara[31], Antoine Vieillard-Baron[32,33], Philippe Vignon[34], Simon T. Vistisen[35], Iwan C. C. van der Horst[36], Jean-Louis Vincent[37] and Jean-Louis Teboul[38]

Ann. Intensive Care (2019) 9:20

Which patient's factor(s) may encourage you to increase your arterial blood pressure target?

Age	14 (2%)
History of chronic hypertension	662 (79%)
History of coronary artery disease	52 (6%)
None of them	102 (12%)
Value of central venous pressure	9 (1%)

EDITORIAL Open Access

Equilibrating SSC guidelines with individualized care

Jean-Louis Vincent[1*], Mervyn Singer[2], Sharon Einav[3], Rui Moreno[4], Julia Wendon[5], Jean-Louis Teboul[6], Jan Bakker[7,8,9,10], Glenn Hernandez[11], Djillali Annane[12], Angélique M. E. de Man[13], Xavier Monnet[14], V. Marco Ranieri[15], Olfa Hamzaoui[16], Jukka Takala[17], Nicole Juffermans[18,19], Jean-Daniel Chiche[20], Sheila N. Myatra[21] and Daniel De Backer[22]

Critical Care (2021) 25:397

We recommend **individualizing** arterial **blood pressure levels.**

Although a mean value of **65 mmHg** may be recommended as an **initial goal**, the optimal level may be **higher** in patients with a history of **hypertension**, atherosclerosis or chronic kidney disease

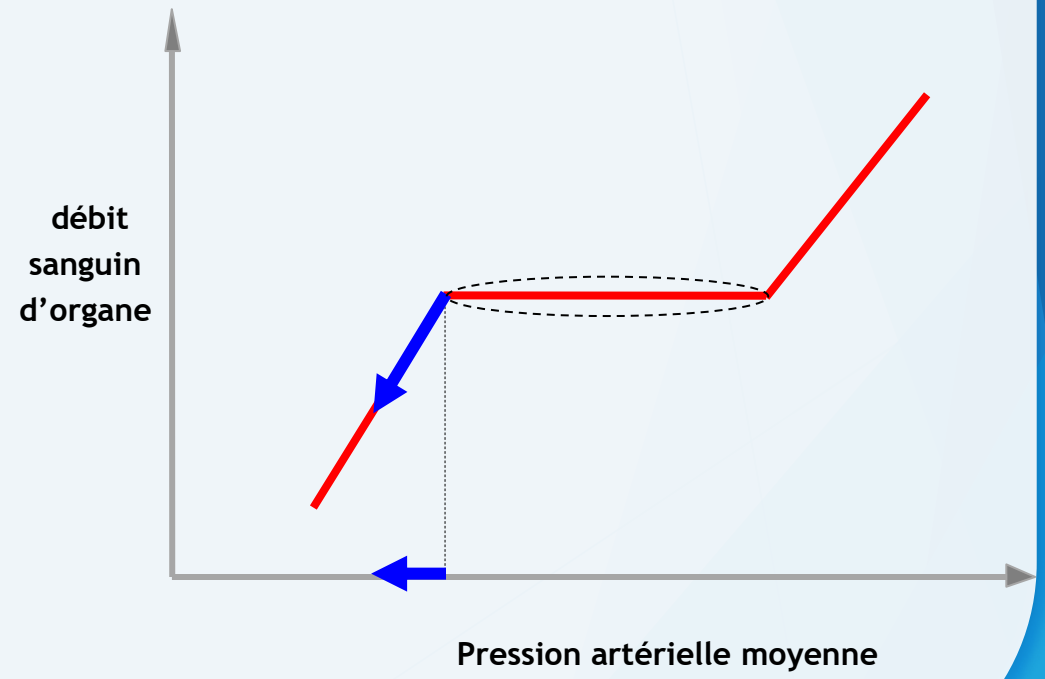
Cibles thérapeutiques: Macrocirculation

1 La pression artérielle moyenne

Quelle valeur seuil ?

Est-elle la même chez tous les patients?

Est-elle la même dans toutes les situations?



SPECIAL ISSUE INSIGHT

Central venous pressure (CVP)

Olfa Hamzaoui[1*] and Jean-Louis Teboul[2,3]

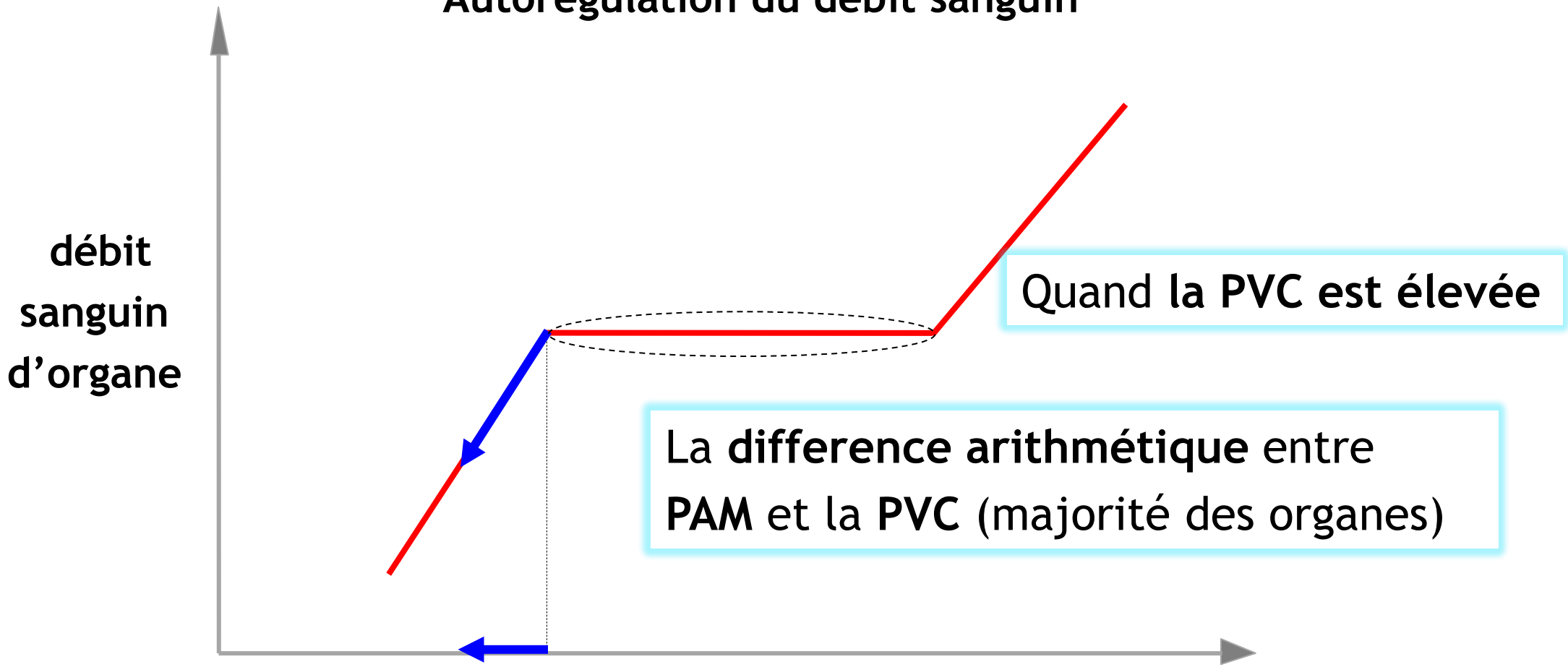
Intensive Care Med (2022) 48:1498–1500

CVP as the downstream pressure for organ perfusion

The CVP also reflects the downstream pressure for perfusion of most vital organs (e.g., brain and kidney). The mean perfusion pressure (MPP) of such organs is the difference between mean arterial pressure (MAP) and CVP.

PPM = PAM - PVC → **PAM** reflète **PPM** quand la PVC est basse

Autoregulation du débit sanguin



Low mean perfusion pressure is a risk factor for progression of acute kidney injury in critically ill patients – A retrospective analysis

Marlies Ostermann[1*], Anna Hall[2] and Siobhan Crichton[3]

BMC Nephrology (2017) 18:151

Table 2 Multivariable analysis: Risk factors for progression from AKI I to AKI III

Parameter	OR (95% CI)[a]	*p*-value
Cumulative fluid balance on day of AKI I [ml]	1.00 (0.99–1.00)	0.98
MAP <65 mmHg for >1 h in first 12 h after diagnosis of AKI I	0.97 (0.48–1.96)	0.93

La **pression de perfusion moyenne** (PPM = PAM - PVC), mais pas **la PAM** était un facteur indépendant associé à la **progression** de **l'IRA.**

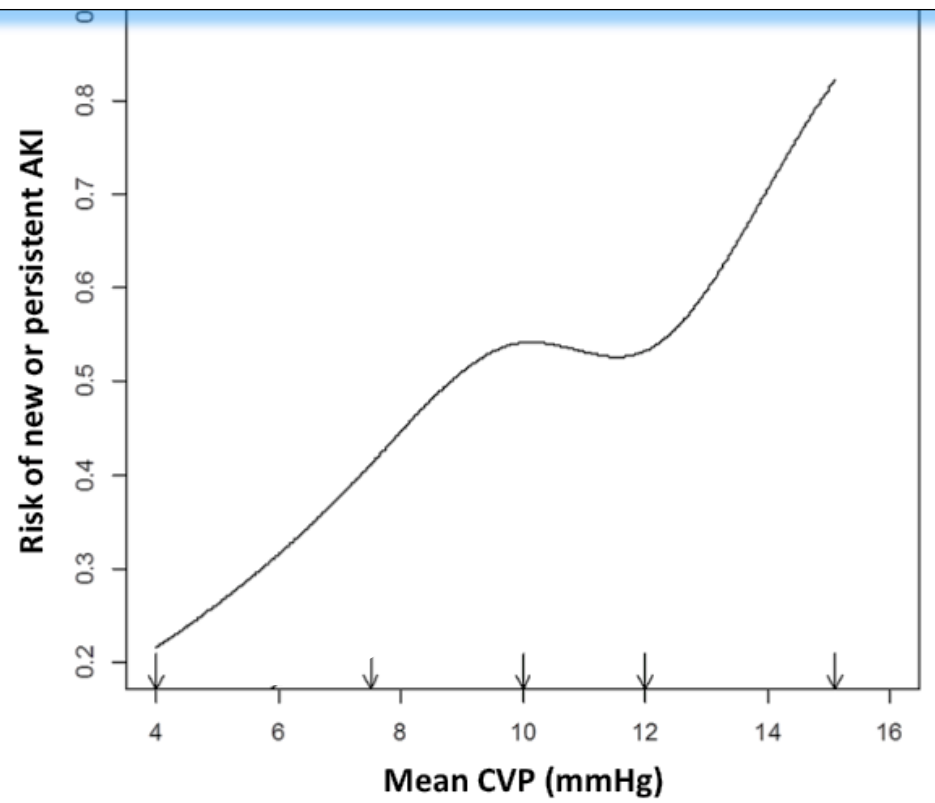
Une valeur de **PPM** de **60 mmHg** était retrouvée comme **valeur-seuil.**

Association between systemic hemodynamics and septic acute kidney injury in critically ill patients: a retrospective observational study

Matthieu Legrand[1,2*], Claire Dupuis[1], Christelle Simon[1], Etienne Gayat[1,3], Joaquim Mateo[1], Anne-Claire Lukaszewicz[1,2,4] and Didier Payen[1,2,4]

Critical Care 2013, **17**:R278

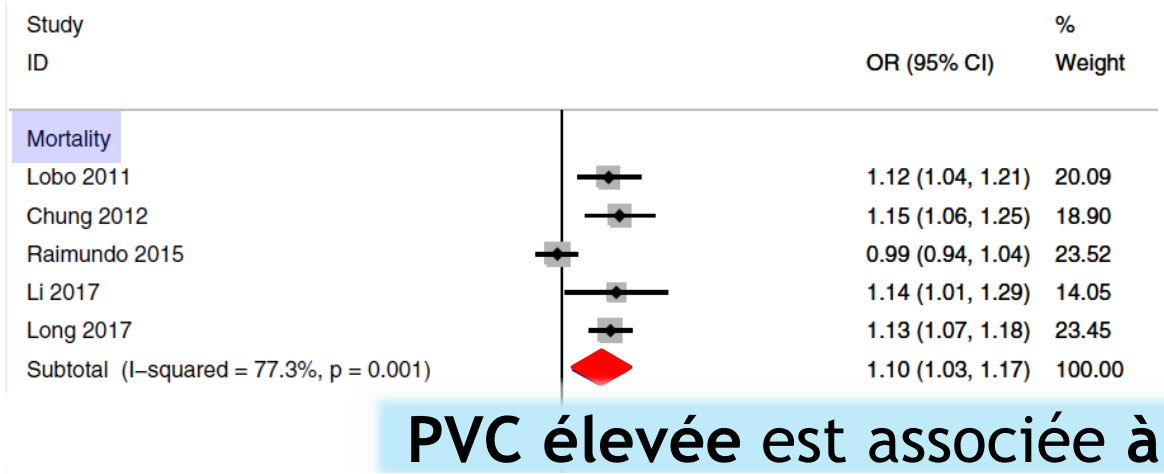
Plus la **PVC** est **élevée**, plus **élevé** est le risque d'**IRA**



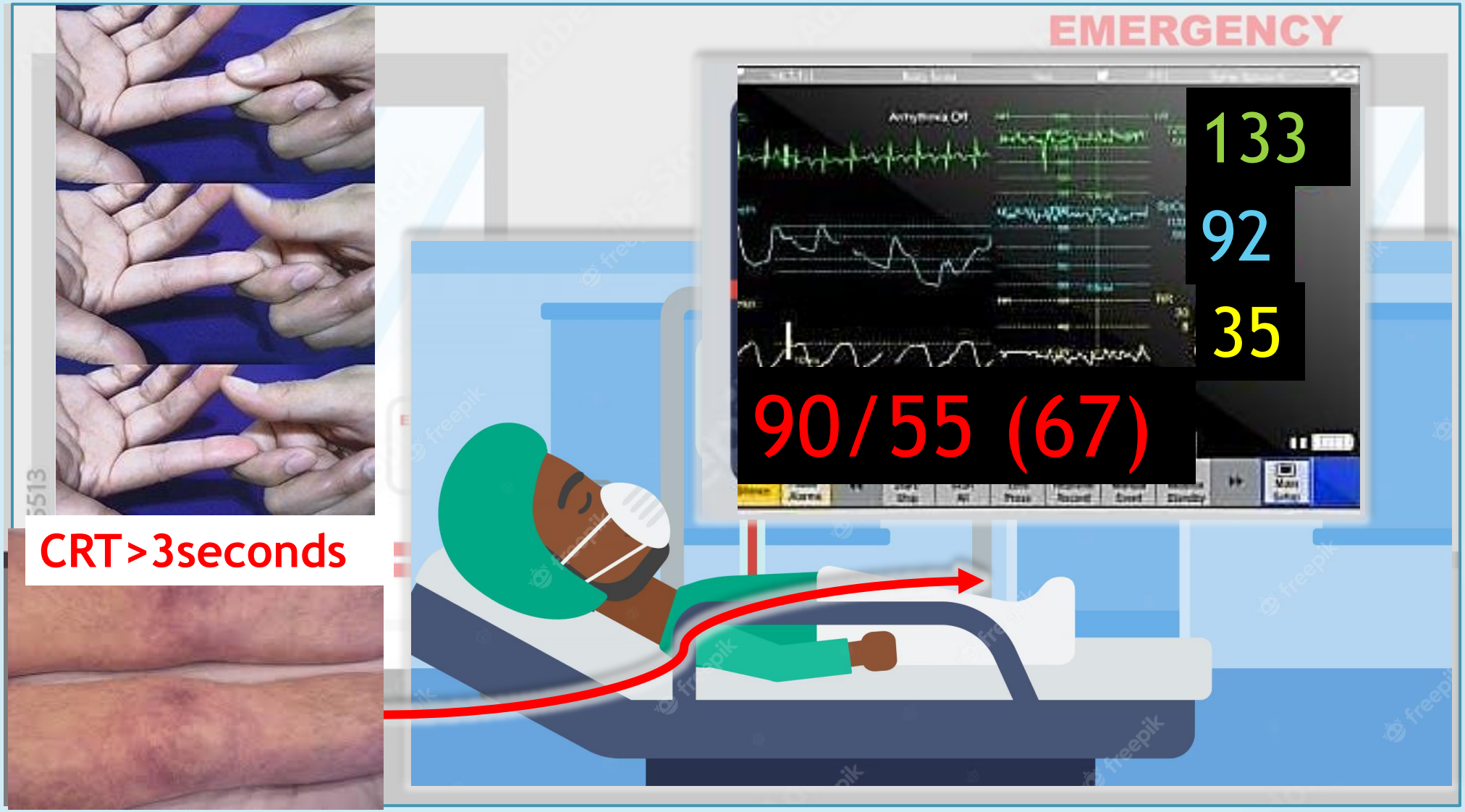
Elevated central venous pressure is associated with increased mortality and acute kidney injury in critically ill patients: a meta-analysis

Chuan-Yu Chen[1], Yan Zhou[1], Peng Wang[1], En-Yao Qi[1] and Wan-Jie Gu[2*]

Critical Care (2020) 24:80



PVC élevée est associée **à un risqué élevé de mortalité**


EMERGENCY
133
92
35
90/55 (67)
CRT>3seconds

Cibles thérapeutiques: Microcirculation

1. Les marbrures

Signes cutanés :

- **Marbrures**

Annals of Intensive Care 2013, **3**:31

Annals of Intensive Care
a SpringerOpen Journal

RESEARCH Open Access

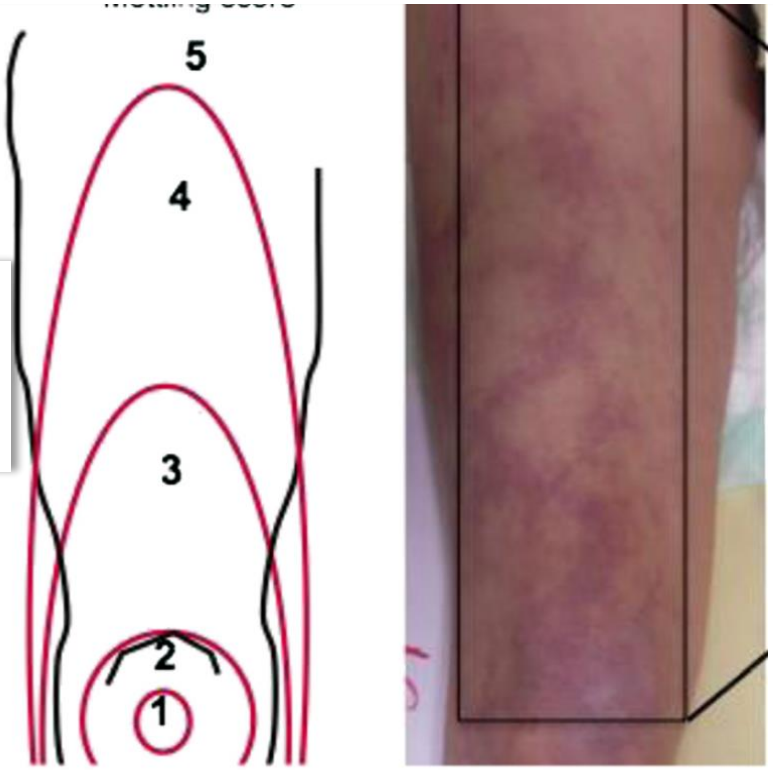
Alteration of skin perfusion in mottling area during septic shock

Hafid Ait-Oufella[1,2,3*], Simon Bourcier[1], Mikael Alves[1,3], Arnaud Galbois[1], Jean-Luc Baudel[1], Dimitri Margetis[1], Naike Bige[1,3], Georges Offenstadt[1,3,4], Eric Maury[1,3,4] and Bertrand Guidet[1,3,4]

La peau est un **organe accessible** qui permet **d'évaluer** la **perfusion tissulaire** au lit du patient de manière **non invasive**

Score de marbrures :

fonction de **l'étendue** des marbrures autour des genoux



Signes cutanés :

- **Marbrures**

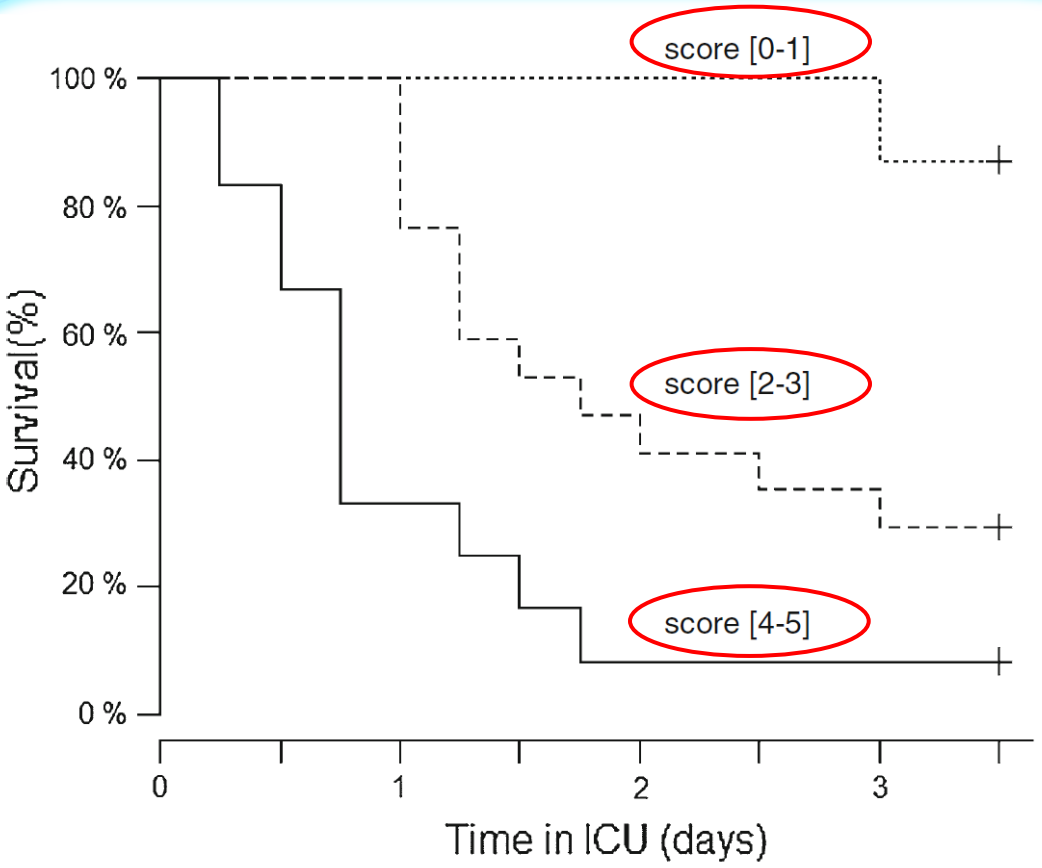
Intensive Care Med (2011) 37:801–807

ORIGINAL

H. Ait-Oufella
S. Lemoinne
P. Y. Boelle
A. Galbois
J. L. Baudel
J. Lemant
J. Joffre
D. Margetis
B. Guidet
E. Maury
G. Offenstadt

Mottling score predicts survival in septic shock

Mottling score at H_6

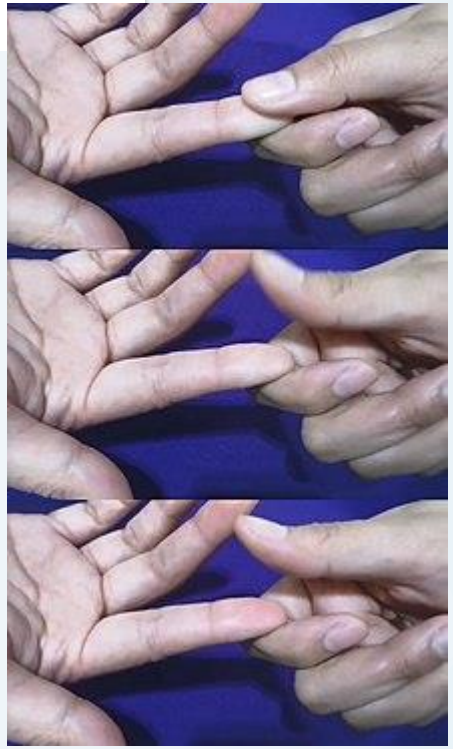


Plus le **score** de **marbrures** est **élevé** à H_6 plus le taux de **survie** est **bas**

Cibles thérapeutiques: Microcirculation

1. Les marbrures

2. Le temps de recoloration cutané



JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Effect of a Resuscitation Strategy Targeting Peripheral Perfusion Status vs Serum Lactate Levels on 28-Day Mortality Among Patients With Septic Shock

The ANDROMEDA-SHOCK Randomized Clinical Trial

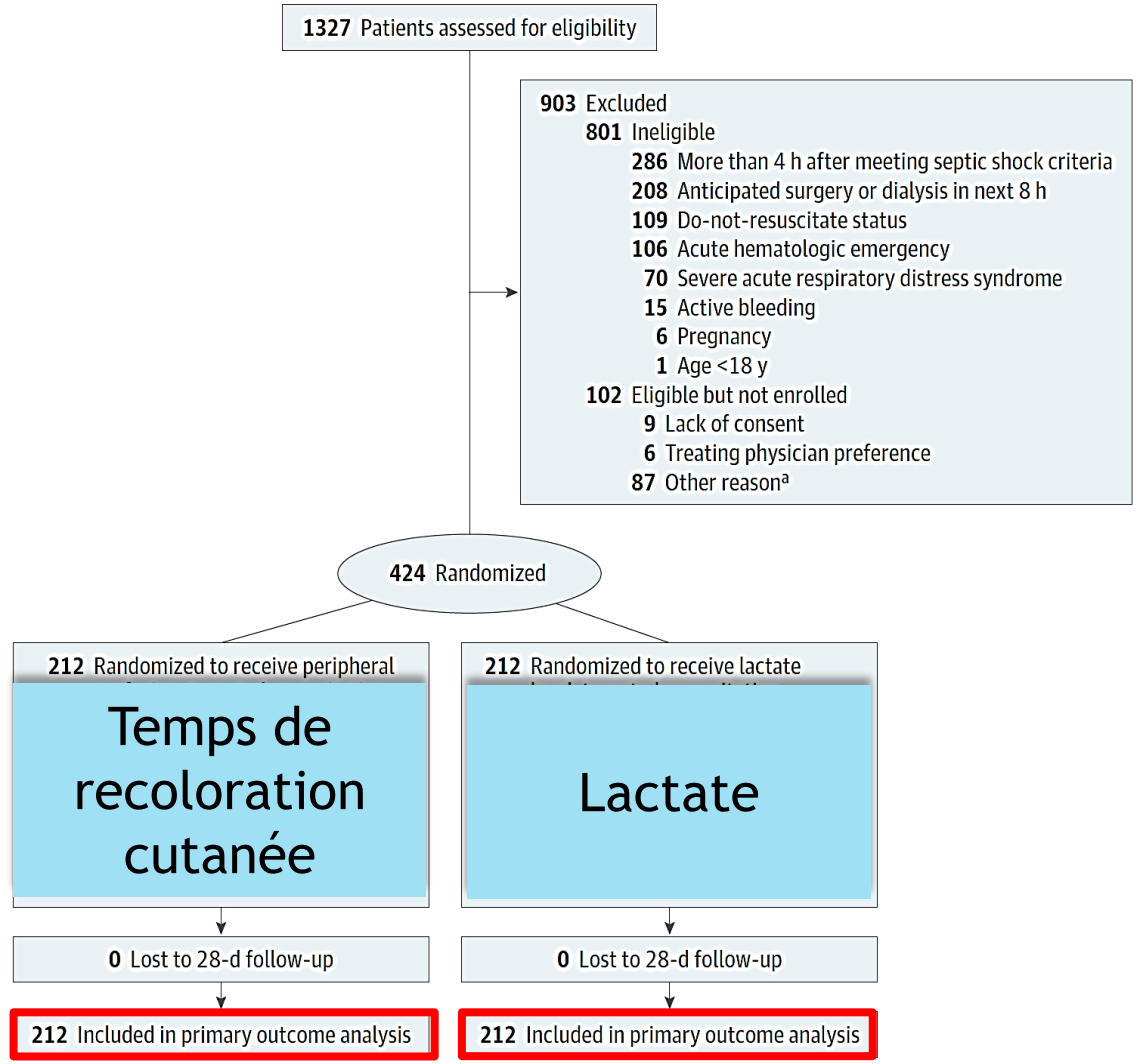
Glenn Hernández, MD, PhD; Gustavo A. Ospina-Tascón, MD, PhD; Lucas Petri Damiani, MSc; Elisa Estenssoro, MD; Arnaldo Dubin, MD, PhD; Javier Hurtado, MD; Gilberto Friedman, MD, PhD; Ricardo Castro, MD, MPH; Leyla Alegría, RN, MSc; Jean-Louis Teboul, MD, PhD; Maurizio Cecconi, MD, FFICM; Giorgio Ferri, MD; Manuel Jibaja, MD; Ronald Pairumani, MD; Paula Fernández, MD; Diego Barahona, MD; Vladimir Granda-Luna, MD, PhD; Alexandre Biasi Cavalcanti, MD, PhD; Jan Bakker, MD, PhD; for the ANDROMEDA-SHOCK Investigators and the Latin America Intensive Care Network (LIVEN)

JAMA. 2019;321(7):654-664.

Signes cutanés :

- Marbrures
- **Temps de recoloration cutanée**

Figure 1. Flow of Participants Through the Study



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Effect of a Resuscitation Strategy Targeting Peripheral Perfusion Status vs Serum Lactate Levels on 28-Day Mortality Among Patients With Septic Shock

The ANDROMEDA-SHOCK Randomized Clinical Trial

Glenn Hernández, MD, PhD; Gustavo A. Ospina-Tascón, MD, PhD; Lucas Petri Damiani, MSc; Elisa Estenssoro, MD; Arnaldo Dubin, MD, PhD; Javier Hurtado, MD; Gilberto Friedman, MD, PhD; Ricardo Castro, MD, MPH; Leyla Alegría, RN, MSc; Jean-Louis Teboul, MD, PhD; Maurizio Cecconi, MD, FFICM; Giorgio Ferri, MD; Manuel Jibaja, MD; Ronald Pairumani, MD; Paula Fernández, MD; Diego Barahona, MD; Vladimir Granda-Luna, MD, PhD; Alexandre Biasi Cavalcanti, MD, PhD; Jan Bakker, MD, PhD; for the ANDROMEDA-SHOCK Investigators and the Latin America Intensive Care Network (LIVEN)

JAMA. 2019;321(7):654-664.

Table 2. Main Outcomes of the Study of Resuscitation Strategies in Septic Shock

Outcome	Peripheral Perfusion-Targeted Resuscitation (n = 212)	Lactate Level-Targeted Resuscitation (n = 212)	Unadjusted Absolute Difference (95% CI)	Adjusted Relative Measure (95% CI)	*P* Value
Primary Outcome					
Death within 28 d, No. (%)	74 (34.9)	92 (43.4)	−8.5 (−18.2 to 1.2)[b]	HR, 0.75 (0.55 to 1.02)[a]	.06[a]
Secondary Outcomes					
Death within 90 d, No. (%)	87 (41.0)	99 (46.7)	−5.7 (−15.6 to 4.2)[b]	HR, 0.82 (0.61 to 1.09)[a]	.17[a]
Mechanical ventilation–free days within 28 d, mean (SD)[c]	14.6 (12.1)	12.7 (12.2)	1.9 (−0.6 to 4.3)		.14
Renal replacement therapy–free days within 28 d, mean (SD)[c]	18.5 (12.1)	16.9 (12.1)	1.7 (−1.5 to 4.8)		.31
Vasopressor-free days within 28 d, mean (SD)[c]	16.7 (12.0)	15.1 (12.3)	1.6 (−0.7 to 3.9)		.18
SOFA at 72 h, No.[d]	165	166			.045
Mean (SD)	5.6 (4.3)	6.6 (4.7)	−1.00 (−1.97 to −0.02)		

Signes cutanés :

- Marbrures
- **Temps de recoloration cutanée**

Kattan *et al. Ann. Intensive Care* (2020) 10:114
https://doi.org/10.1186/s13613-020-00732-1

Annals of Intensive Care

RESEARCH Open Access

A lactate-targeted resuscitation strategy may be associated with higher mortality in patients with septic shock and normal capillary refill time: a post hoc analysis of the ANDROMEDA-SHOCK study

Eduardo Kattan[1], Glenn Hernández[1], Gustavo Ospina-Tascón[2], Emilio Daniel Valenzuela[1], Jan Bakker[1,3,4,5], Ricardo Castro[1*] and The ANDROMEDA-SHOCK Study Investigators and the Latin America Intensive Care Network (LIVEN)

378 patients de l'étude ANDROMEDA-SHOCK avaient des données disponibles à H_2

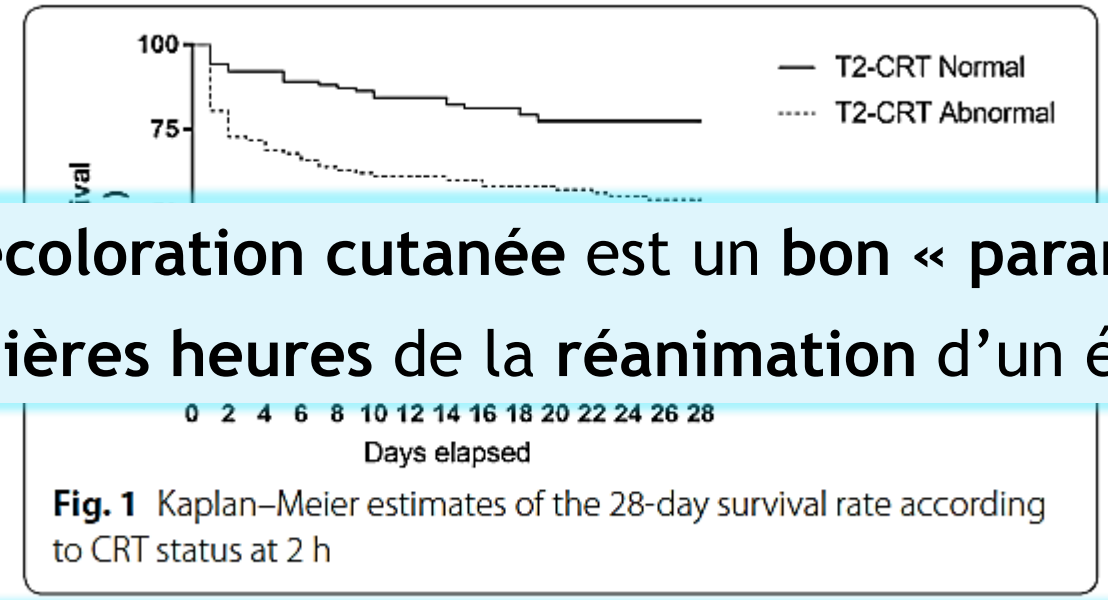


Fig. 1 Kaplan–Meier estimates of the 28-day survival rate according to CRT status at 2 h

Le **temps de recoloration cutanée** est un **bon « paramètre cible »** lors des **premières heures** de la **réanimation** d'un état de **choc**

Indépendamment du bras dans lequel le patient était randomisé :

- **le sous-groupe de patients avec un temps de recoloration cutanée normal à H_2** avait un **taux de mortalité plus bas à J_{28}**
- Ce groupe avait reçu **moins de remplissage** et avait un **score SOFA plus bas** à H_{24}

GUIDELINES

Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021

Laura Evans[1*], Andrew Rhodes[2], Waleed Alhazzani[3], Massimo Antonelli[4], Craig M. Coopersmith[5], Craig French[6], Flávia R. Machado[7], Lauralyn Mcintyre[8], Marlies Ostermann[9], Hallie C. Prescott[10],

Intensive Care Med

8. For adults with septic shock, we **suggest** using capillary refill time to guide resuscitation as an adjunct to other measures of perfusion

Weak recommendation, low-quality evidence

Cibles thérapeutiques: Microcirculation

1. Les marbrures
2. Le temps de recoloration cutané
3. Le Lactate

Hyperlactatémie

↗ production du Lactate

anaérobie

Hypoxie tissulare

aérobie

- Production Endogène
- Inflammation/stress
  - glycolyse accélérée
  - inhibition de la pyruvate deshydrogenase

↘ clairance du lactate

- Dysfonction hépatique/débit
- altération de la fonction rénale

GUIDELINES

Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021

Intensive Care Med (2021) 47:1181–1247

7 For adults with sepsis or septic shock, we **suggest** guiding resuscitation to decrease serum lactate in patients with elevated lactate level, over not using serum lactate.

Phase plus tardive

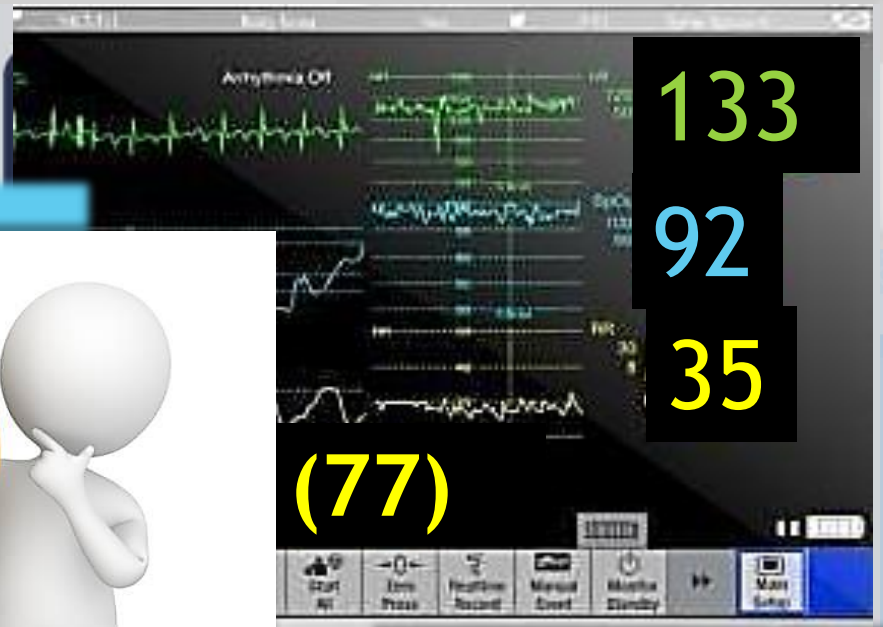
2 Heures après en réanimation

Oligo-anurie

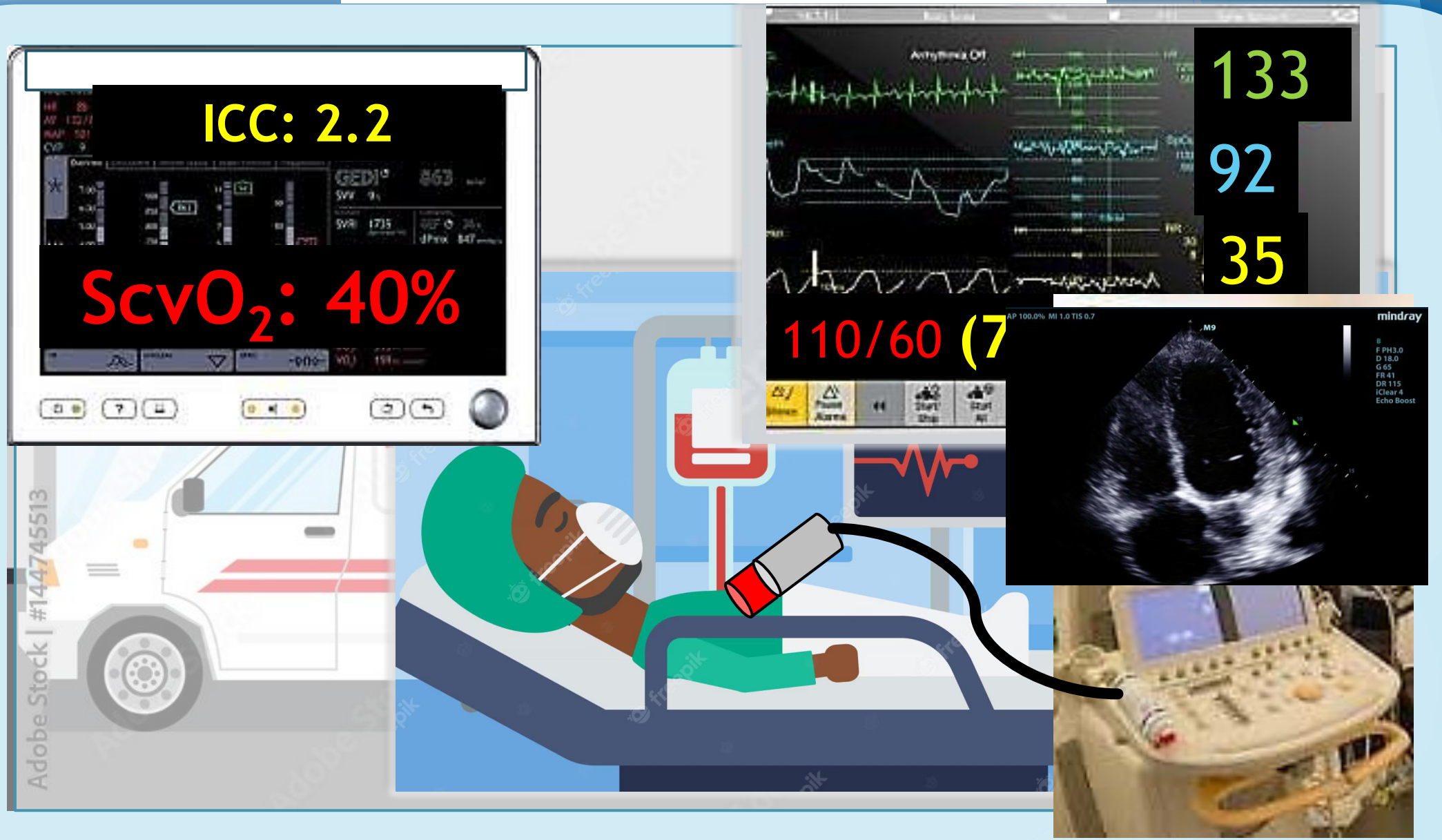
- créatinine = 250 µmol/L
- Na^+ = 140 mmol/L
- K^+ = 4 mmol/L
- ALAT = 2,500 IU/L
- ASAT = 3,500 UI/L
- pH = 7.10
- PaO_2 = 50 m
- $PaCO_2$ = 40
- lactate = 10 mmol/L

Défail

Hyperlactat
tiss



2 Heures après en réanimation

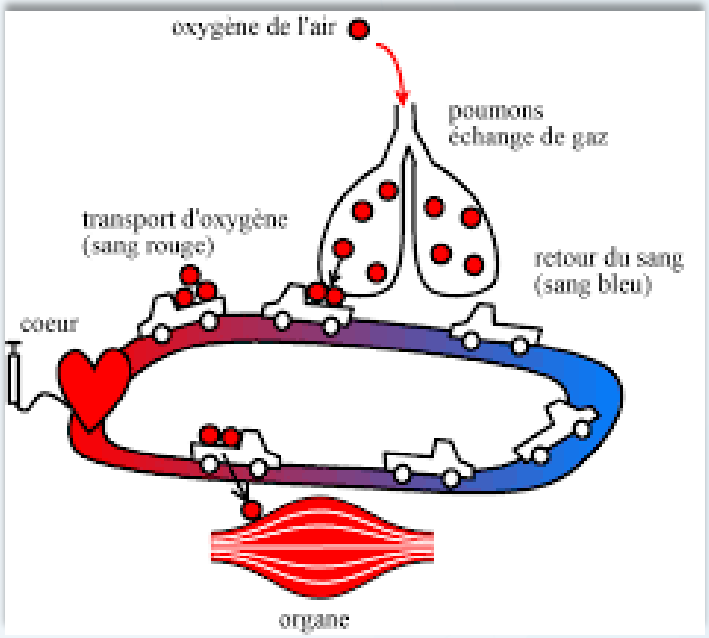


Cibles thérapeutiques: Macrocirculation

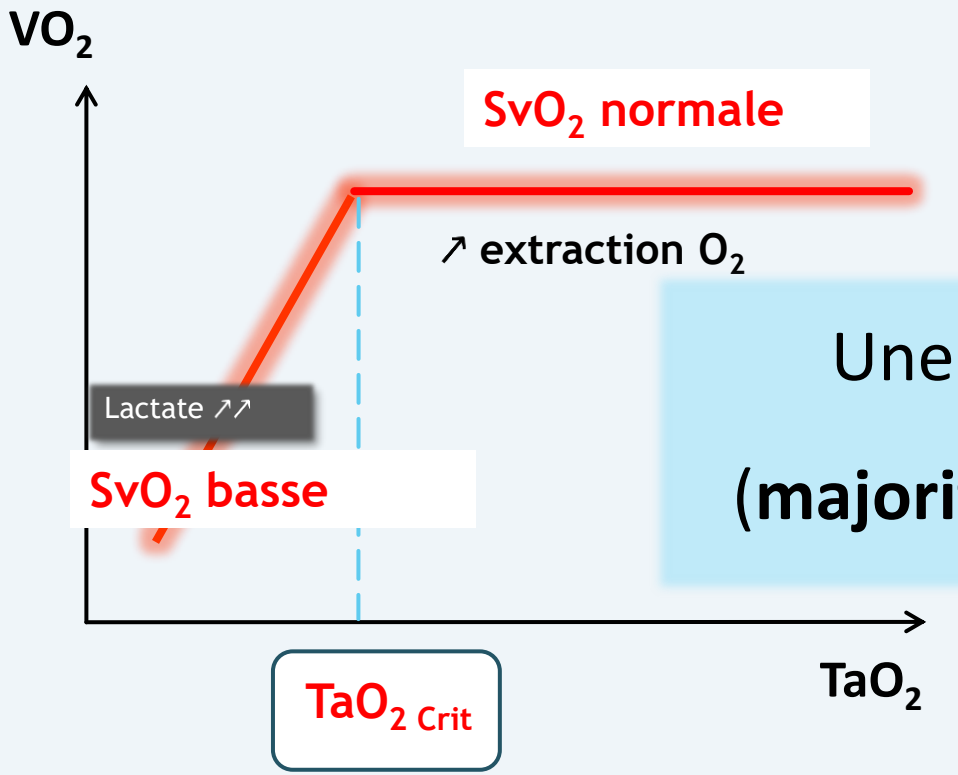
1. La pression artérielle moyenne

2. La $ScvO_2$

→ **Indicateur de la balance TaO_2/VO_2**



$$SvO_2 = SaO_2 - \frac{VO_2}{DC \times Hb \times 13.4}$$



Une **basse** $ScvO_2$ incite à **augmenter le** TaO_2

(**majoritairement** par une **augmentation du DC**)

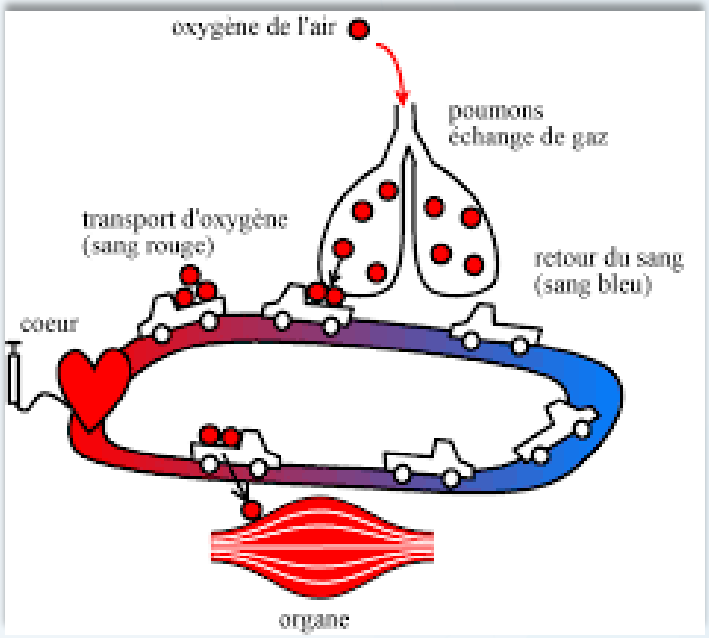
Cibles thérapeutiques: Macrocirculation

1. La pression artérielle moyenne

2. La $ScVO_2$

Indicateur de la balance TaO_2/VO_2

→ **$ScvO_2$** un reflet acceptable de la **SvO_2**



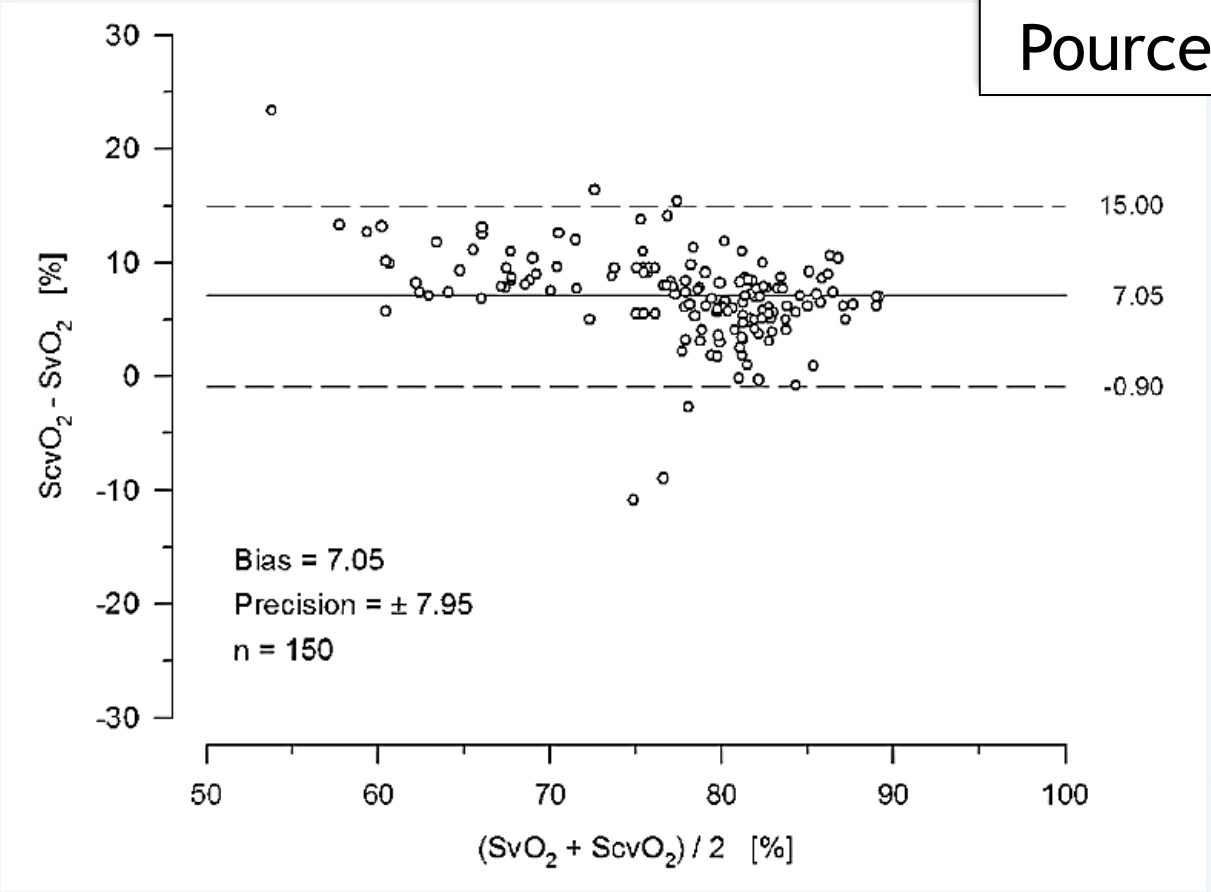
Intensive Care Med (2004) 30:1572–1578

ORIGINAL

Konrad Reinhart
Hans-Jörg Kuhn
Christiane Hartog
Donald L. Bredle

Continuous central venous and pulmonary artery oxygen saturation monitoring in the critically ill

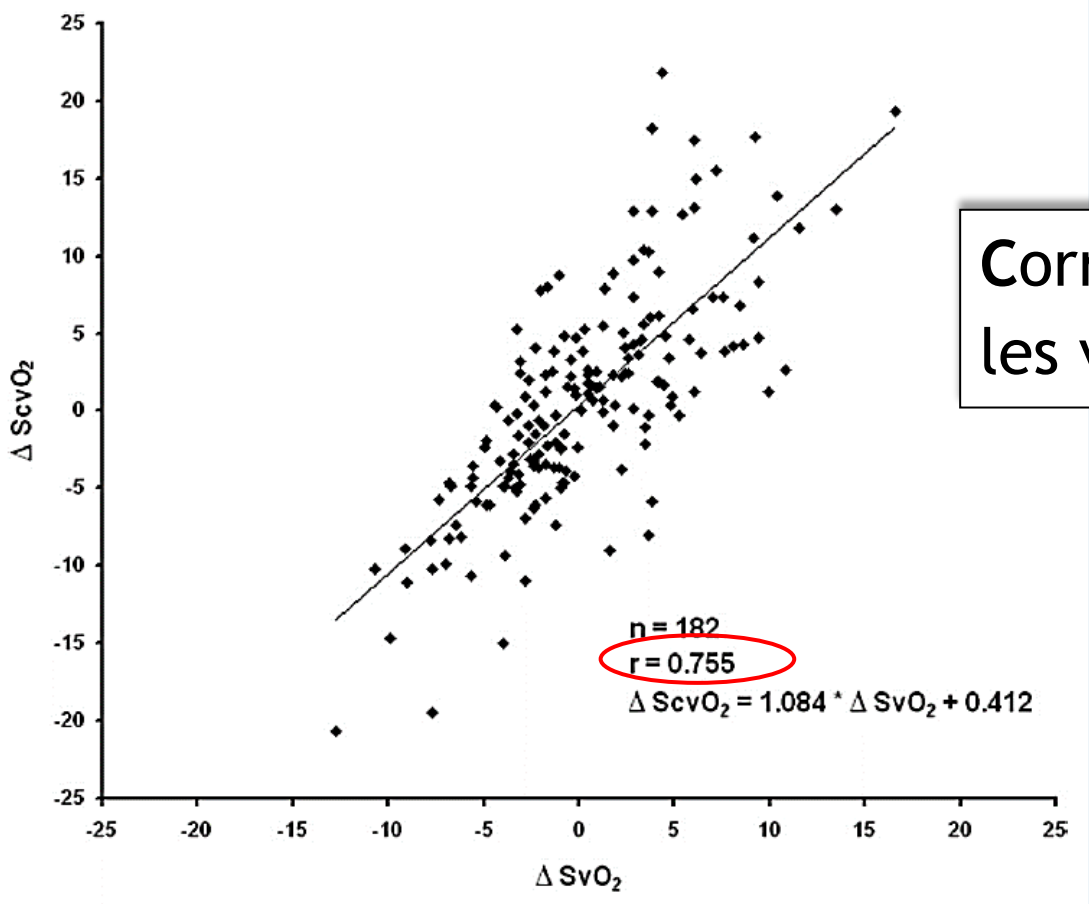
Pourcentage d'erreur= 11%



Trends but Not Individual Values of Central Venous Oxygen Saturation Agree with Mixed Venous Oxygen Saturation during Varying Hemodynamic Conditions

Michael H. Dueck, M.D., D.E.A.A., Markus Klimek, M.D., D.E.A.A.,† Stefan Appenrodt,‡ Christoph Weigand, M.D.,* Ulf Boerner, M.D.§*

Anesthesiology 2005; 103:249–57



Corrélation **satisfaisante** entre les variations des deux **paramètres**

Cibles thérapeutiques: Macrocirculation

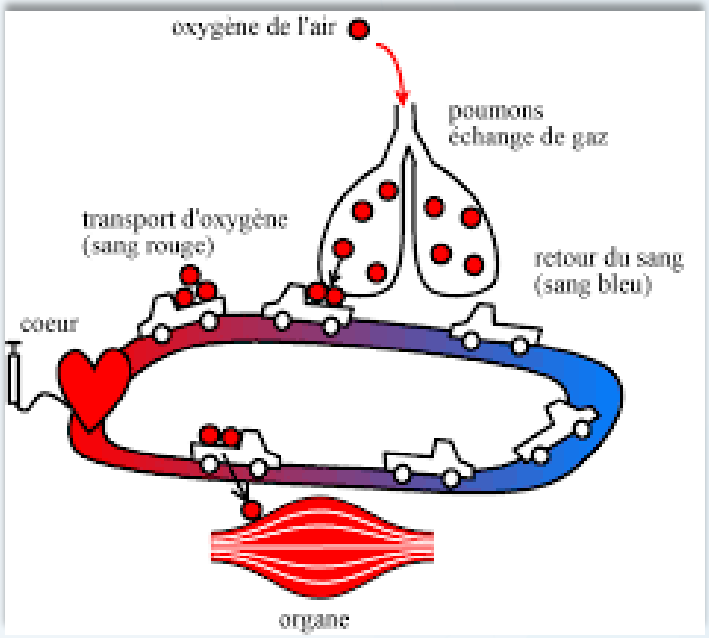
1. La pression artérielle moyenne

2. La $ScVO_2$

Indicateur de la balance TaO_2/VO_2

$ScvO_2$ un reflet acceptable de la SvO_2

Peut être utilisée comme une vraie cible thérapeutique

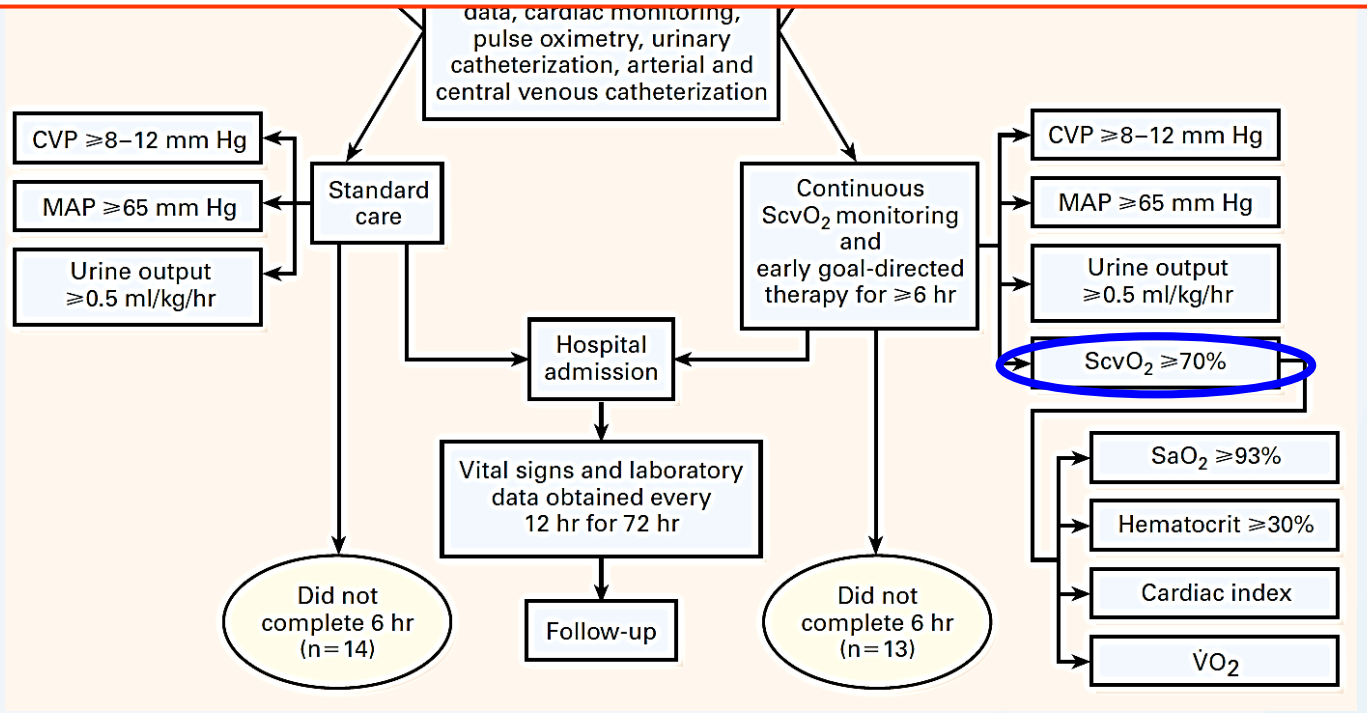


The NEW ENGLAND JOURNAL of MEDICINE

Vol. 345, No. 19 · November 8, 2001

EARLY GOAL-DIRECTED THERAPY IN THE TREATMENT OF SEVERE SEPSIS AND SEPTIC SHOCK

EMANUEL RIVERS, M.D., M.P.H., BRYANT NGUYEN, M.D., SUZANNE HAVSTAD, M.A., JULIE RESSLER, B.S., ALEXANDRIA MUZZIN, B.S., BERNHARD KNOBLICH, M.D., EDWARD PETERSON, PH.D., AND MICHAEL TOMLANOVICH, M.D., FOR THE EARLY GOAL-DIRECTED THERAPY COLLABORATIVE GROUP*



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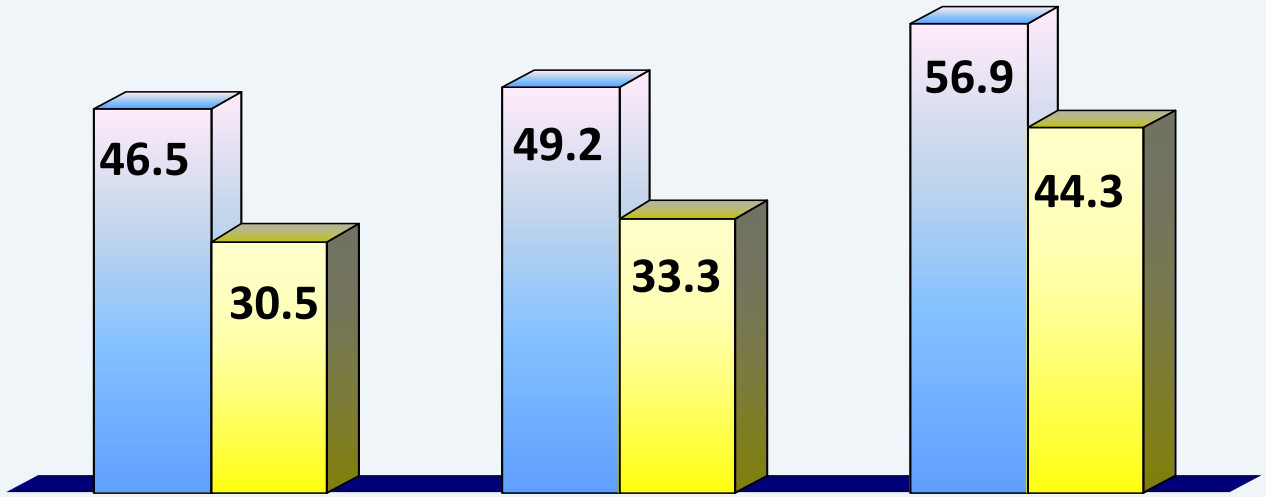
N Engl J Med 2001;345:1368-77

CONTROL

EGDT



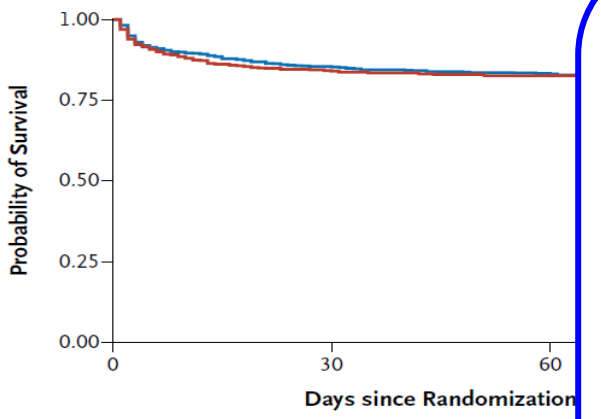
	Mortalité hospitalière (%)	Mortalité J28 (%)	Mortalité J60 (%)
p	0.009	0.01	0.03

Une des rares études qui **en ciblant** la **correction** de la **$ScvO_2$** montre une **nette baisse** de la **mortalité**

Goal-Directed Resuscitation for Patients with Early Septic Shock

The ARISE Investigators and the ANZICS Clinical Trials

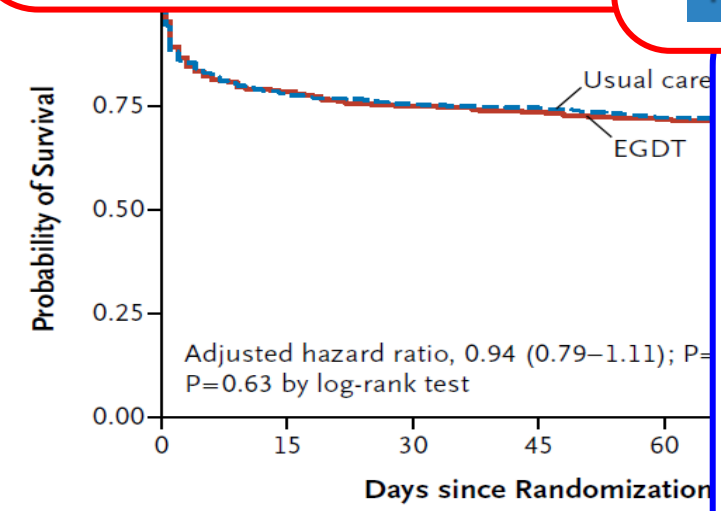
Arise N Engl J Med 2014;371:1496-506



Trial of Early, Goal-Directed Resuscitation for Septic Shock

Paul R. Mouncey, M.Sc., Tiffany M. Osborn, M.D., G. Sarah Power
David A. Harrison, Ph.D., M. Zia Sadique, Ph.D., Richard D. Grieve
Rahi Jahan, B.A., Sheila E. Harvey, Ph.D., Derek Bell, M.D., Julian F. B
Timothy J. Coats, M.D., Mervyn Singer, M.D., J. Duncan Young,
and Kathryn M. Rowan, Ph.D., for the ProMISe Trial Investigat

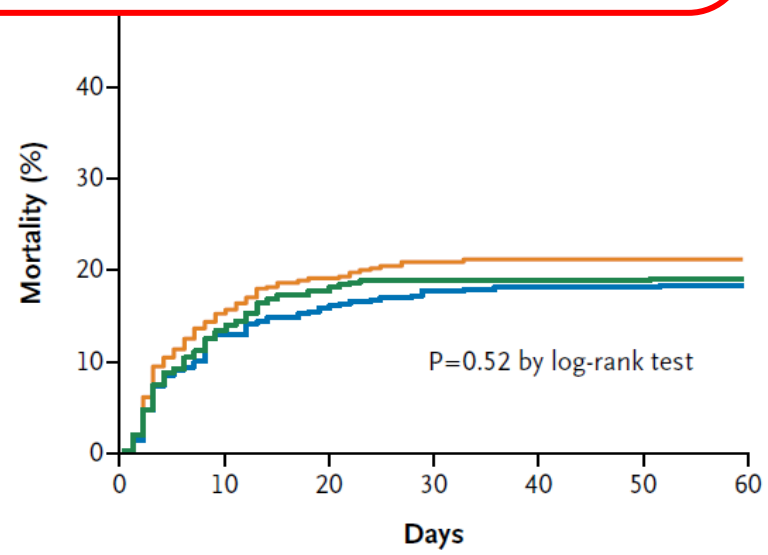
Promise N Engl J Med 2015;372:1301-11.



A Randomized Trial of Protocol-Based Care for Early Septic Shock

The ProCESS Investigators*

Process N Engl J Med 2014;370:1683-93.



Aucune amélioration de la mortalité

Goal-Directed Resuscitation for Patients with Early Septic Shock

The ARISE Investigators and the ANZICS Clinical Trials

Arise N Engl J Med 2014;371:1496-506

Trial of Early, Goal-Directed Resuscitation for Septic Shock

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Promise N Engl J Med 2015;372:1301-11.

A Randomized Trial of Protocol-Based Care for Early Septic Shock

The ProCESS Investigators*

Process N Engl J Med 2014;370:1683-93.

- Les patients étaient **moins sévères**
- La valeur **moyenne** de la **$ScvO_2$** à l'inclusion était de **70 %** ou **plus** (dû à un remplissage substantiel avant l'inclusion)
- Ces études **ne peuvent pas démontrer de bénéfice** à cibler 70 %

Intensive Care Med (2016) 42:1350–1359

CONFERENCE REPORTS AND EXPERT PANEL

Less invasive hemodynamic monitoring in critically ill patients

Jean-Louis Teboul[1*], Bernd Saugel[2], Maurizio Cecconi[3], Daniel De Backer[4], Christoph K. Hofer[5], Xavier Monnet[1], Azriel Perel[6], Michael R. Pinsky[7], Daniel A. Reuter[2], Andrew Rhodes[3], Pierre Squara[8], Jean-Louis Vincent[9] and Thomas W. Scheeren[10]

$ScvO_2$ is used as a surrogate of mixed venous blood oxygen saturation (SvO_2), which reflects in real time the balance between oxygen consumption and oxygen delivery. Hence, a low $ScvO_2$ may indicate insufficient global oxygen delivery in case of shock and incite one to increase it.

Equilibrating SSC guidelines with individualized care

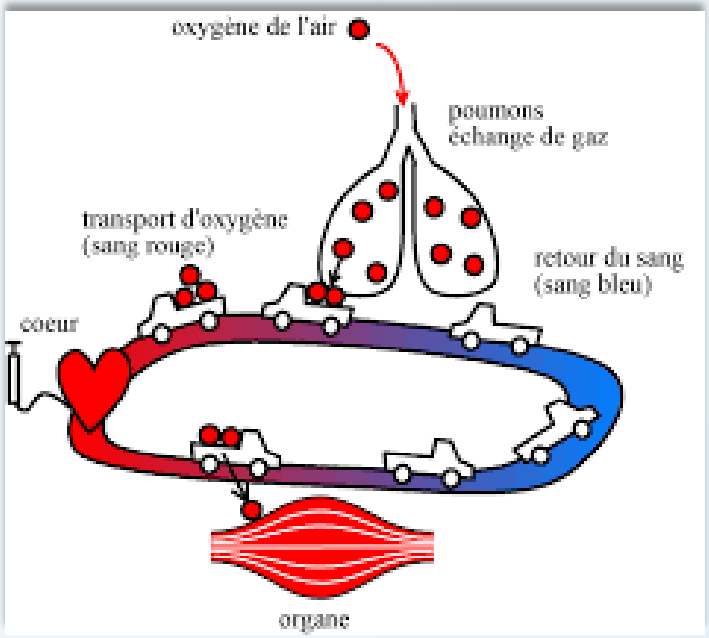
Jean-Louis Vincent[1*], Mervyn Singer[2], Sharon Einav[3], Rui Moreno[4], Julia Wendon[5], Jean-Louis Teboul[6], Jan Bakker[7,8,9,10], Glenn Hernandez[11], Djillali Annane[12], Angélique M. E. de Man[13], Xavier Monnet[14], V. Marco Ranieri[15], Olfa Hamzaoui[16], Jukka Takala[17], Nicole Juffermans[18,19], Jean-Daniel Chiche[20], Sheila N. Myatra[21] and Daniel De Backer[22]

Critical Care (2021) 25:397

→ We recommend **optimizing oxygen delivery**, based on clinical assessment complemented by careful hemodynamic assessment including measurement of **mixed** (or **central**) **venous oxygen saturation (SvO_2)** and even carbon dioxide-derived variables

Cibles thérapeutiques: Macrocirculation

1. La pression artérielle moyenne
2. La $ScvO_2$
3. La différence veino-artérielle en $\mathbf{PCO_2}$



1

Equation de **Fick** appliquée au **CO_2**

$$CvCO_2 - CaCO_2 = \frac{VCO_2}{\text{Débit cardiaque}}$$

2

$$\Delta PCO_2 = k \cdot \Delta CCO_2$$

3

L'équation **simplifiée** de **Fick**

$$\Delta PCO_2 = k. \frac{VCO_2}{\text{Débit cardiaque}}$$

$PcvCO_2$ - $PaCO_2$: marqueur de l'« adéquation » du débit veineux systémique à éliminer le CO_2 produit au niveau périphérique

Hemodynamic management of cardiovascular failure by using PCO_2 venous-arterial difference

Martin Dres · Xavier Monnet · Jean-Louis Teboul

J Clin Monit Comput (2012) 26:367–374

Fick equation $CvCO_2 - CaCO_2 = \frac{VCO_2}{\text{Cardiac Output}}$

In case of **low cardiac output**, the **high PCO_2** gap is related to **CO_2 stagnation**, a phenomenon that results from a **low clearance** of the **CO_2 produced** at the periphery (due to the **slow efferent venous blood flow**).

$PcvCO_2$ - $PaCO_2$: marqueur de l'« adéquation » du débit veineux systémique à éliminer le CO_2 produit au niveau périphérique

- Un ΔPCO_2 élevé suggère qu'une augmentation du **DC** peut être raisonnablement **envisagée**

- Un ΔPCO_2 élevé suggère qu'une augmentation du **DC** peut être raisonnablement **envisagée**

- Un **ΔPCO_2 normal** (≤ 6 mmHg) suggère qu'une augmentation du **DC** n'est **pas** l'option thérapeutique **prioritaire**

REVIEW Open Access

Effective hemodynamic monitoring

Michael R. Pinsky[1*], Maurizio Cecconi[2,3], Michelle S. Chew[4], Daniel De Backer[5], Ivor Douglas[6], Mark Edwards[7], Olfa Hamzaoui[8], Glenn Hernandez[9], Greg Martin[10], Xavier Monnet[11], Bernd Saugel[12], Thomas W. L. Scheeren[13], Jean-Louis Teboul[14] and Jean-Louis Vincent[15]

Critical Care (2022) 26:294

In some forms of distributive shock, $ScvO_2$ can be > 70% despite ongoing CVI due to impairment of oxygen extraction [84, 86]. A v-aPCO_2 > 6 mmHg (or > 0.8 kPa) identifies patients for whom an increase in CO may be beneficial in sustaining organ perfusion despite a SvO_2 > 70%.

Equilibrating SSC guidelines with individualized care

Jean-Louis Vincent[1*], Mervyn Singer[2], Sharon Einav[3], Rui Moreno[4], Julia Wendon[5], Jean-Louis Teboul[6], Jan Bakker[7,8,9,10], Glenn Hernandez[11], Djillali Annane[12], Angélique M. E. de Man[13], Xavier Monnet[14], V. Marco Ranieri[15], Olfa Hamzaoui[16], Jukka Takala[17], Nicole Juffermans[18,19], Jean-Daniel Chiche[20], Sheila N. Myatra[21] and Daniel De Backer[22]

Critical Care (2021) 25:397

- We recommend **optimizing oxygen delivery**, based on clinical assessment complemented by careful hemodynamic assessment including measurement of mixed (or central) venous oxygen saturation (SvO_2)

Que retenir ?

A la phase toute intiale

- La **pression artérielle moyenne** est une **cible thérapeutique** lors de la prise en charge du choc septique
- La **valeur cible** doit être **individualisée** en fonction du terrain et des pathologies associées : **hypertension chronique et PVC élevée**
- **Les marbrures et le temps de recolaration cutanée** sont des **vrais outils** pour une évaluation simple de **la microciculation** et peuvent être une **vraie cible thérapeutique**

Que retenir ?

A la phase tardive

- Le **débit cardiaque** n'est **pas** une **cible th**
  indicateurs **de l'adéquation** entre **le trar**
  êtr

Merci!

débit cardiaque peut être envisagée.