

Cas clinique interactif: « une pneumonie urinaire »

Enseignement national DES Maladies Infectieuses

1er avril 2021

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Médecine Intensive Réanimation – CHU DIJON

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M. M., 73 ans, adressé en MIR par les urgences pour détresse respiratoire et instabilité tensionnelle

- Antécédents:

- Diabète de type 2
- HTA
- Insuffisance rénale chronique (néphroangiosclérose: créatininémie habituelle à 150 umol/L)
- Prostatectomie

- Traitements habituels:

- Amlodipine
- Furosemide
- Repaglinide

L'histoire commence 5 jours plus tôt...

- Dysurie, constipation inhabituelle, vomissements, « mal au dos »...
- Apparition secondaire d'un essoufflement
- *Température non prise*
- A la prise en charge au SAU:
 - Fc = 100 bpm
 - TA = 120/67 mmHg
 - FR = 33/min
 - T°=38.6°C
 - SpO2 = 93% sous 2 L/min aux lunettes

Examen clinique initial...

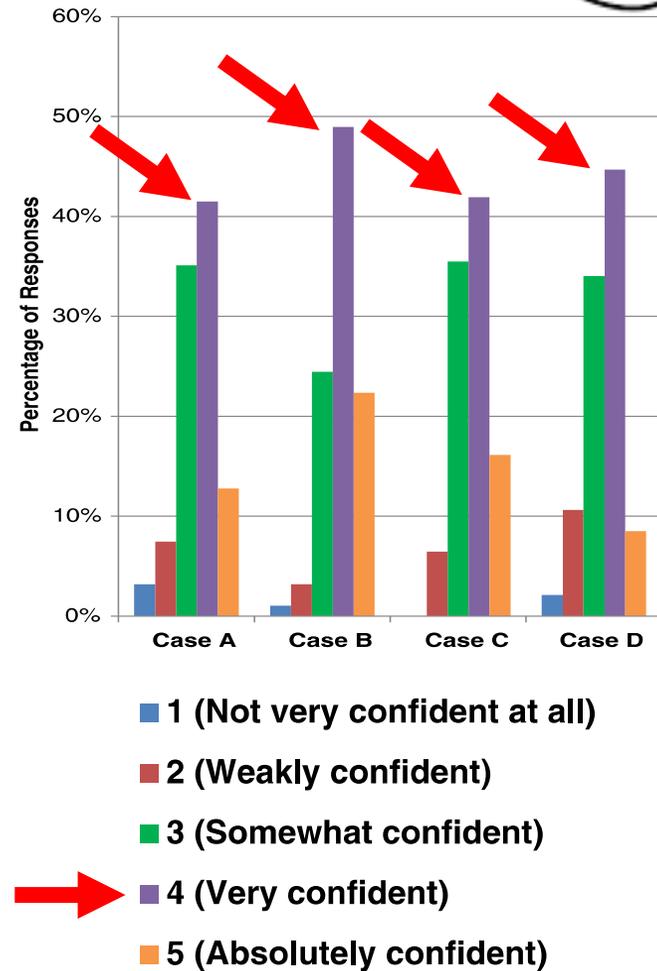
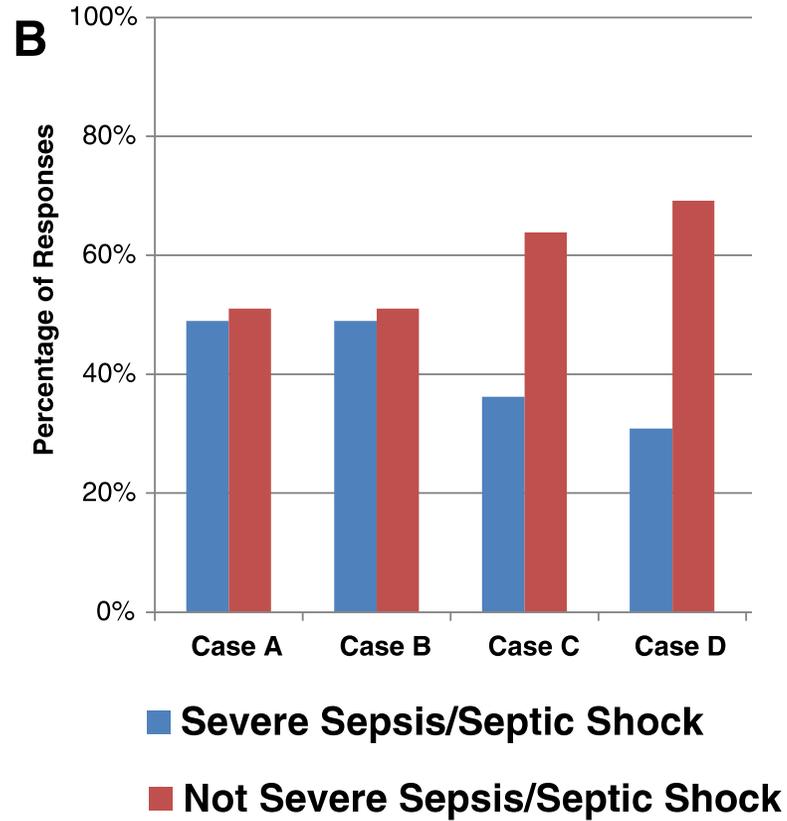
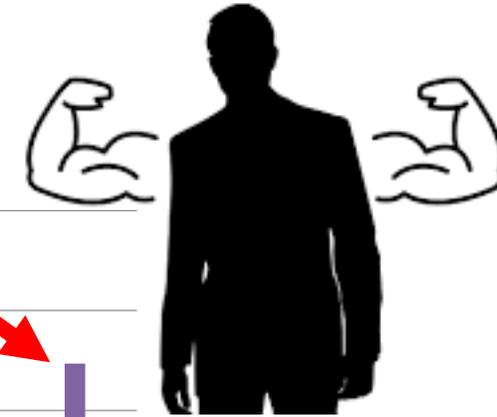
- CGS 15
- Dyspnée et polypnée: ne finit pas ses phrases
- Pas de signe de choc
- Abdomen souple et sensible
- Globe vésical (bladderScan: 700 mL)
- Champs pulmonaires libres mais diminution MV à la base gauche

Q1: A ce stade de la prise en charge, comment pourriez vous décrire le patient?

- A. Il existe un sepsis
- B. Il existe un syndrome de réponse inflammatoire systémique donc un sepsis
- C. Le patient présente une infection probable mais sans signe de gravité apparent
- D. Un remplissage vasculaire doit être débuté sans délai car le patient est tachycarde
- E. Une antibiothérapie adaptée doit être débutée sans délai après prélèvement des hémocultures et d'un ECBU



Diagnosing sepsis is **subjective** and highly variable: a survey of intensivists using case vignettes



Special Communication | CARING FOR THE CRITICALLY ILL PATIENT

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)



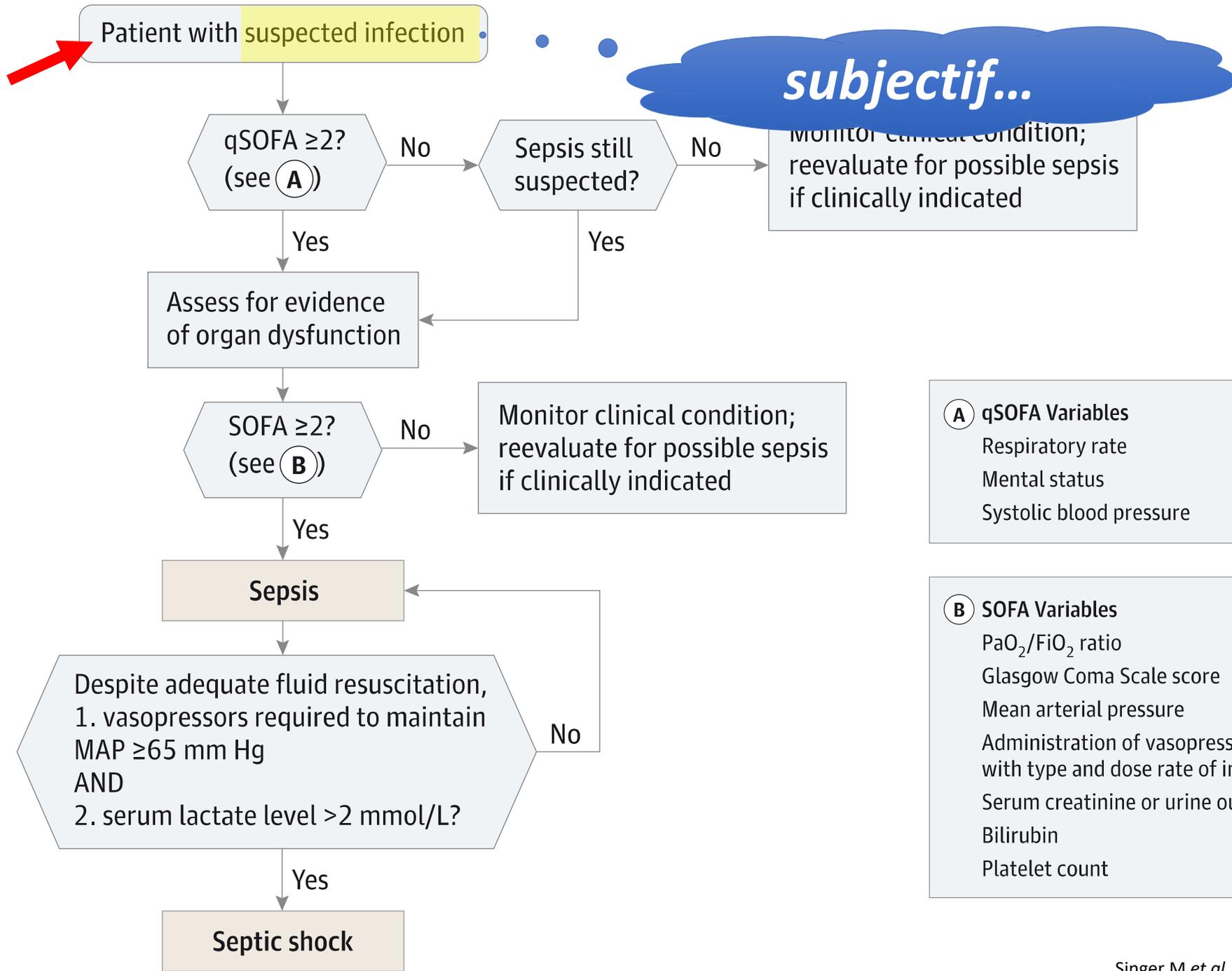
Box 4. qSOFA (Quick SOFA) Criteria

Respiratory rate ≥ 22 /min

Altered mentation

Systolic blood pressure ≤ 100 mm Hg





subjectif...

- A** qSOFA Variables
- Respiratory rate
 - Mental status
 - Systolic blood pressure

- B** SOFA Variables
- PaO₂/FiO₂ ratio
 - Glasgow Coma Scale score
 - Mean arterial pressure
 - Administration of vasopressors with type and dose rate of infusion
 - Serum creatinine or urine output
 - Bilirubin
 - Platelet count

Le premier bilan biologique vous parvient...

- Hb = 13.4 g/dL
- GB = 1600/mm³
 - PNN = 780/mm³
 - PNB = 0 /mm³
 - PNE = 0 /mm³
 - Lc = 360/mm³
 - Monocytes = 100/mm³
- Plaquettes = 133,000/mm³

Na = 139 Meq/L

K = 4.3 Meq/L

Cl = 104 Meq/L

HCO₃ = 18 Meq/L

Glycémie = 12.5 mmol/L

Urée = 27 mmol/L

Créatininémie = 403 micromol/L

Des gaz du sang et une RP sont également réalisés...

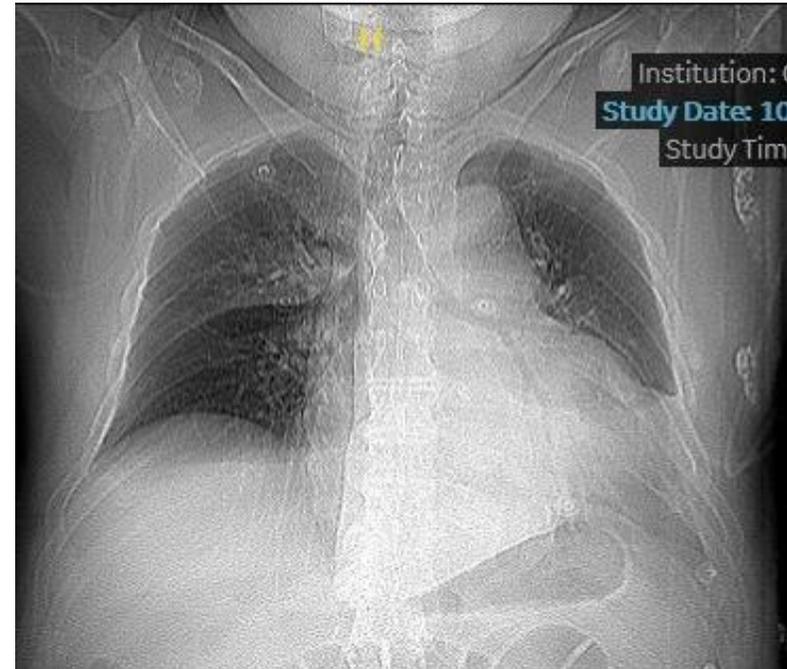
pH= 7.44

PaO₂ = 61 mmHg

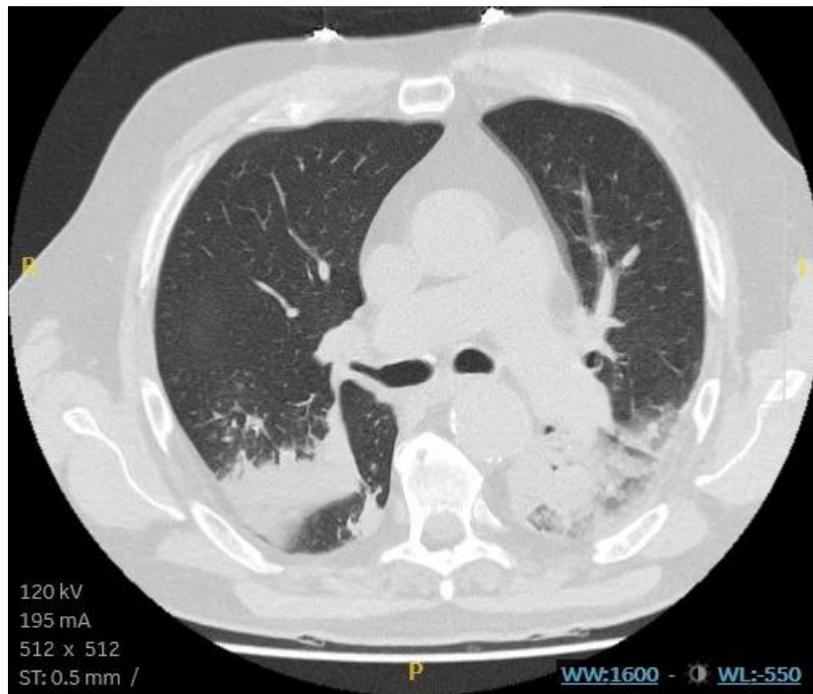
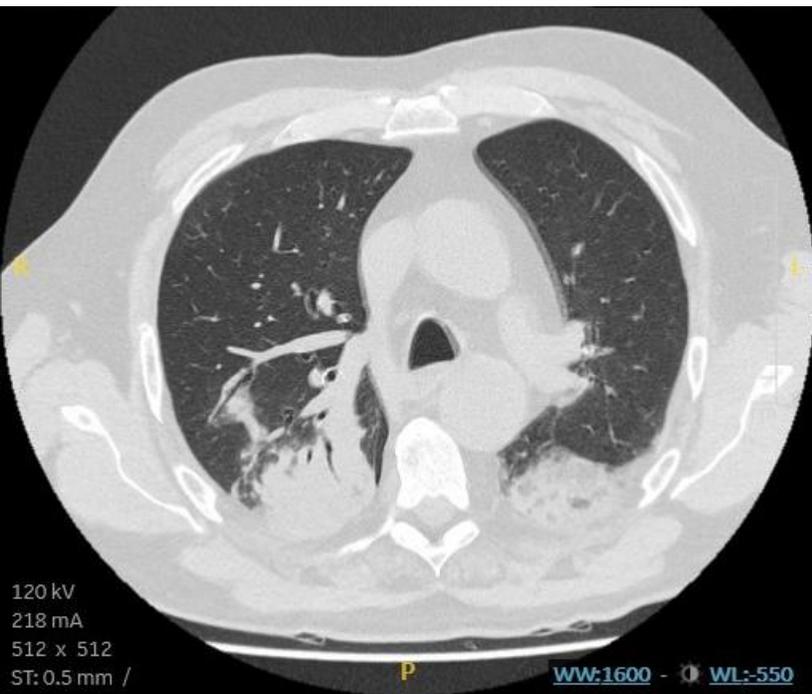
PaCO₂ = 23 mmHg

HCO₃ = 17 Meq/L

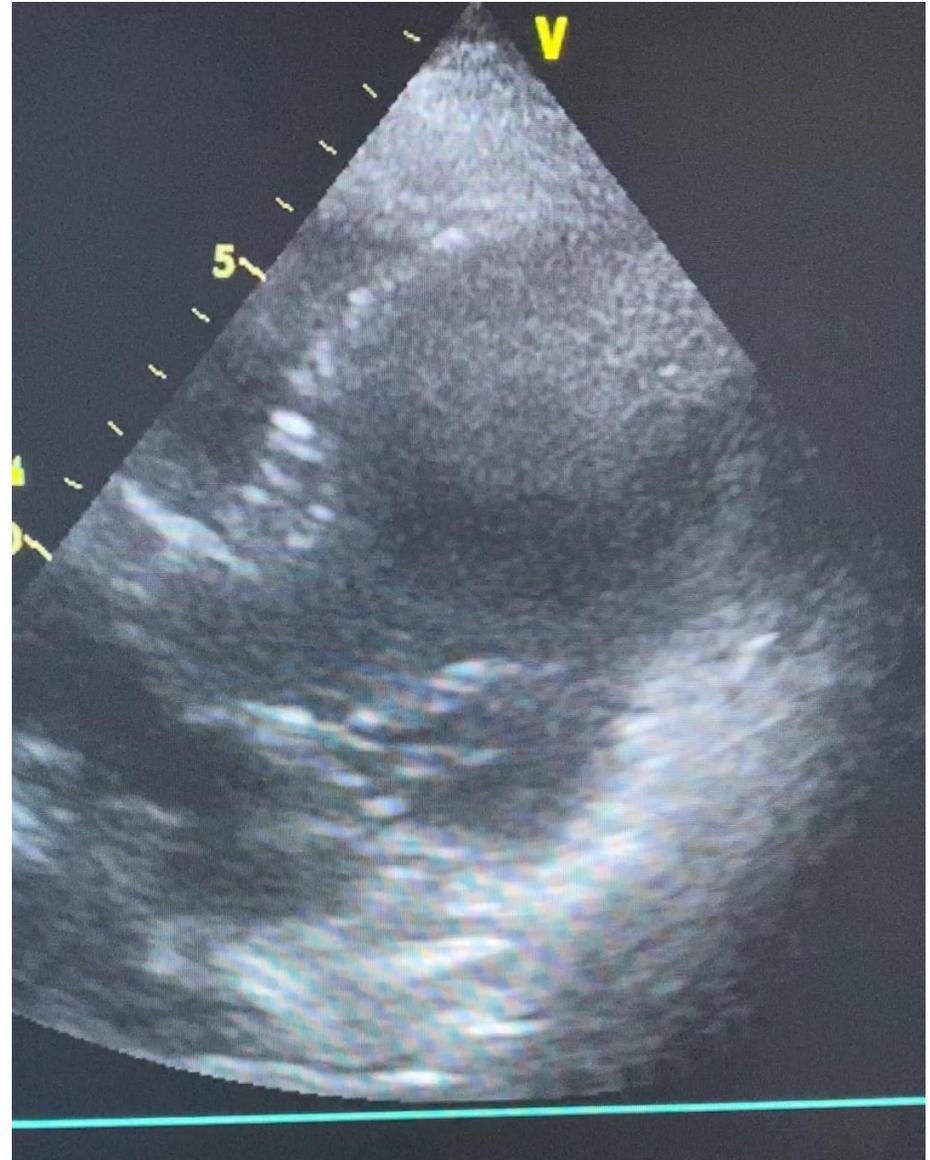
SpO₂ = 92%



Ainsi qu'un scanner thoracique...



Et une
ETT...



Q2. Avec ces nouveaux éléments, allez vous revoir votre jugement concernant la gravité du patient d'après les recommandations actuelles?

- A. Oui car il existe des critères de gravité
- B. Oui car il existe des critères de sepsis
- C. Non car il n'existe pas d'élément de gravité
- D. Oui car il existe une neutropénie
- E. Non car l'insuffisance rénale est fonctionnelle

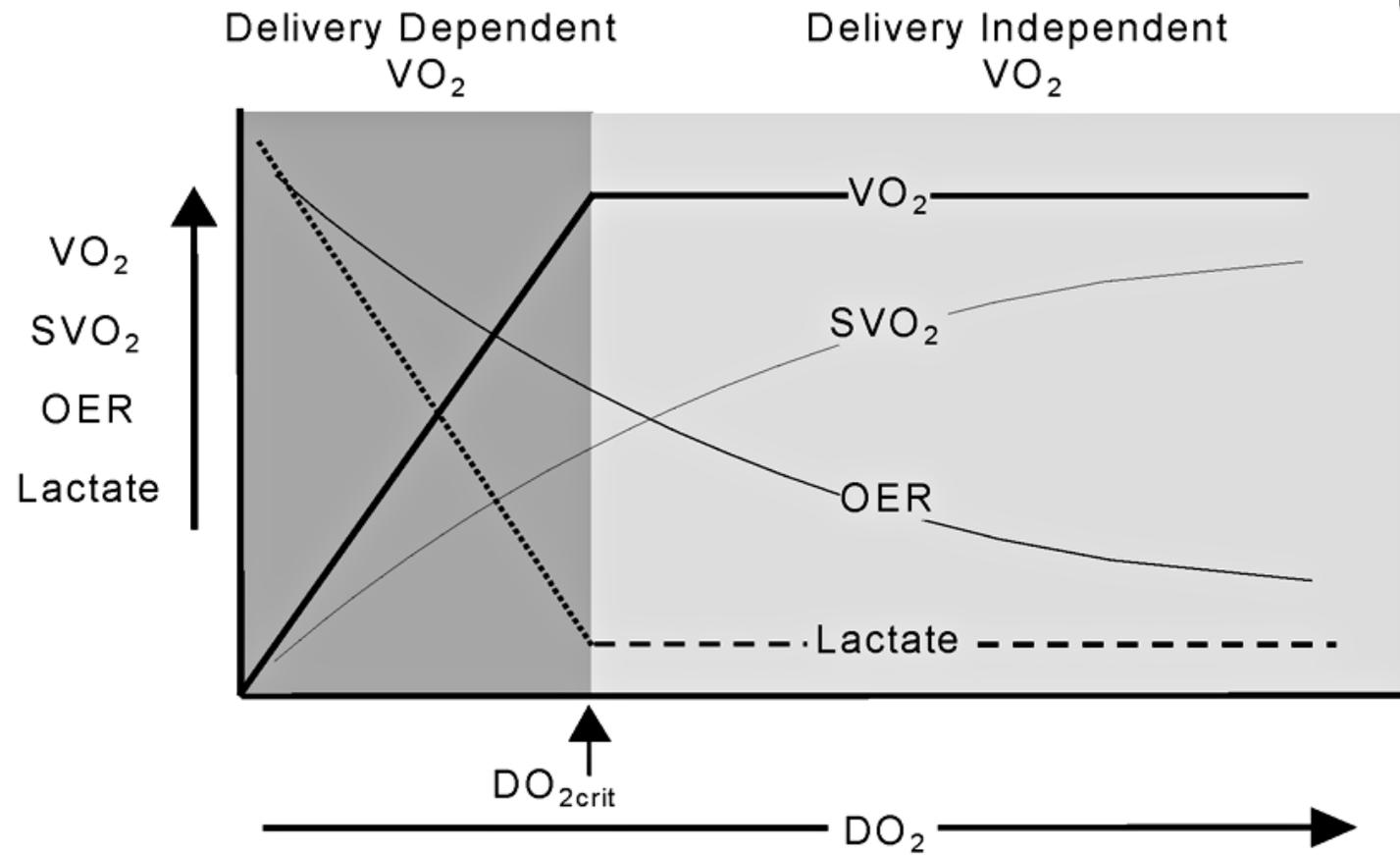
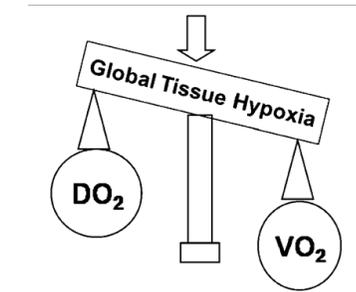
Score SOFA

System	Score				
	0	1	2	3	4
Respiration					
Pao ₂ /Fio ₂ , mm Hg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory support
Coagulation					
Platelets, ×10 ³ /μL	≥150	<150	<100	<50	<20
Liver					
Bilirubin, mg/dL (μmol/L)	<1.2 (20)	1.2-1.9 (20-32)	2.0-5.9 (33-101)	6.0-11.9 (102-204)	>12.0 (204)
Cardiovascular	MAP ≥70 mm Hg	MAP <70 mm Hg	Dopamine <5 or dobutamine (any dose) ^b	Dopamine 5.1-15 or epinephrine ≤0.1 or norepinephrine ≤0.1 ^b	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1 ^b
Central nervous system					
Glasgow Coma Scale score ^c	15	13-14	10-12	6-9	<6
Renal					
Creatinine, mg/dL (μmol/L)	<1.2 (110)	1.2-1.9 (110-170)	2.0-3.4 (171-299)	3.5-4.9 (300-440)	>5.0 (440)
Urine output, mL/d				<500	<200

6 points

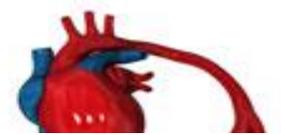
Q3. Vous considérez désormais que le patient présente un sepsis. Qu'allez vous doser en urgence? (QROC)

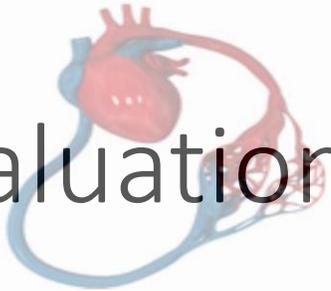
Insuffisance circulatoire **aiguë**: *inadéquation* VO_2/DO_2



$$DO_2 = Hb \times 1.36 \times SaO_2 \times Qc$$

I. NORMAL

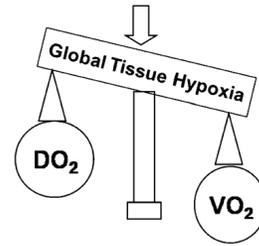




Evaluation hémodynamique

MACROCIRCULATION

- Pression artérielle
- Fréquence cardiaque
- Débit cardiaque
- *Pression veineuse centrale*



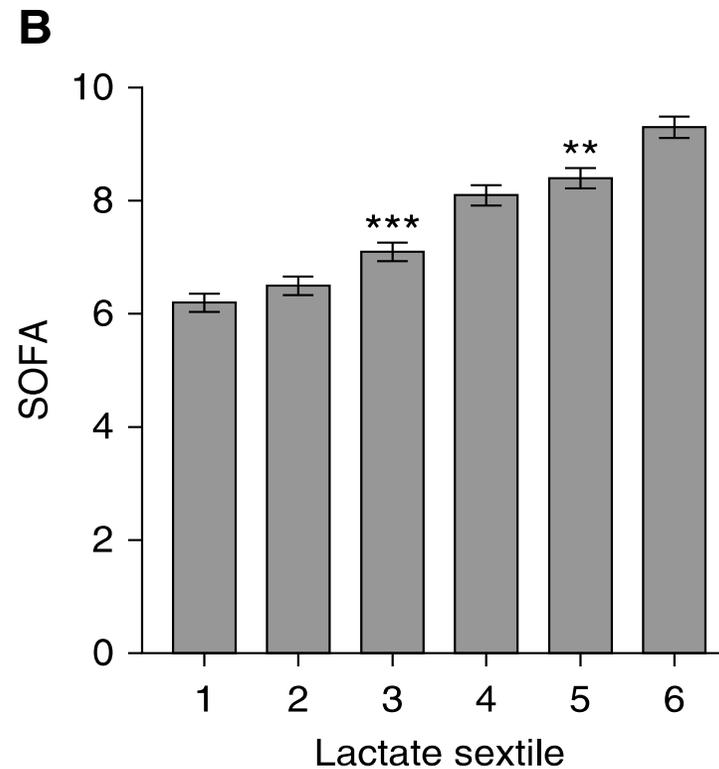
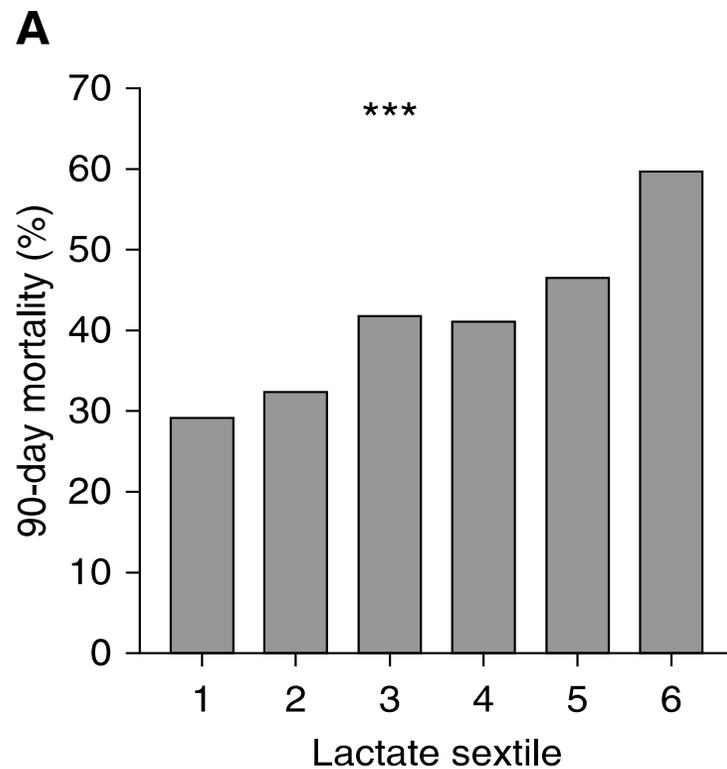
PERFUSION TISSULAIRE MICROCIRCULATION

- Téguments
- Diurèse
- **Lactate**
- *SvcO₂*



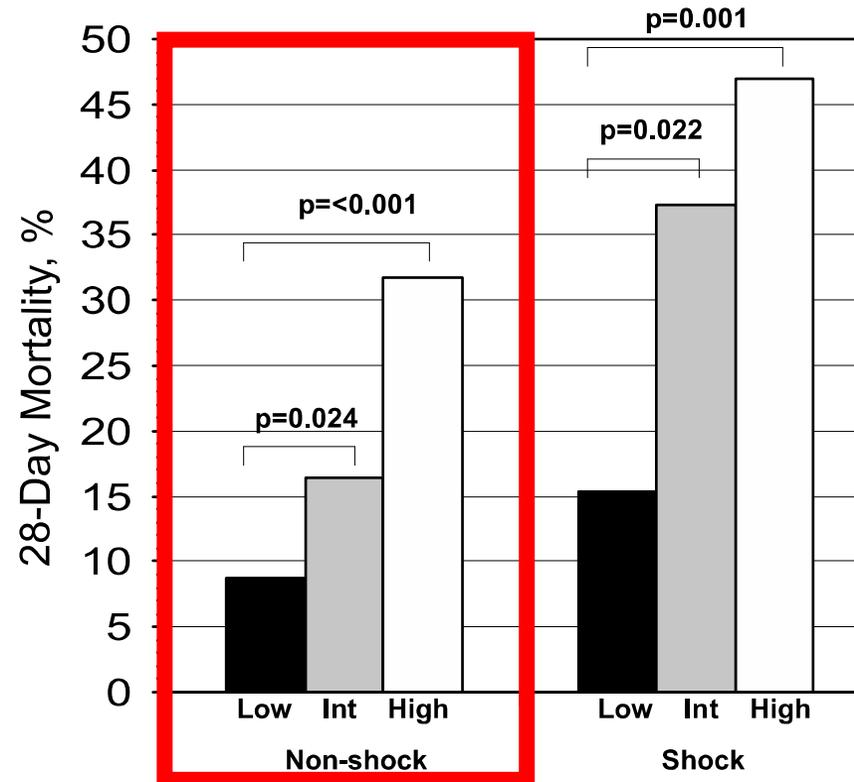
***Discordances et
manque de cohérence
dans le sepsis...***

Hyperlactatémie et **sévérité** clinique

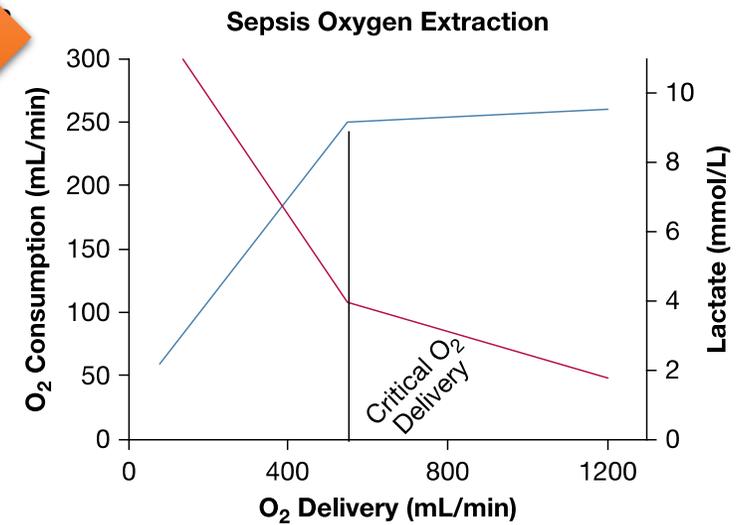
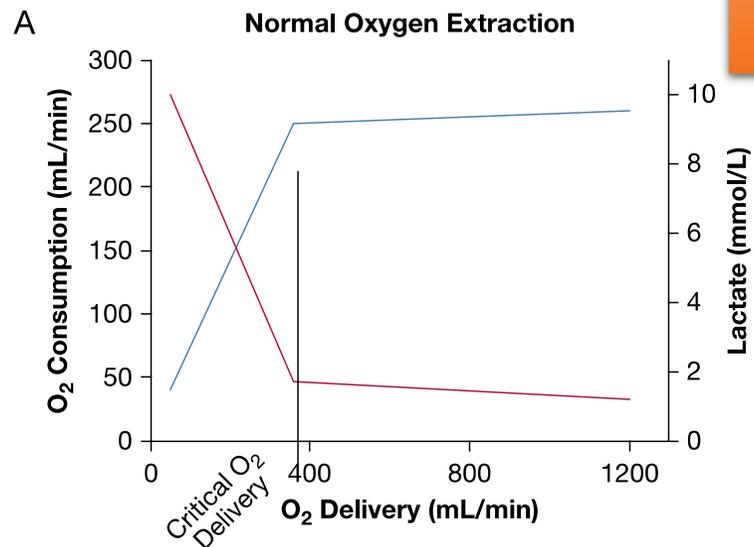
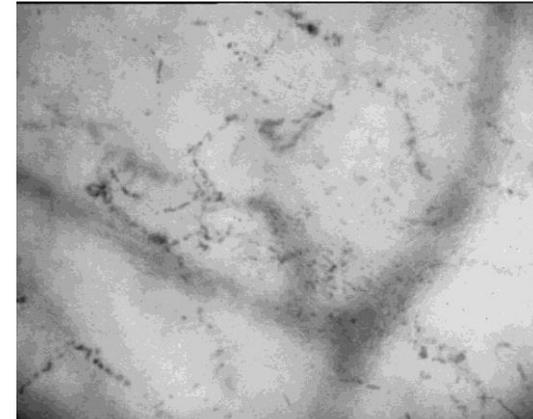
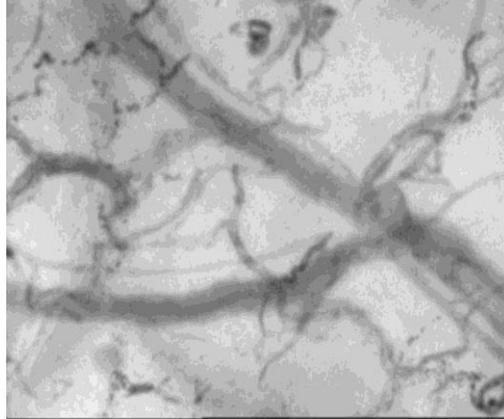
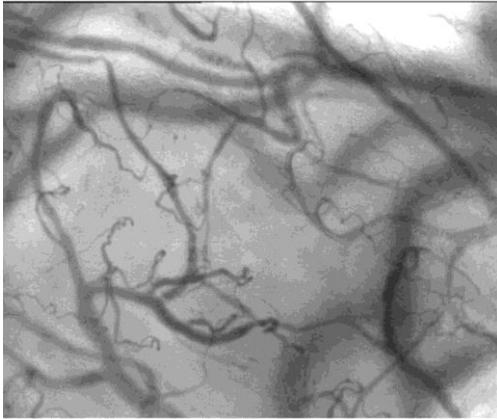


Lactate elevation ...risk stratification

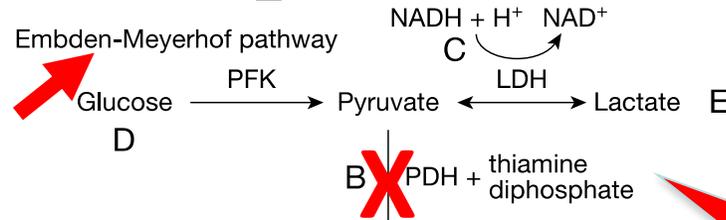
Même si tension conservée!!!



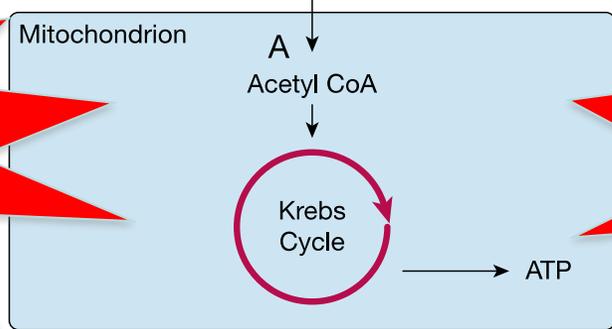
Baisse extraction O_2 ...



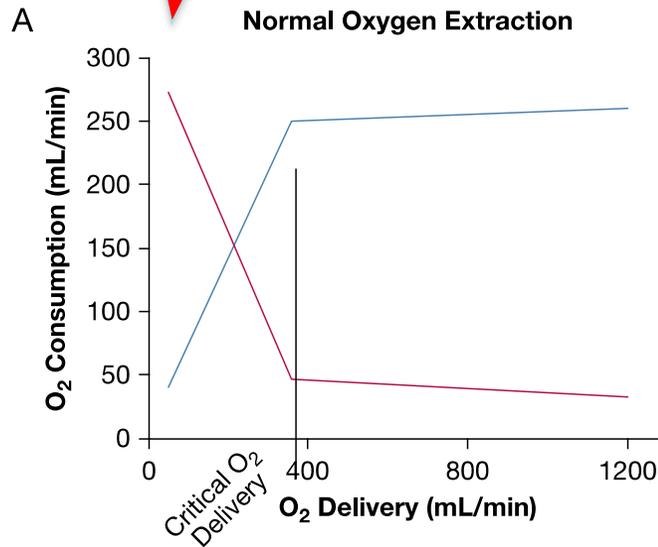
Baisse extraction O₂...



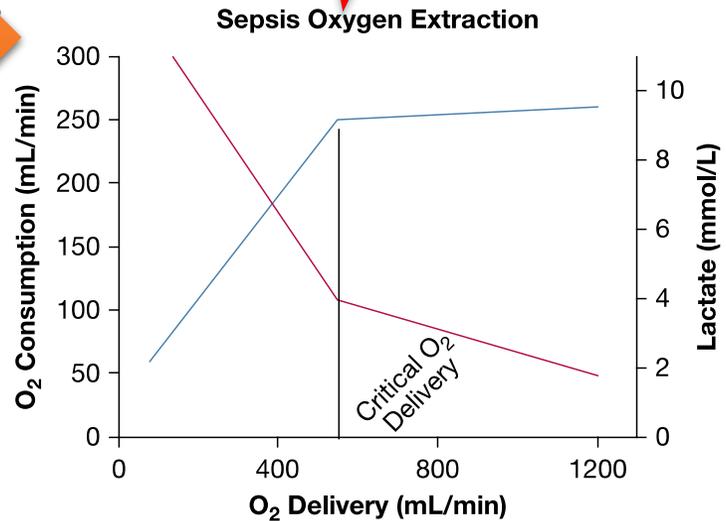
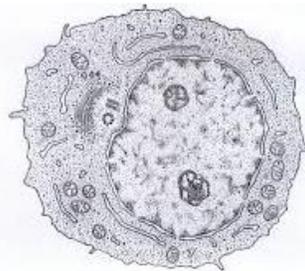
Glycolyse
+++



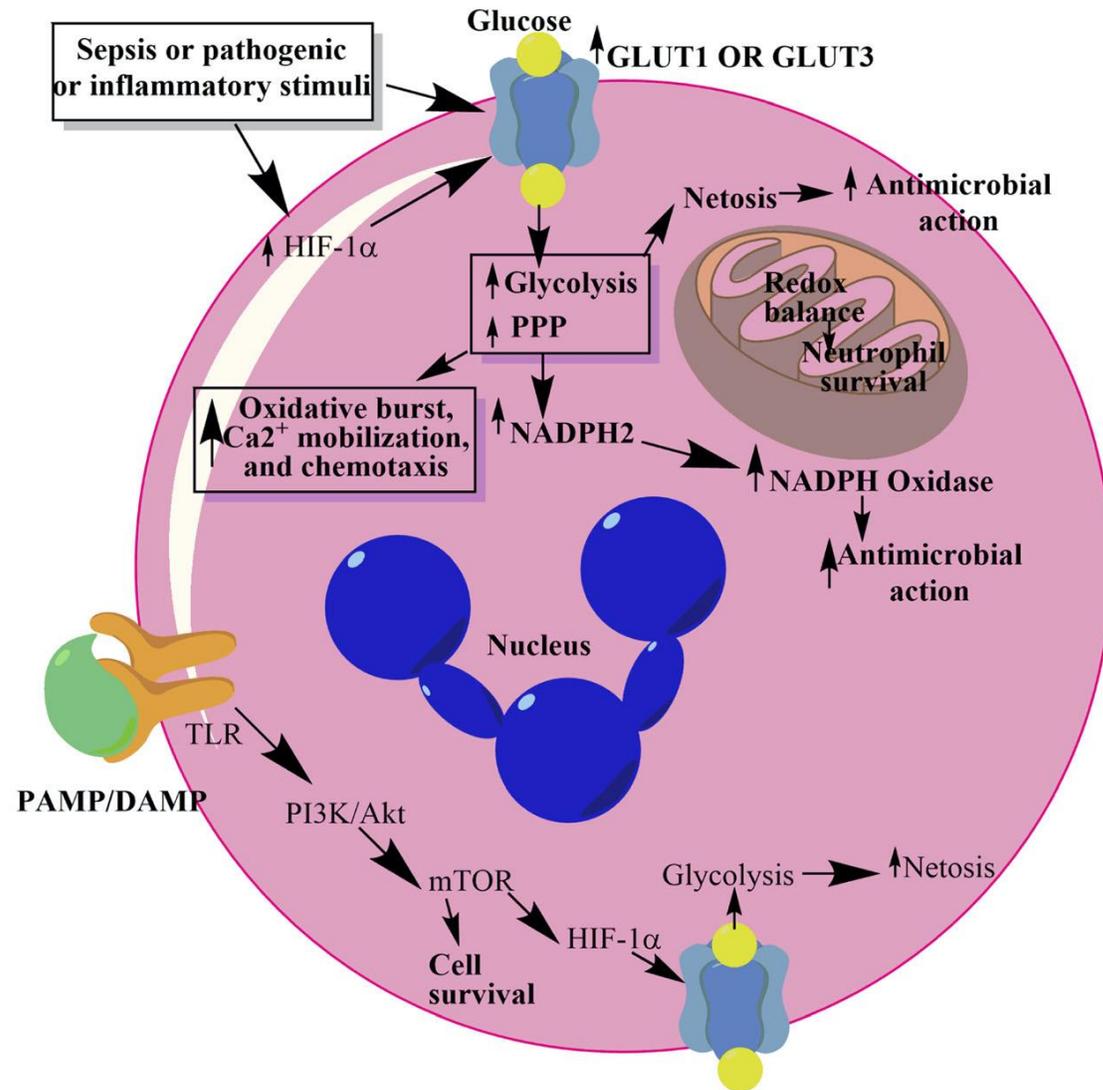
Warburg effect



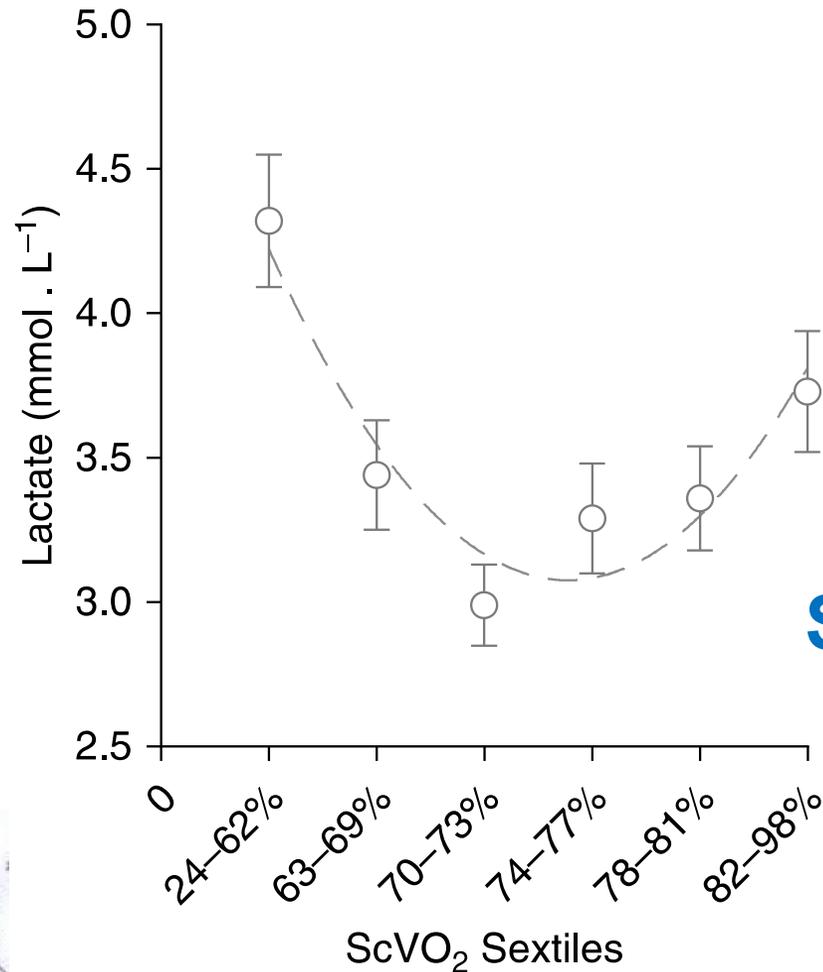
SEPSIS →



Adaptation métabolique des cellules

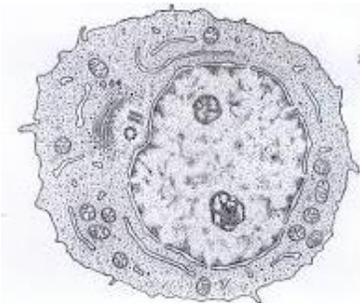


Lactatémie et ScvO₂

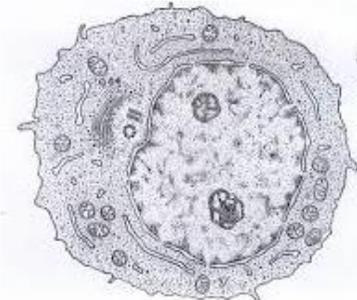
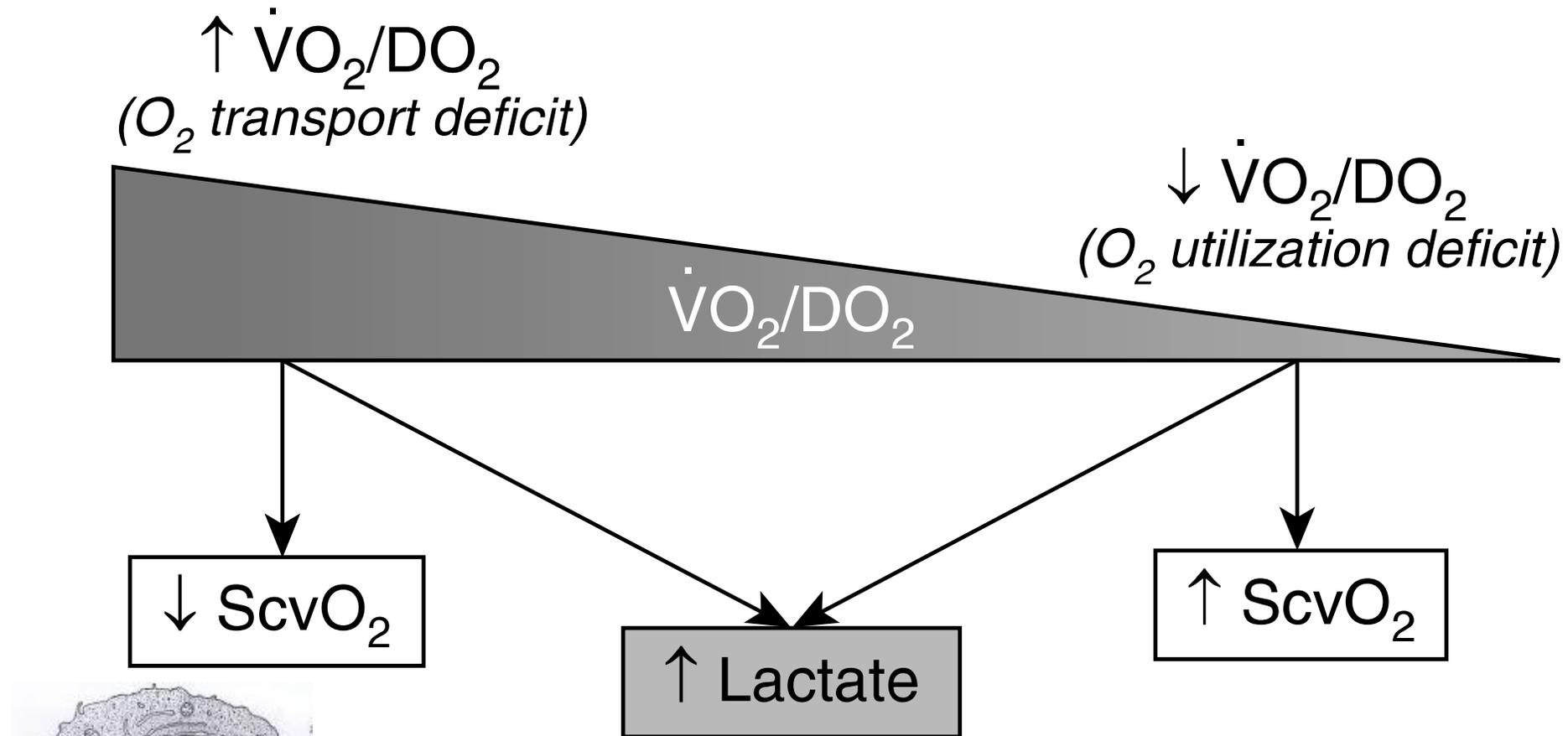


Si
extraction
O₂ OK!!!

$$SvO_2 \approx SaO_2 - VO_2 / (Qc \times Hb)$$



Lactatémie et ScvO₂



Q4. La lactatémie est à 5.5 mmol/L.
Quelle(s) doit(vent) désormais être votre(vos)
priorité(s) dans l'heure?

- A. Drainage des urines
- B. Antibiothérapie adaptée
- C. Remplissage vasculaire par soluté colloïde
- D. Remplissage vasculaire par soluté cristalloïde
- E. Mise sous noradrénaline



The Surviving Sepsis Campaign Bundle: 2018 update

- Measure lactate level. Remeasure if initial lactate is >2 mmol/L.
- Obtain blood cultures prior to administration of antibiotics.
- Administer broad-spectrum antibiotics.
- Begin rapid administration of 30ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.
- Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mm Hg.



**“Time zero” or “time of presentation” is defined as the time of triage in the Emergency Department or, if presenting from another care venue, from the earliest chart and documentation of the clinical elements of sepsis (formerly severe sepsis) or septic shock ascertainment.*

Fig. 1 Hour-1 Surviving Sepsis Campaign Bundle of Care

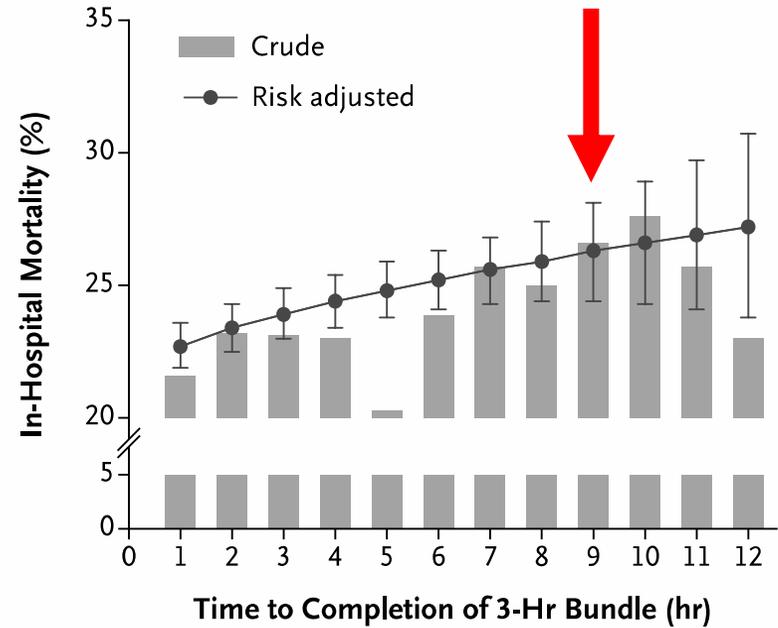
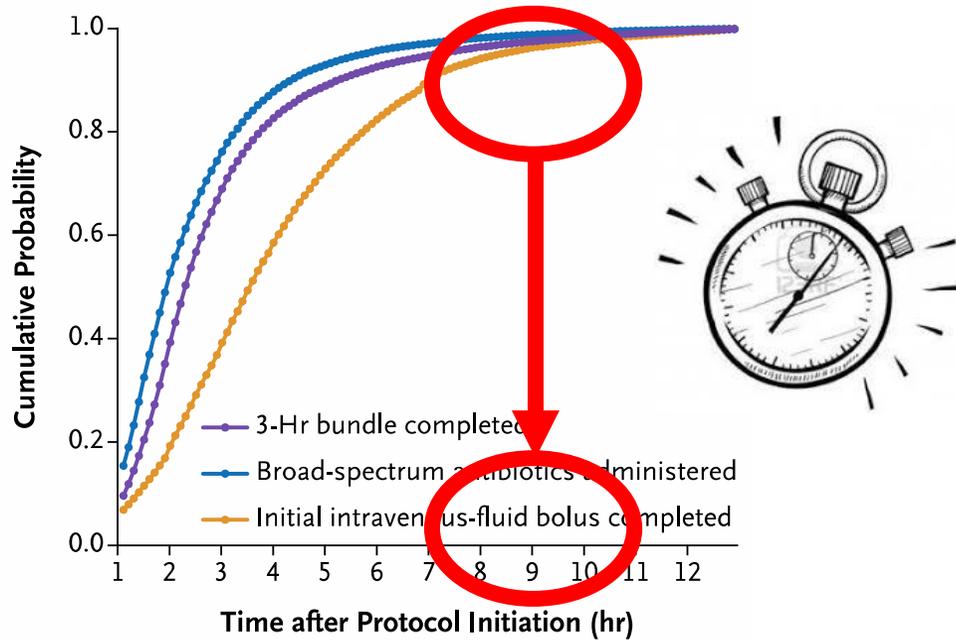
**Dans
l’heure!!!**

ORIGINAL ARTICLE

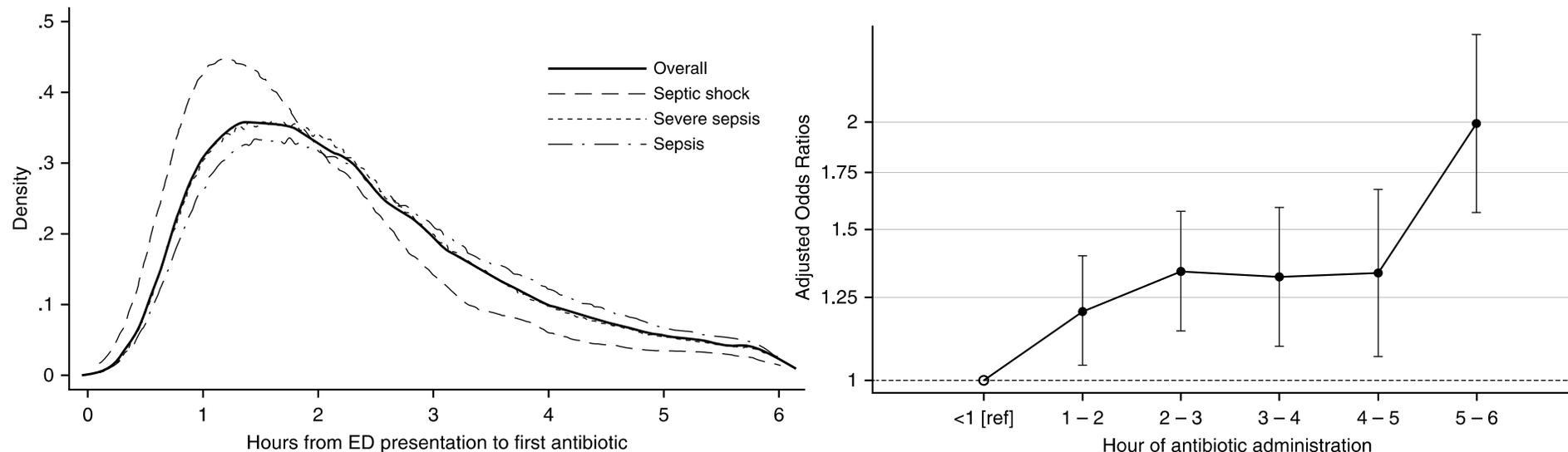
3-Hrs Bundle:

- Broad spectrum ATB
- Blood culture collection
- Lactate measurement

Time to Treatment and Mortality during Mandated Emergency Care for Sepsis



The Timing of Early Antibiotics and Hospital Mortality in Sepsis



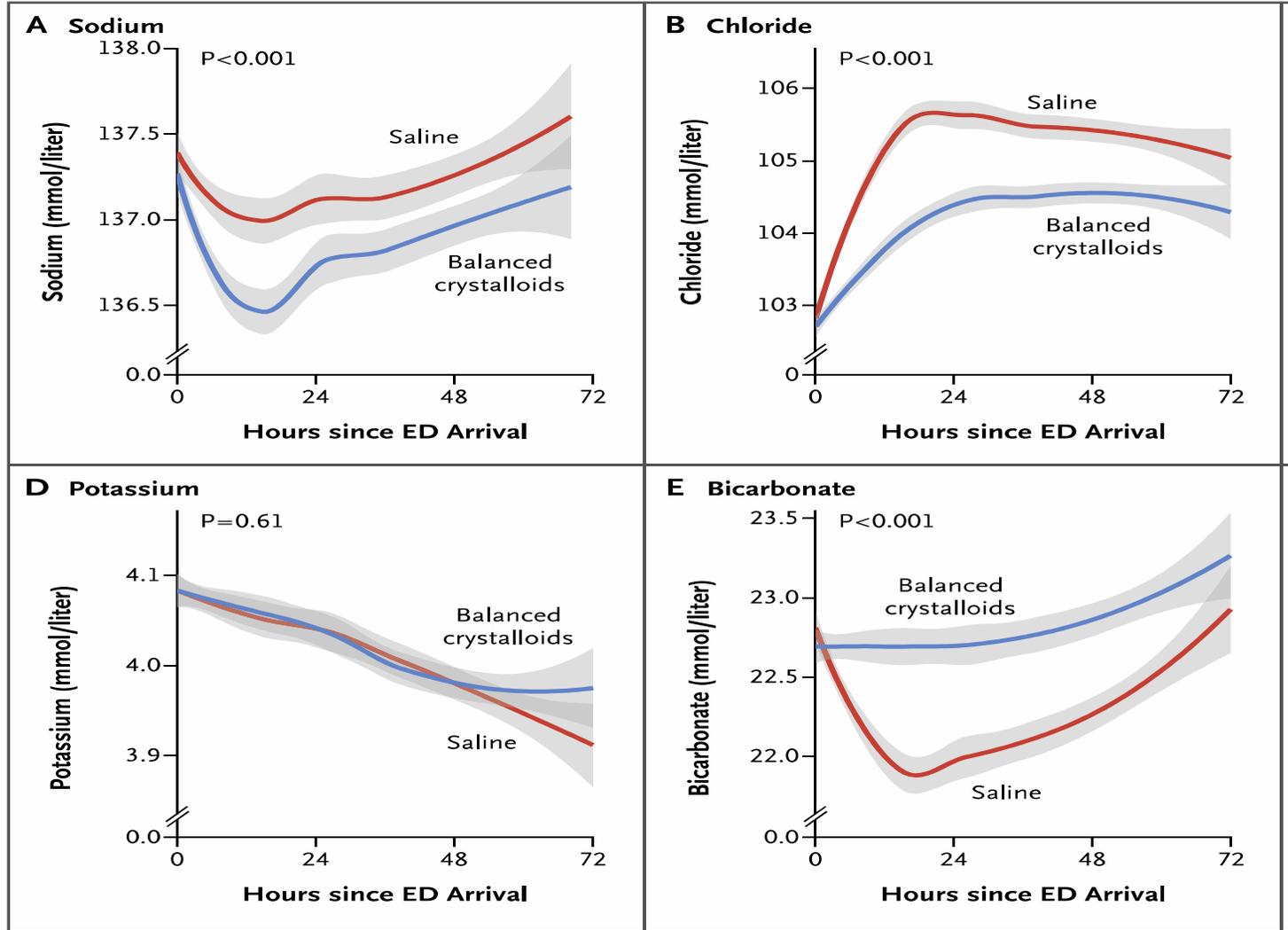
Model	Odds Ratio for Hospital Mortality, per Elapsed Hour until Antibiotic Administration	95% CI	P Value
Unadjusted	0.89	0.86–0.91	<0.001
+ Sepsis severity strata	0.96	0.93–0.99	0.013
+ Severity of illness	1.08	1.04–1.12	<0.001
+ Demographics	1.09	1.05–1.13	<0.001
Fully adjusted model, in each subgroup			
Sepsis only	1.09	1.00–1.19	0.046
Severe sepsis only	1.07	1.01–1.24	0.014
Septic shock only	1.14	1.06–1.23	0.001

Q5. Le(s)quel(s) des solutés suivants allez vous utiliser du coup?

- A. Sérum physiologique
- B. Sérum hypersalé
- C. Ringer lactate
- D. Isofundine®
- E. Glucosé à 5%

ORIGINAL ARTICLE

Balanced Crystalloids versus Saline in Noncritically Ill Adults

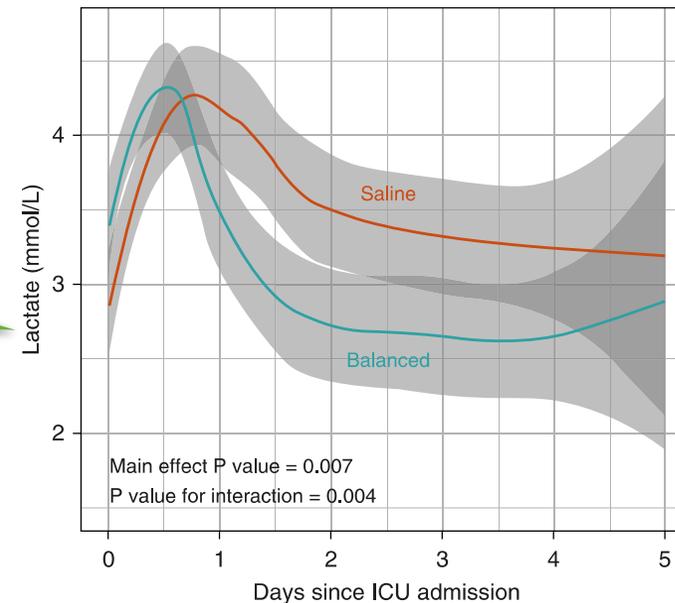


Balanced Crystalloids versus Saline in Sepsis

A Secondary Analysis of the SMART Clinical Trial

Outcome*	n	Balanced Crystalloids (n = 824)	Saline (n = 817)	Adjusted OR (95% CI) [†]
Primary outcome				
30-d in-hospital mortality, n (%)	1,641	217 (26.3)	255 (31.2)	0.74 (0.59 to 0.93)
Additional renal outcomes [§]				
Major adverse kidney event within 30 d, n (%)	1,641	292 (35.4)	328 (40.1)	0.78 (0.63 to 0.97)

Clearance lactate plus rapide



Q6. Parmi les propositions suivantes, laquelle de ces antibiothérapies empiriques vous paraît-elle la plus appropriée?

- A. Amoxicilline-Acide clavulanique
- B. Céfotaxime
- C. Imipénème
- D. Céfotaxime + Amikacine
- E. Céfotaxime + métronidazole + Amikacine



Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

D. ANTIMICROBIAL THERAPY

1. We recommend that administration of IV antimicrobials be initiated as soon as possible after recognition and **within 1 h for both sepsis and septic shock** (strong recommendation, moderate quality of evidence; grade applies to both conditions).

A large, multi-pointed red starburst graphic with a white outline, containing the text 'Broad-spectrum is tantalizing!' in yellow.

**Broad-spectrum
is tantalizing!**

In addition, the clinician must assess risk factors for infection with multidrug-resistant pathogens including prolonged hospital/chronic facility stay, recent antimicrobial use, prior hospitalization, and prior colonization or infection with multidrug-resistant organisms. The occurrence of more severe illness (e.g., septic shock) may be intrinsically associated with a higher probability of resistant isolates due to selection in failure to respond to earlier antimicrobials.

Cédric Bretonnière
Marc Leone
Christophe Milési
Bernard Allaouchiche
Laurence Armand-Lefevre
Olivier Baldesi
Lila Bouadma
Dominique Decré
Samy Figueiredo
Rémy Gauzit
Benoît Guery
Nicolas Joram
Boris Jung
Sigismond Lasocki
Alain Lepape
Fabrice Lesage
Olivier Pajot
François Philippart
Bertrand Souweine
Pierre Tattevin
Jean-François Timsit
Renaud Vialet
Jean Ralph Zahar
Benoît Misset
Jean-Pierre Bedos

Strategies to reduce curative in intensive care

**Carbapenems should
be avoided except...**

In terms of empirical antimicrobial treatment, when a nosocomial
acquired severe bacterial infection is suspected, we
recommend not prescribing carbapenem solely on the basis
of the nosocomial nature of the infection, but rather
considering the presence of at least two of the following
criteria:

Previous treatment with a third-generation cephalosporin,
fluoroquinolones (including a single dose) or a piperacillin–
tazobactam combination in the last 3 months,
Carriage of extended-spectrum β -lactamase-producing
Enterobacteriaceae or of ceftazidime-resistant *P. aeruginosa*,
determined within the last 3 months, whatever the sampling
site,
Hospitalization during the last 12 months,
Patient living in a nursing facility or in a long-term care
facility for elderly and carrying an indwelling catheter and/or
a gastrostomy tube,
Ongoing epidemic episode of multidrug-resistant bacteria in
the healthcare institution for which the only treatment option
is carbapenem

PNA grave



Traitement probabiliste

- C3G IV (céfotaxime ou ceftriaxone) + amikacine
- si allergie :
 - aztréonam + amikacine
- si antécédent de BLSE (IU ou colonisation urinaire < 6 mois)
 - carbapénème (imipénème, méropénème) + amikacine
 - en cas d'allergie aux carbapénèmes : aztréonam + amikacine
- si choc septique, ET présence d'au moins un facteur de risque d'EBLSE*
 - carbapénème (imipénème, méropénème) + amikacine
 - en cas d'allergie aux carbapénèmes : aztréonam + amikacine

* Facteurs de risque d'EBLSE : colonisation urinaire ou IU à EBLSE < 6 mois, antibiothérapie par pénicilline+inhibiteur, céphalosporine de 2^{ème} ou 3^{ème} génération, ou fluoroquinolone < 6 mois, voyage récent en zone d'endémie d'EBLSE, hospitalisation < 3 mois, vie en long-séjour

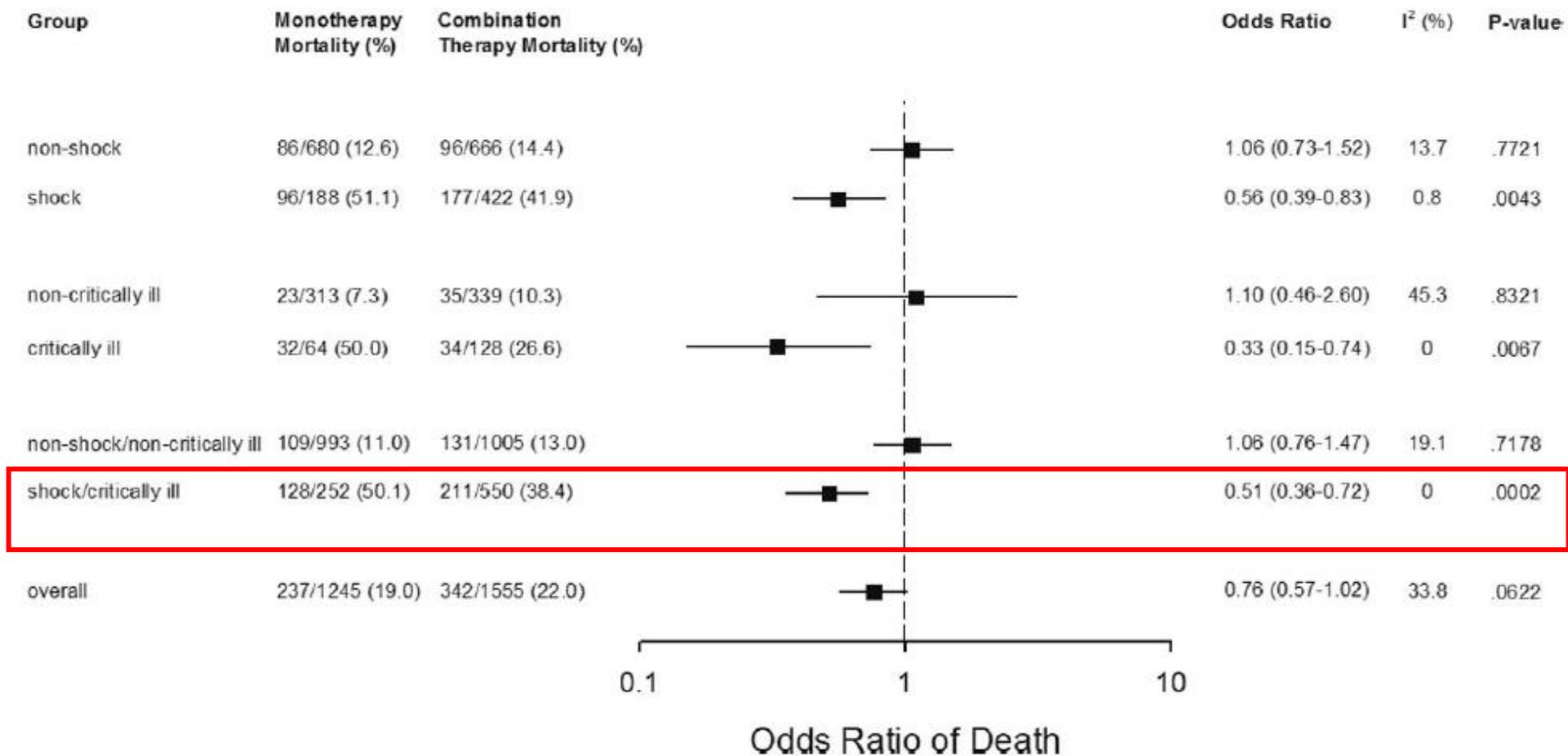


Optimisation des doses!

Long-established antibiotics		
Piperacillin/tazobactam	4.5 g every 6 h CI	BSI, HAP, VAP, UTI, cIAI
Ceftazidime	6 g every 24 h CI	BSI, HAP, VAP, UTI, cIAI
Cefepime	2 g every 8 h or CI	BSI, HAP, VAP, UTI, cIAI
Aztreonam	1 g (2 g) every 8 h	BSI, HAP, VAP, UTI, cIAI
Imipenem/cilastatin	500 mg (1 g) every 6 h	BSI, HAP, VAP, UTI, cIAI
Meropenem	1 g (2 g) every 8 h or CI	BSI, HAP, VAP, UTI, cIAI
Tigecycline	100–200 mg loading those, then 50–100 mg every 12 h	cIAI
"Old" antibiotics		
Gentamicin	7 mg/kg/day every 24 h	In combination for BSI, UTI, c HAP, cIAI, VAP
Amikacin	25–30 mg/kg/day every 24 h	In combination for BSI, UTI, VA HAP, VAP
Colistin	9 MU loading dose, 4.5 MU every 8–12 h	In combination for BSI, UTI, HAP, VAP
Fosfomycin	4–6 g every 6 h CI	In combination for BSI, UTI, HAP, VAP
Vancomycin	15–30 mg/kg loading dose, 30–60 mg/ kg every 12 h, 6 h or CI	BSI, HAP, VAP
Linezolid	600 mg every 12 h	BSI, HAP, VAP, SSTI



Bithérapie?



Vous prenez le temps de réexaminer le patient...

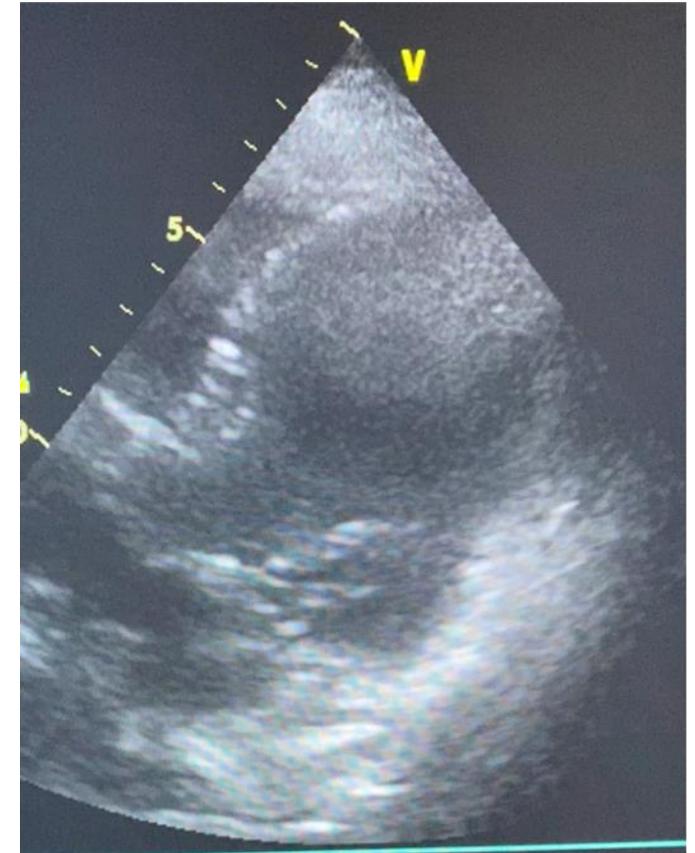
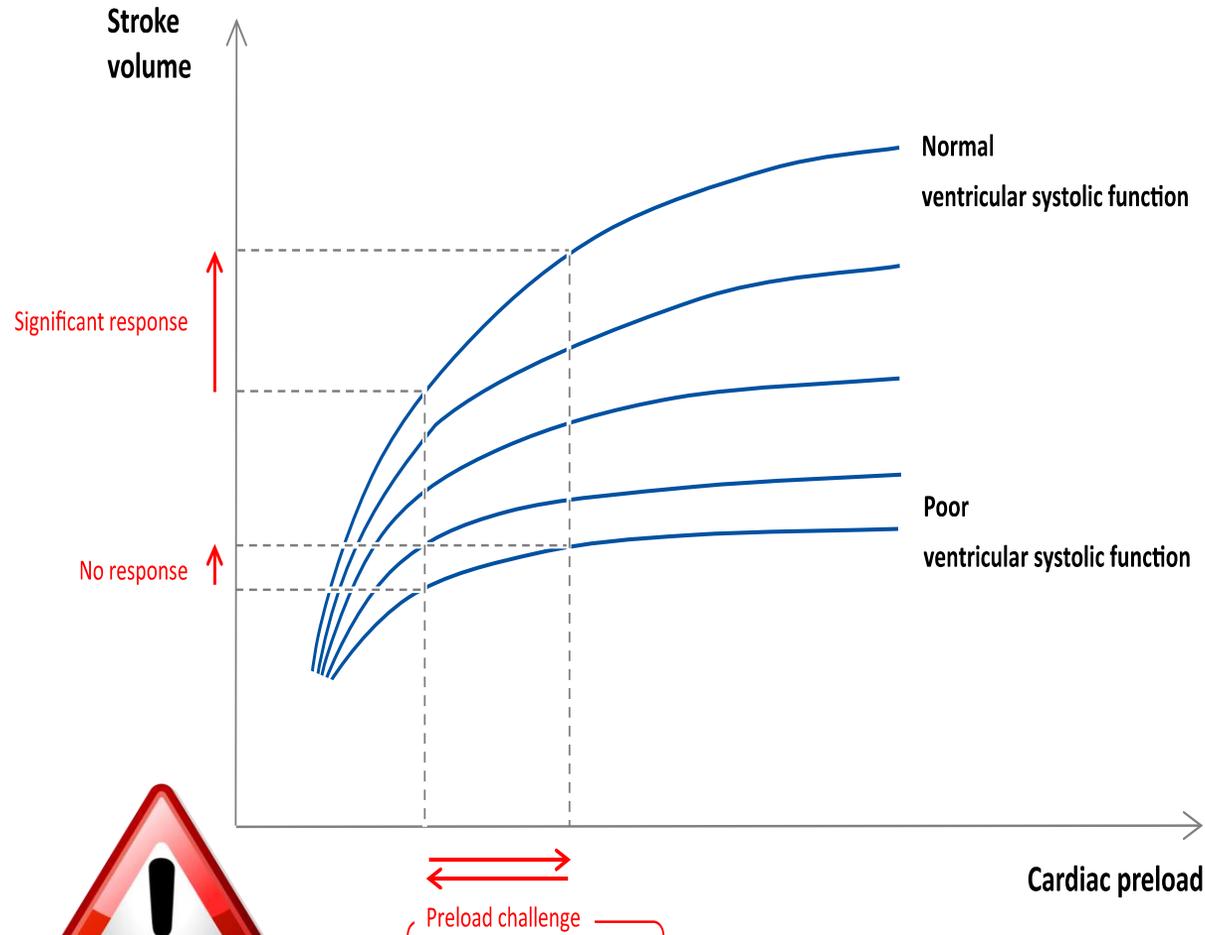


TRC = 7s

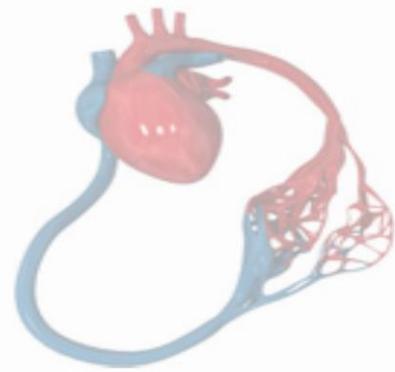
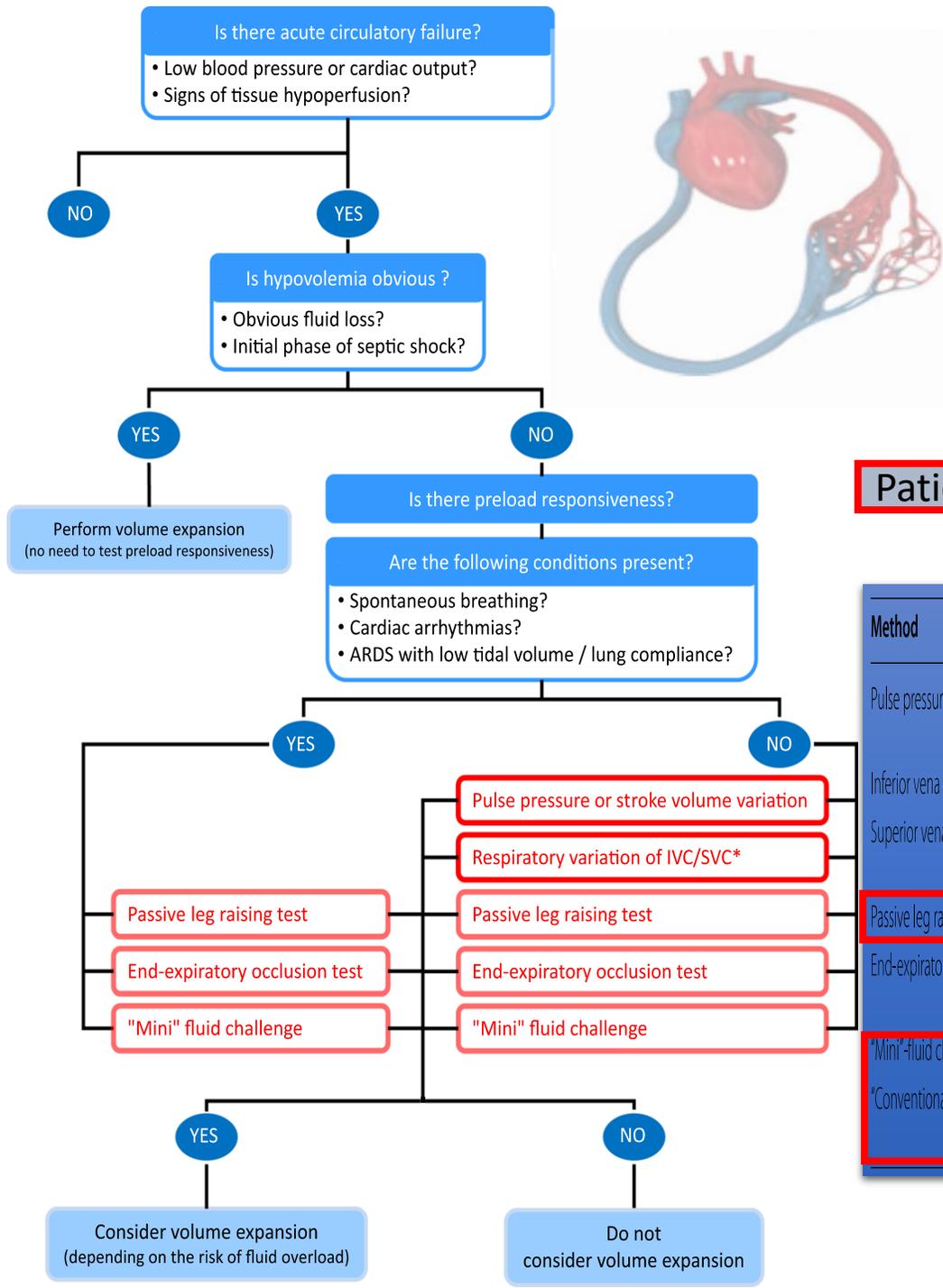
Q7. Comment allez vous pouvoir guider la conduite de votre remplissage vasculaire initial?

- A. Surveillance de la pression veineuse centrale
- B. Test du lever de jambes passif
- C. Surveillance des marbrures
- D. Surveillance du lactate
- E. Surveillance du temps de recoloration cutanée

Amélioration DO_2 : *Précharge*-dépendance?



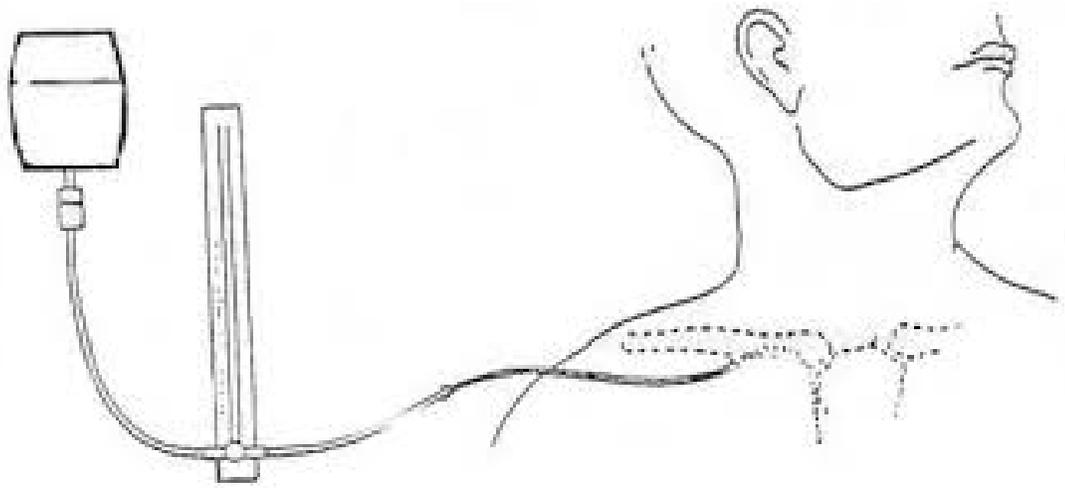
$$DO_2 = Hb \times 1.36 \times SaO_2 \times Qc$$



Patient en ventilation spontanée...

Method	Threshold	Main limitations
Pulse pressure/stroke volume variations [22]	12%	Cannot be used in case of spontaneous breathing, cardiac arrhythmias, low tidal volume/ lung compliance
Inferior vena cava diameter variations [44]	12%	Cannot be used in case of spontaneous breathing, low tidal volume/lung compliance
Superior vena caval diameter variations [44]	36%*	Requires performing transesophageal Doppler Cannot be used in case of spontaneous breathing, low tidal volume/lung compliance
Passive leg raising [55]	10%	Requires a direct measurement of cardiac output
End-expiratory occlusion test [75]	5%	Cannot be used in non-intubated patients Cannot be used in patients who interrupt a 15-s respiratory hold
"Mini"-fluid challenge (100 mL) [84]	6%**	Requires a precise technique for measuring cardiac output
"Conventional" fluid challenge (500 mL) [81]	15%	Requires a direct measurement of cardiac output Induces fluid overload if repeated

Indicateurs statiques

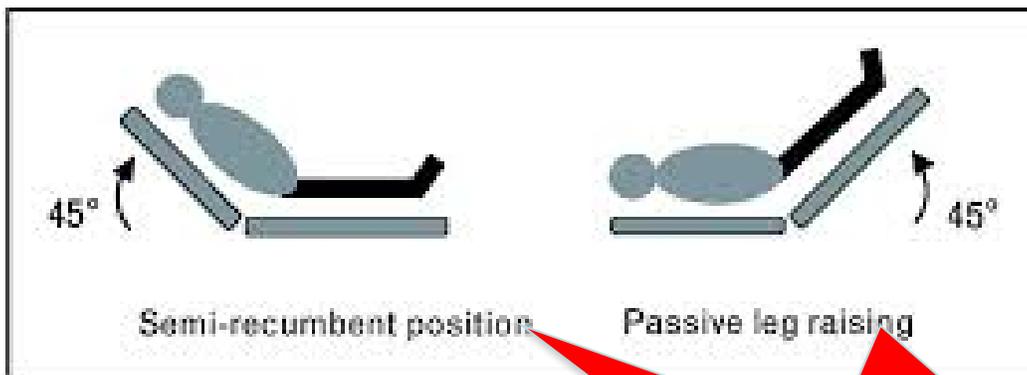


Pression Veineuse Centrale

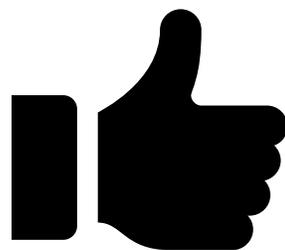


Pressions de remplissage

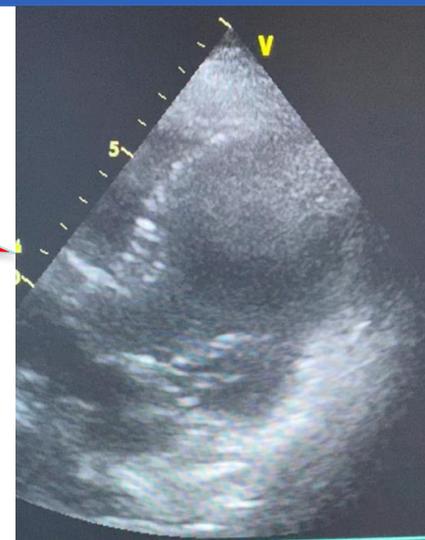
Indicateurs dynamiques



« auto-remplissage »
250 mL

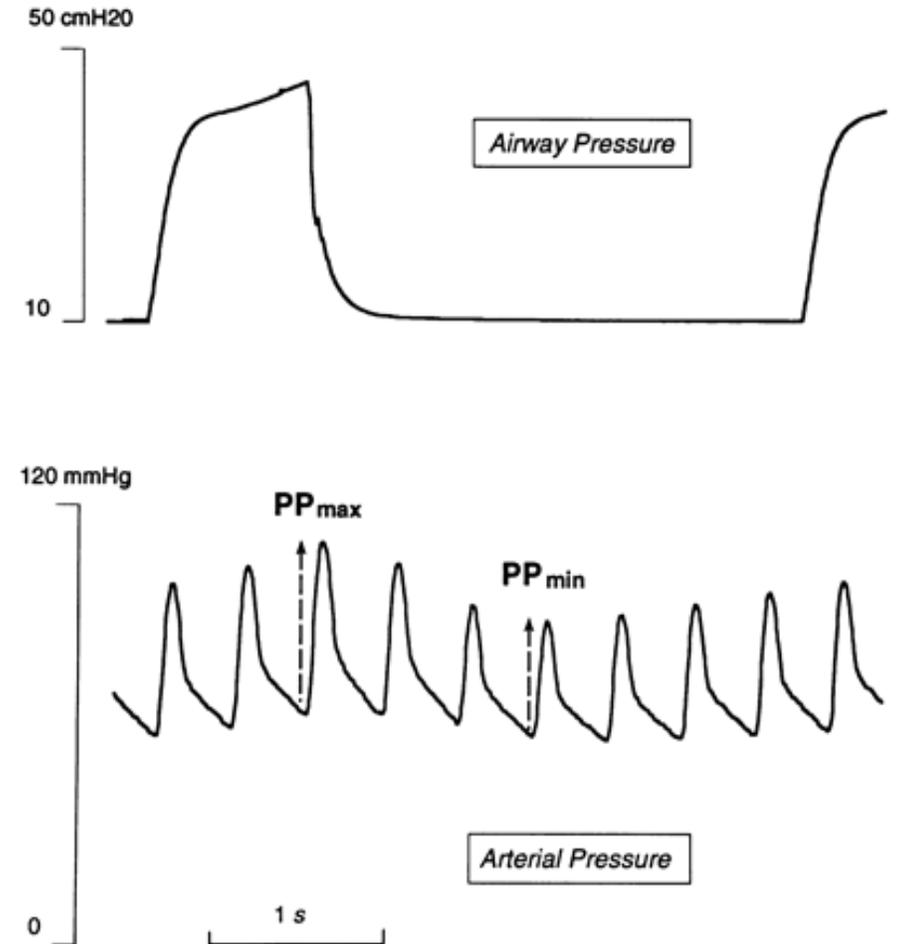
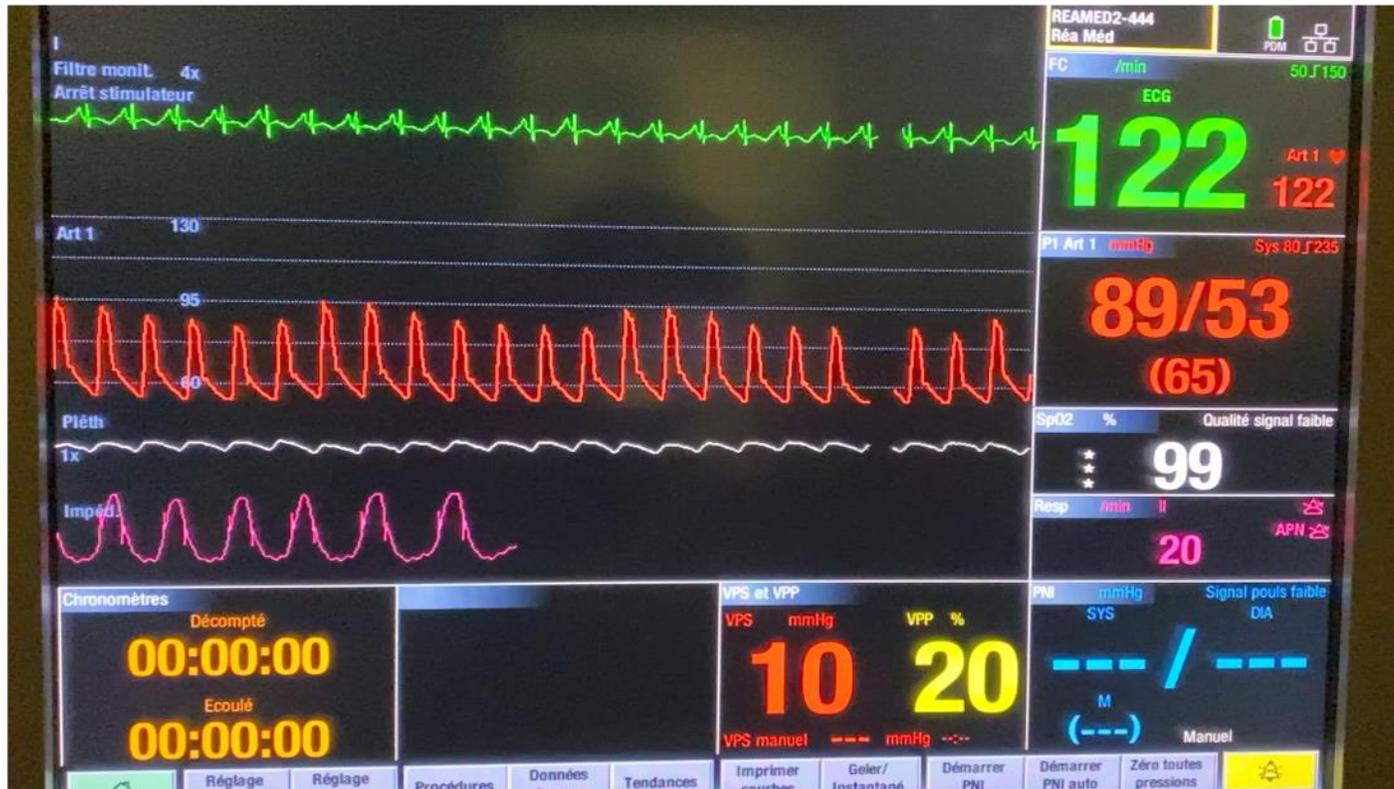


débit
cardiaque?



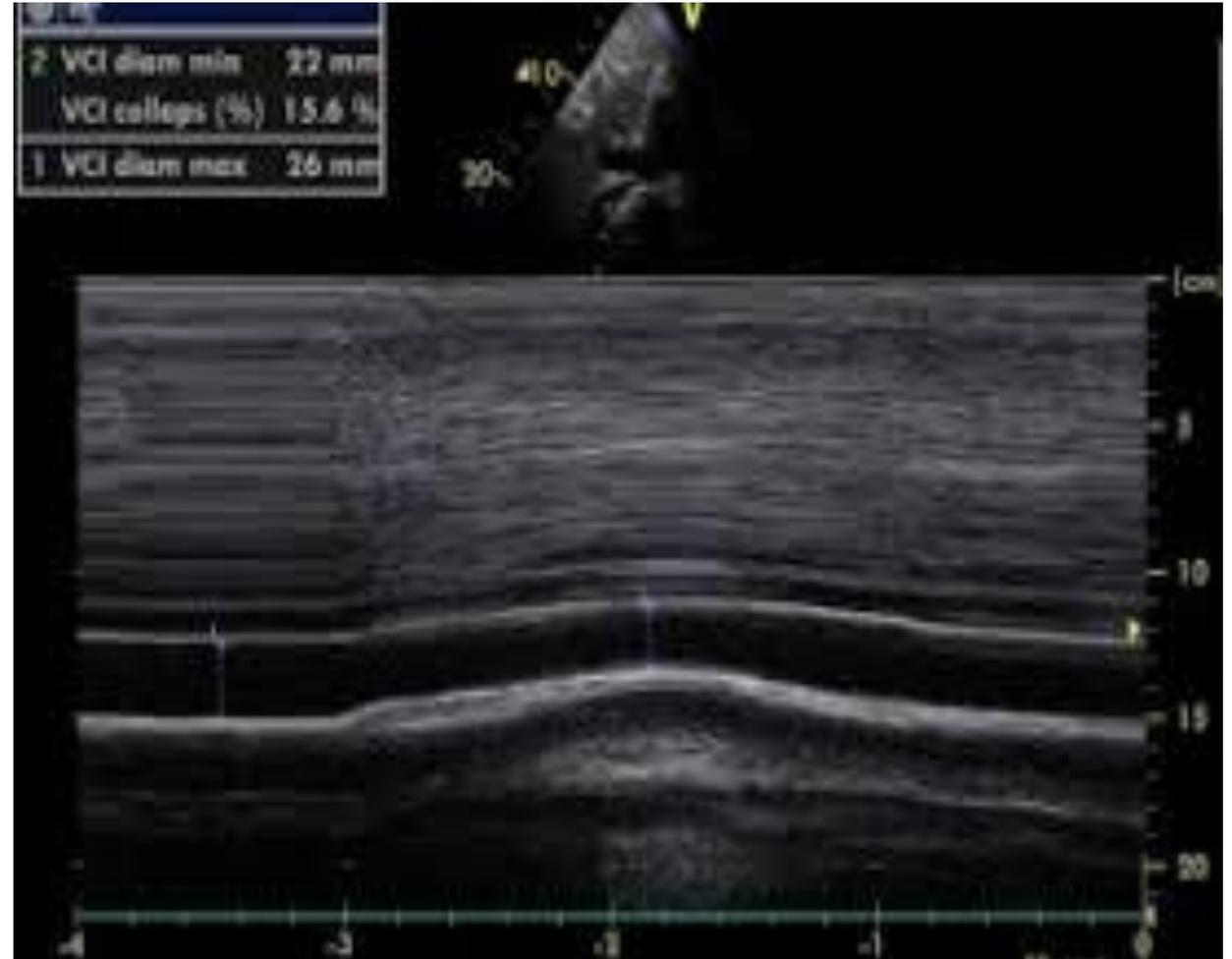
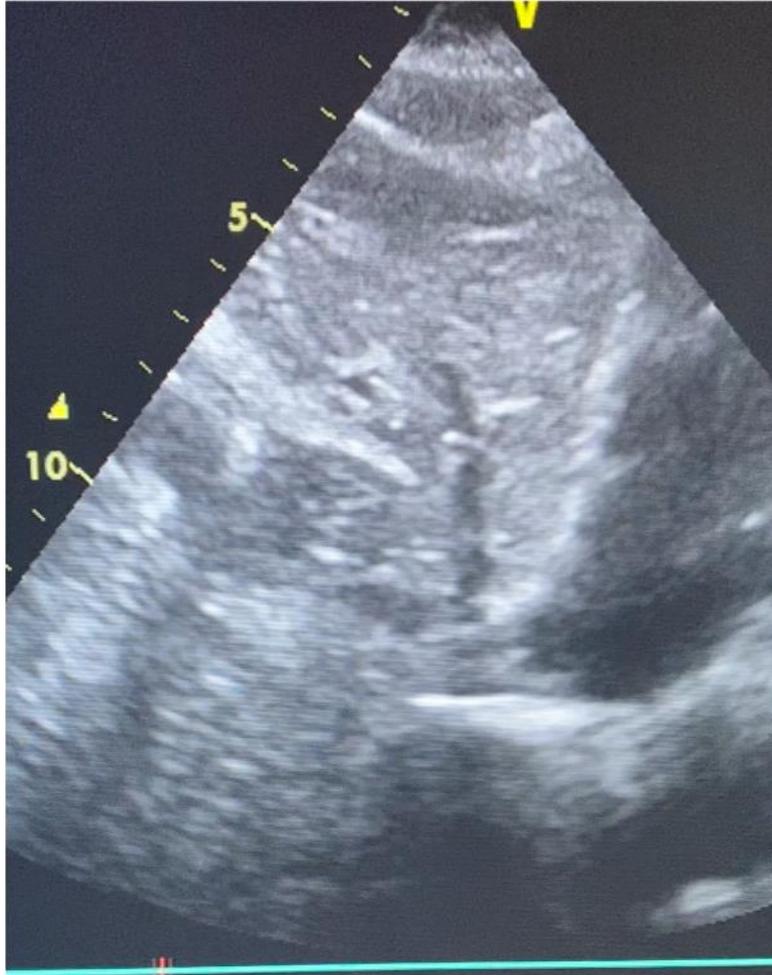
levé de jambes passif

Indicateurs dynamiques



Variations Pression Pulsée

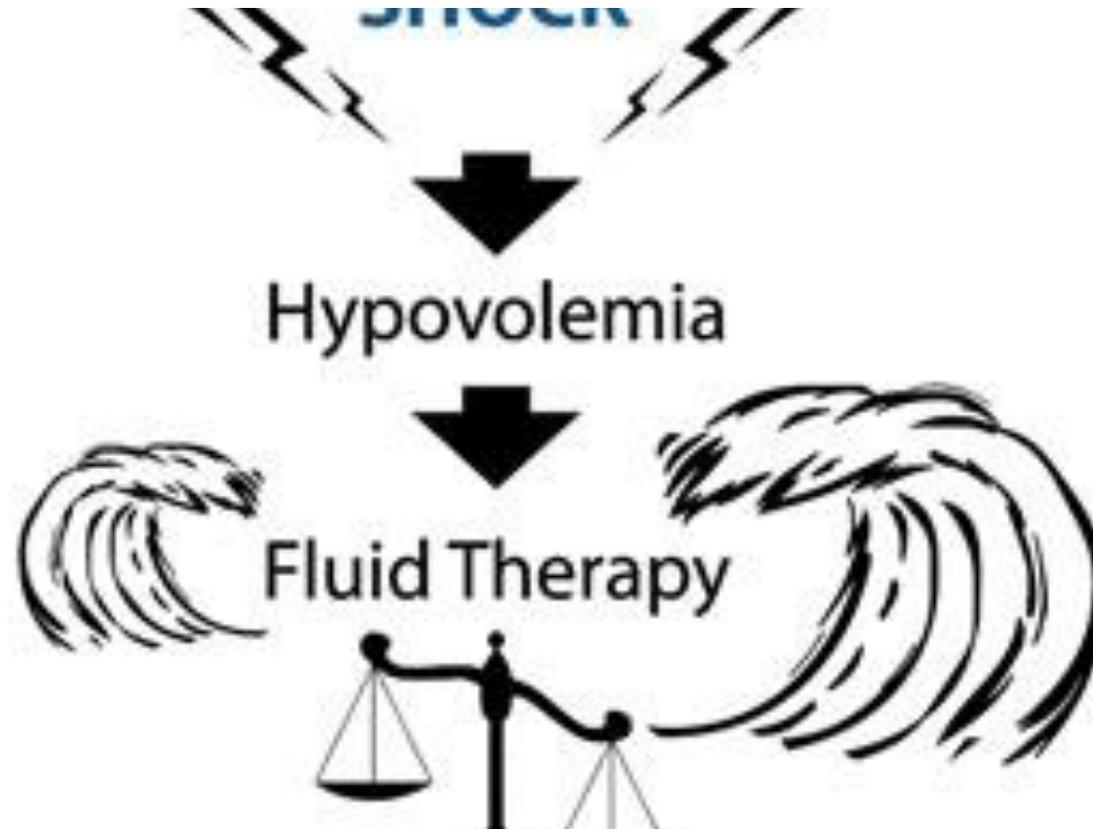
Indicateurs dynamiques



Variations Respiratoires VCI (ou VCS)

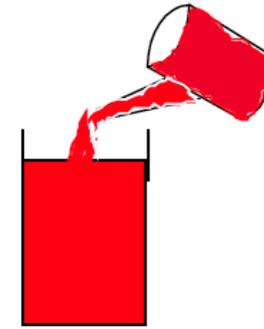
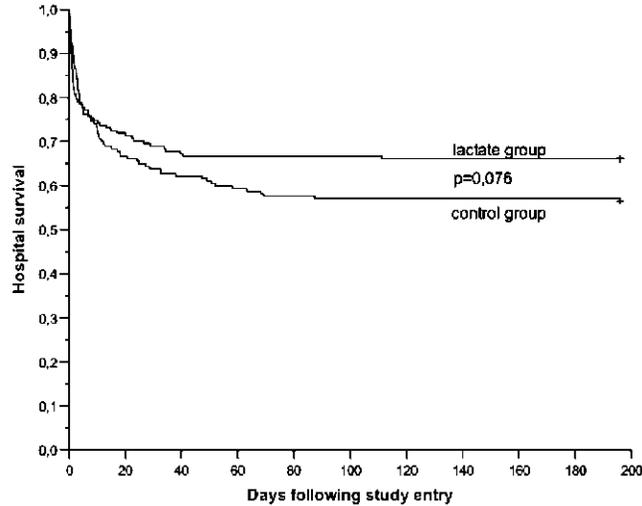


Jusqu'où faut-il remplir
les patients **septiques**?



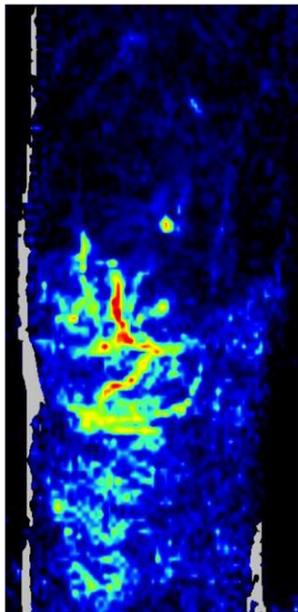
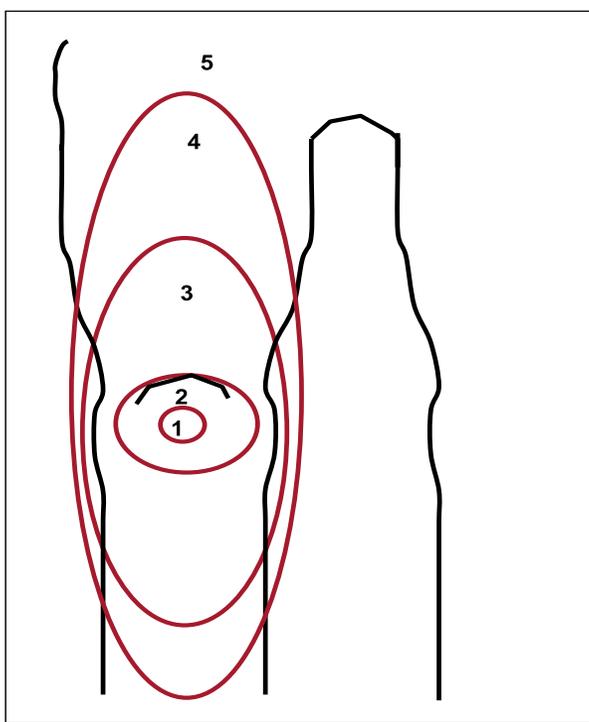
Early Lactate-Guided Therapy in Intensive Care Unit Patients

A Multicenter, Open-Label, Randomized Controlled Trial

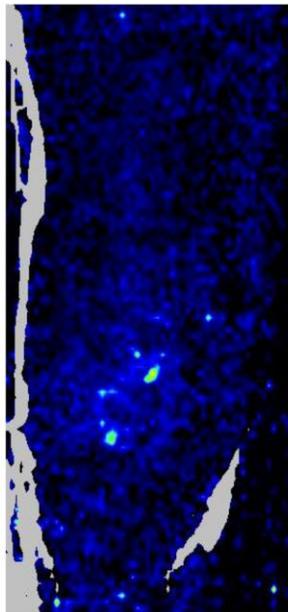


Treatment	Control Group	Lactate Group	P Value
Fluids, ml*			
0-8 h [†]	2,194 ± 1,669	2,697 ± 1,965	0.011
9-72 h [‡]	10,043 ± 6,141	8,515 ± 4,987	0.055
Red blood cell transfusion, ml			
0-8 h [†]	196 ± 495	322 ± 1037	0.15
9-72 h [‡]	345 ± 667	423 ± 1300	0.59
Any inotropic, %§			
0-8 h [†]			0.17
9-72 h [‡]			0.12
Any vasodilator, %¶			
0-8 h [†]			<0.001
9-72 h [‡]			0.005
Any vasopressor, %**			
0-8 h [†]	63.6	69.5	0.25
9-72 h [‡]	63.7	71.4	0.16

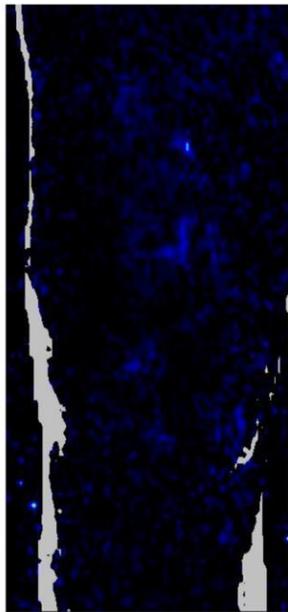
**Remplissage
+rapide/-abondant**



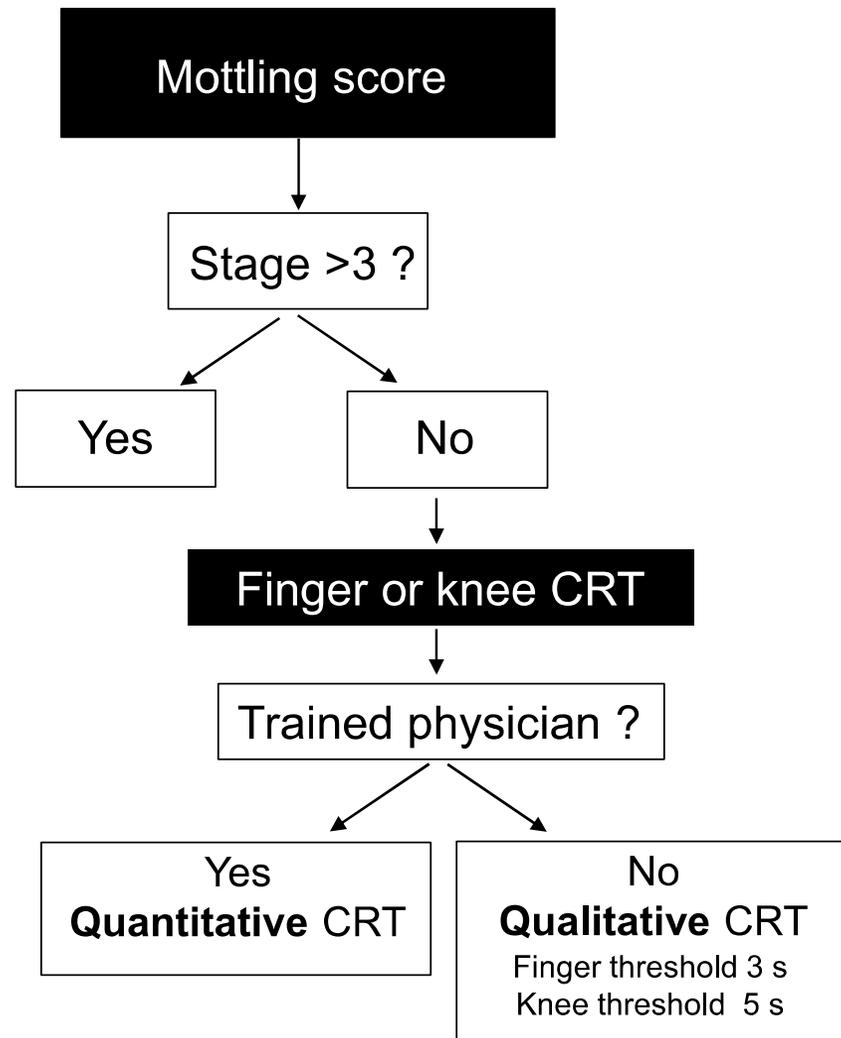
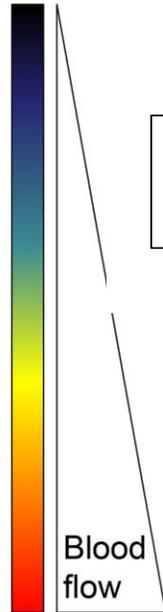
Stage 0



Stage 3



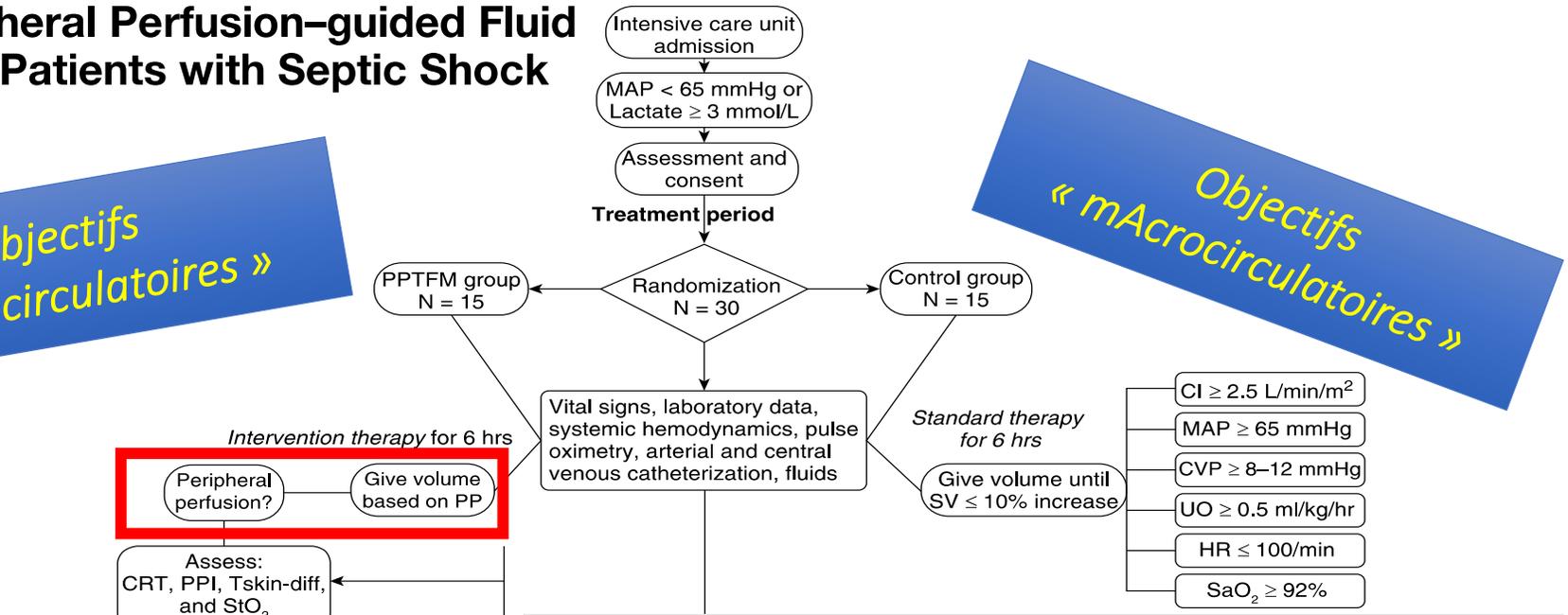
Stage 5



Early Peripheral Perfusion-guided Fluid Therapy in Patients with Septic Shock

Objectifs
« microcirculatoires »

Objectifs
« macrocirculatoires »



Variables and Groups	Study Period	
	0-6 h	7-72 h
Cumulative fluids, ml		
Control	6,069 (1,715)	10,028 (941)
PPTFM	4,227 (1,081)	7,565 (982)
Urine output, ml		
Control	520 (160)	2,469 (542)
PPTFM	332 (84)	1,680 (527)
SOFA _{total}		
Control	12.8 (10.0-16.8)	11.0 (5.3-15.3)
PPTFM	11.5* (8.0-13.0)	8.3 (5.5-13.1)
Mechanical ventilation free days, d		
Control	2 (2-6)	
PPTFM	2 (1-5)	
Intensive care unit mortality, n (%)		
Control	6 (40)	
PPTFM	7 (47)	
Intensive care unit stay, d		
Control	8 (3-8)	
PPTFM	10 (2-10)	
Hospital stay, d		
Control	43 (8-45)	
PPTFM	16 (5-28)*	



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

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
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)		
ICU length of stay, mean (SD), d ^e	9.1 (9.8)	9.0 (9.6)	0.1 (-1.7 to 2.0)		.91
Hospital length of stay, mean (SD), d ^f	22.9 (28.8)	18.3 (19.0)	4.6 (0.0 to 9.1)		.05
Amount of resuscitation fluids within the first 8 h, No.	206	209			
Mean (SD), mL	2359 (1344)	2767 (1749)	-408 (-705 to -110)		.01

