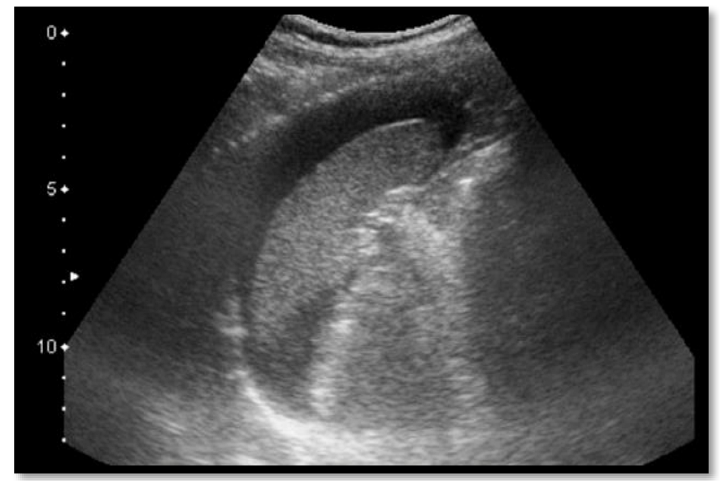


Prise en charge initiale du traumatisé grave
2004 / 2024
JRUR

Pr Laurent ZIELESKIEWICZ
SAR Hôpital Nord
Fédération de traumatologie hôpital nord
AP-HM, Marseille

Conflit d'intérêt

Formations échographie et symposiums GE

Objectif principal

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

Edward W. Campion, M.D., *Editor*

Initial Care of the Severely Injured Patient

David R. King, M.D.

Objectif secondaire

2004
2024

20 ans déjà …..

Références

Rossaint *et al. Critical Care* (2023) 27:80
https://doi.org/10.1186/s13054-023-04327-7

Critical Care

GUIDELINES **Open Access**

The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition

Recommandations Formalisées d'Experts

« Prise en charge du traumatisme abdominal grave de l'adulte : les 48 premières heures »

THE EARLY MANAGEMENT OF SEVERE ABDOMINAL TRAUMA

2019

CrossMark

Traumatisme thoracique : prise en charge des 48 premières heures

Société française d'anesthésie et de réanimation [1], Société française de médecine d'urgence [2]

Recommandations Formalisées d'Experts

Actualisation de recommandations

Prise en charge des patients présentant, ou à risque, de traumatisme vertébro-médullaire

Management of patients with, or at risk of spinal cord injury

2019

Prise en charge des traumatisés pelviens graves à la phase précoce (24 premières heures) ☆,☆☆

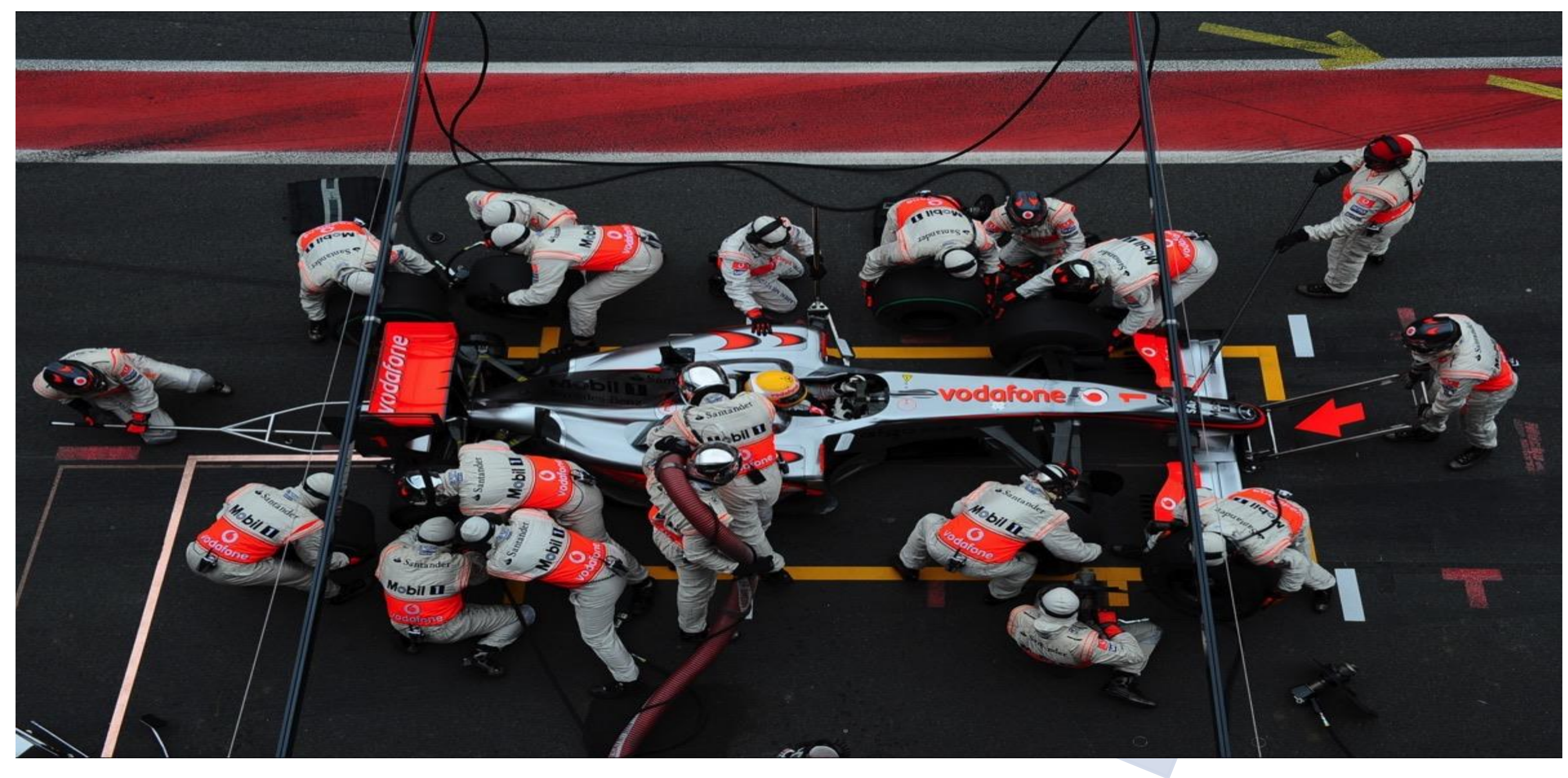
Pascal Incagnoli, Alain Puidupin, Sylvain Ausset, Jean-Paul Beregi, Jacques Bessereau, Xavier Bobbia, Julien Brun, Élodie Brunel, Clément Buléon, Jacques Choukroun, Xavier Combes, Jean Stéphane David, François-Régis Desfemme, Delphine Garrigue, Jean Luc Hanouz, Éric Kipnis, Isabelle Plénier, Frédéric Rongieras, Benoît Vivien

Anesth Reanim. 2016; 2: 431–453

CrossMark

Prise en charge des traumatisés crâniens graves à la phase précoce (24 premières heures) ☆

Protocoles > Personnalisation



Plan

Traitement médical / triade létale / arrêter hémorragie

Pré-hospitalière	Déchocage/Diagnostic	TT médical	TT interventionnel
Vite Premiers soins Orientation Transmission	Organisation « militaire »	Coag Taper fort et vite	Damage control

Rappels
Ce qui ne change pas

Epidémiologie

Original article

Preventable deaths in a French regional trauma system: A six-year analysis of severe trauma mortality

E. Girard[a b], Q. Jegousso[c], B. Boussat[b d], P. François[b d], F.-X. Ageron[e], C. Letoublon[a b], P. Bouzat[b c], TRENAU group[1]

5-15 % de décès

10-20 % des décès = mort évitable (hémorragie ++)

Décès précoce = hémorragie ou traumatisme crânien

Piège physiopathologique

L'hémoglobine ne reflète pas la sévérité de l'hémorragie

Hb = 13 g/dL

Plasma

..

RBC

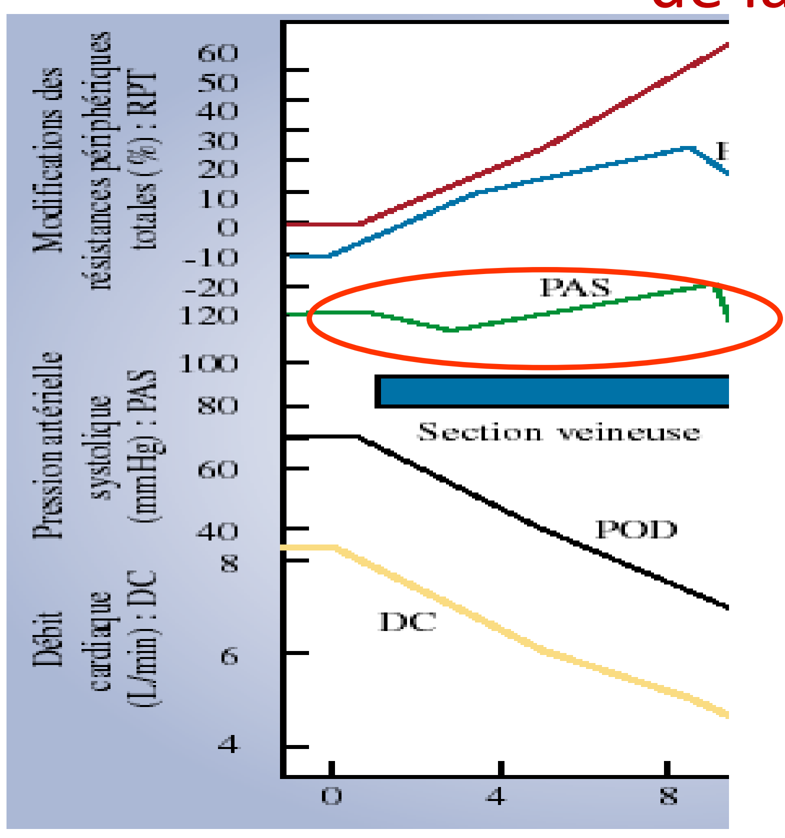
Hb = 13 g/dL

↓ Volume sanguin
Pas de modification du ratio

Walley. Am J Respir Crit Care Med 2011

Piège physiopathologique

La Tension Artérielle n'est pas un indicateur précoce de la gravité des patients

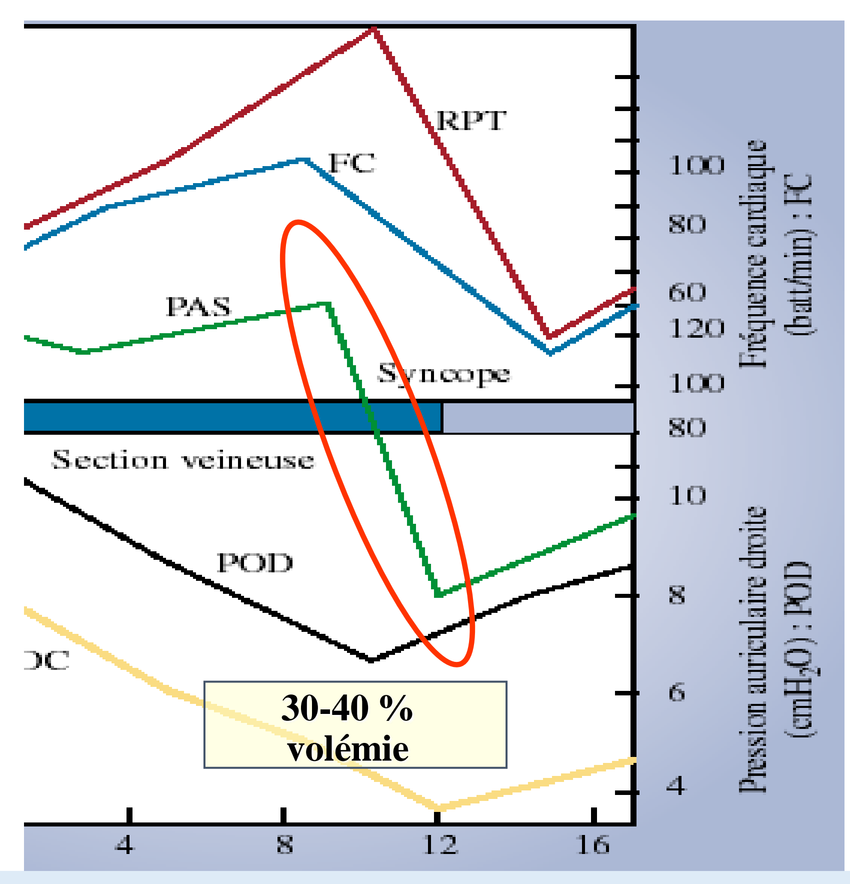


Phase sympathico-excitatrice

- Système sympathique (NA)
- Système rénine-angiotensine - vasopressine
- Diminution du tonus vagal

Barcroft et coll., Lancet 1944;1:489-91

Piège physiopathologique



Phase sympathico-inhibitrice

30 à 40% de volémie

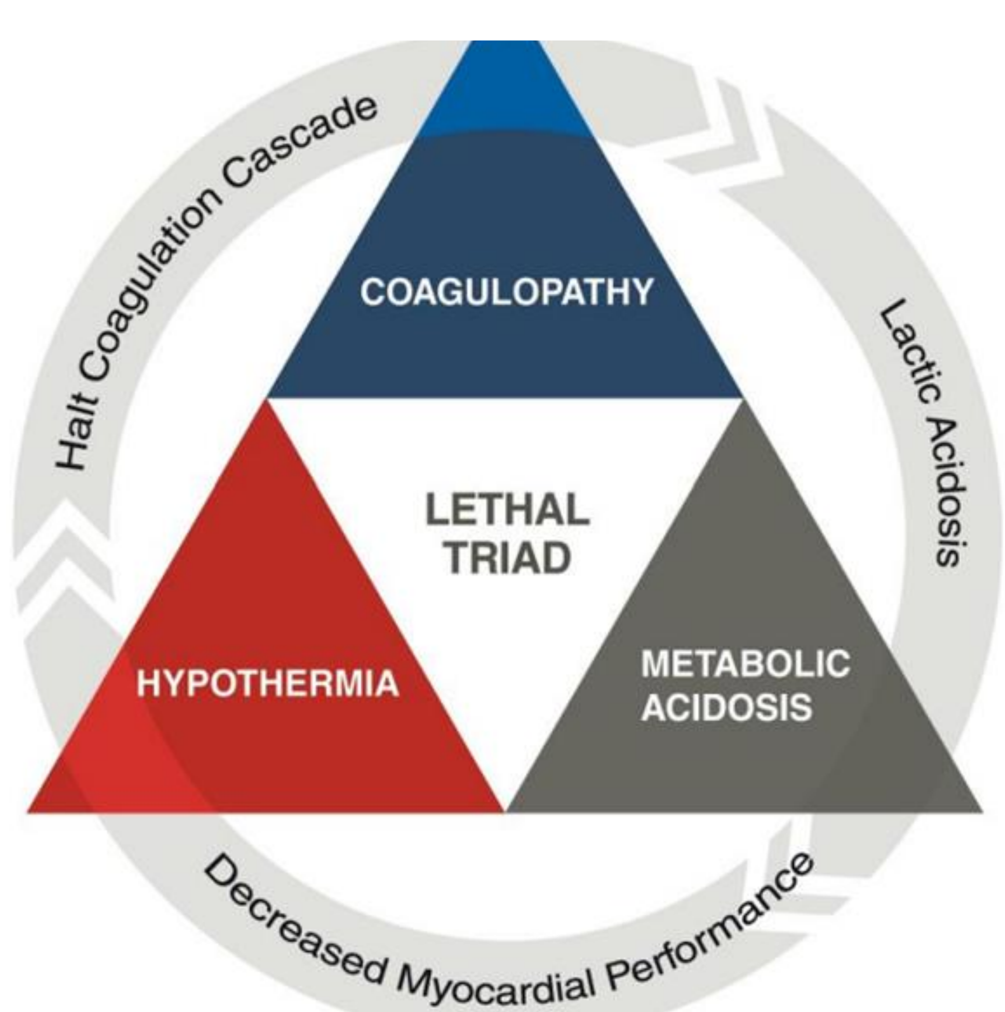
- Augmentation du tonus vagal
- ➘ PA
- ➘ RVS
- ➘ FC

Barcroft et coll., Lancet 1944;1:489-91

Chapitre 1
Pré-hospitalier
=

Bonne PEC
Bonne orientation

PEC pré hospitalière



Ne pas entrer dans la triade létale

- **Lutte contre l'hypothermie**
- **Solutés de remplissage balancés**
- **Noradrénaline précoce**

PEC pré hospitalière

Garrot

Chirurgie

Prise en charge pré-hospitalière

Yeguiayan *et al. Critical Care* 2011, **15**:R34
http://ccforum.com/content/15/1/R34

RESEARCH Open Access

Medical pre-hospital management reduces mortality in severe blunt trauma: a prospective epidemiological study

Jean-Michel Yeguiayan[1*], Delphine Garrigue[2], Christine Binquet[3], Claude Jacquot[4], Jacques Duranteau[5], Claude Martin[6], Fatima Rayeh[7], Bruno Riou[8], Claire Bonithon-Kopp[3], Marc Freysz[1], The FIRST (French Intensive Care Recorded In Severe Trauma) Study Group

Réduction mortalité à 30 j
PEC plus longue mais
Délais arrivée centre de niveau 1 diminué

Prise en charge pré hospitalière

Original Investigation

September 25, 2019

Association of Prehospital Time to In-Hospital Trauma Mortality in a Physician-Staffed Emergency Medicine System

Tobias Gauss, MD[1]; François-Xavier Ageron, MD, PhD[2]; Marie-Laure Devaud, MD[3]; et al

Author Affiliations | Article Information

JAMA Surg. 2019;154(12):1117-1124. doi:10.1001/jamasurg.2019.3475

RR de mort augmente de 9% par 10 min (4% en corrigé)

(odds ratio, 1.04 [95% CI, 1.01-1.07]).

Définition

Traumatisme grave = une lésion menaçant la vie

Ou

Cinétique laissant à penser que la vie est menacée

Définition

1 Critère de Vittel = traumatisé grave

Examen initial du patient	Glasgow < 13 SaO_2 < 90% Pression artérielle systolique < 90 mmHg
Circonstances de l'accident	Victime éjectée – projetée - écrasée Décès dans l'accident Chute > 6m – explosions - blast
Prise en charge préhospitalière	Ventilation assistée Remplissage > 1000 mL Catécholamines
Lésions observées ou suspectées	Trauma pénétrant – volet thoracique – trauma bassin Amputation de membre – ischémie aiguë de membre Brûlure – suspicion de lésion médullaire

Pré Hospitalier

sfmu

SFAR

Recommandations Formalisées d'Experts

« Prise en charge du traumatisme abdominal grave de l'adulte : les 48 premières heures »

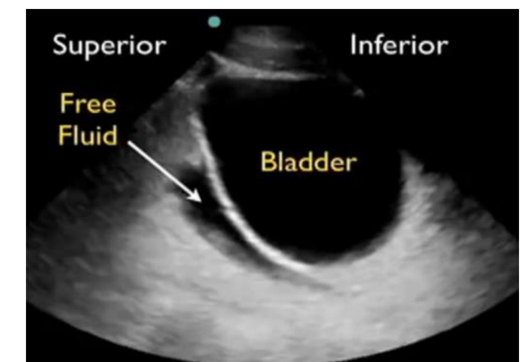
THE EARLY MANAGEMENT OF SEVERE ABDOMINAL TRAUMA

2019

Examen clinique trompeur

R1 – Chez les patients traumatisés graves, il n'est pas recommandé de se limiter à l'examen clinique pour affirmer ou infirmer la présence d'une lésion abdominale.
Grade 1-, (accord FORT)

Pré Hospitalier



sfmu

SFAR

Recommandations Formalisées d'Experts

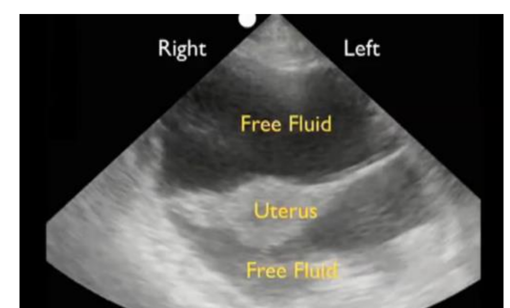
« Prise en charge du traumatisme abdominal grave de l'adulte : les 48 premières heures »

THE EARLY MANAGEMENT OF SEVERE ABDOMINAL TRAUMA

2019

R2.1 – En cas de suspicion de traumatisme abdominal, il est probablement recommandé d'utiliser l'échographie de type FAST en préhospitalier pour diagnostiquer la présence d'un épanchement intra-péritonéal.
Grade 2+, (accord FORT)
Pas de recommandation : Après analyse de la littérature, les experts ne sont pas en mesure d'émettre une recommandation concernant l'impact de la réalisation de l'échographie de type FAST en pré-hospitalier sur la stratégie d'orientation du patient suspect d'un traumatisme abdominal grave.

Echographie pré hospitalière



European Journal of Trauma and Emergency Surgery (2022) 48:2701–2708
https://doi.org/10.1007/s00068-021-01806-w

ORIGINAL ARTICLE

Prehospital FAST reduces time to admission and operative treatment: a prospective, randomized, multicenter trial

Benjamin Lucas[1] · Dorothea Hempel[2,3,4] · Ronny Otto[1] · Franziska Brenner[5,6] · Mario Stier[5] · Ingo Marzi[5] · Raoul Breitkreutz[7] · Felix Walcher[1,5]

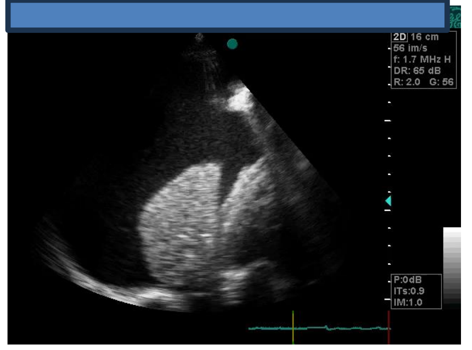
Check for updates

Review

Diagnostic accuracy for hemoperitoneum, influence on prehospital times and time-to-definitive treatment of prehospital FAST: A systematic review and individual participant data meta-analysis

Lorenzo Gamberini[a], Tommaso Scquizzato[b], Marco Tartaglione[a], Valentina Chiarini[a], Carlo Alberto Mazzoli[a], Davide Allegri[c], Cristian Lupi[a], Giovanni Gordini[a], Carlo Coniglio[a], Etrusca Brogi[d]

Réduit le temps de diagnostic
Réduit le temps avant intervention
Mortalité ?



Prehosp Disaster Med. 2023 Aug; 38(4): 444–449.
Published online 2023 Jul 17. doi: 10.1017/S1049023X23006003

PMCID: PMC10445110
PMID: 37458496

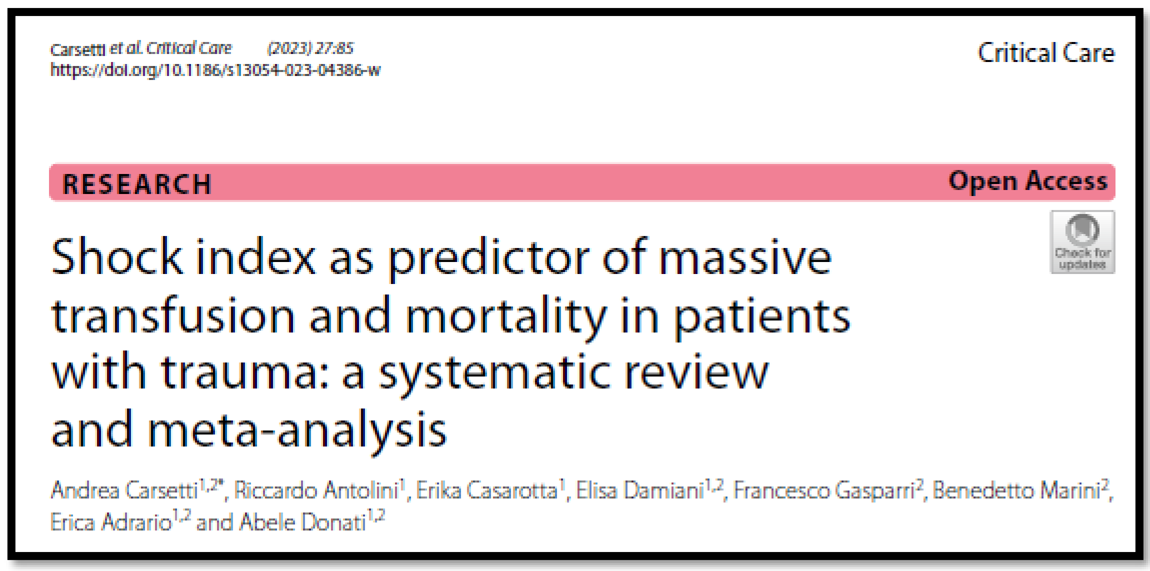
Impact of Point-of-Care Ultrasound on Prehospital Decision Making by HEMS Physicians in Critically Ill and Injured Patients: A Prospective Cohort Study

Niek J. Vianen, MD, MSc,[1] Esther M.M. Van Lieshout, MSc,[1] Koen H.A. Vlasveld, BSc,[1] Iscander M. Maissan, MD,[2] Patricia C. Gerritsen, MD,[3] Dennis Den Hartog, MD,[1] Michael H.J. Verhofstad, MD,[1] and Mark G. Van Vledder, MD[1]

Impact thérapeutique = 25%

We suggest the use of pre-hospital ultrasonography (PHUS) for the detection of haemo-/ pneumothorax, haemopericardium and/or free abdominal fuid in patients with thoracoabdominal injuries, if feasible without delaying transport (Grade 2B).

Triage et Scores


Carsetti et al. Critical Care (2023) 27:85
https://doi.org/10.1186/s13054-023-04386-w

Critical Care

RESEARCH Open Access

Shock index as predictor of massive transfusion and mortality in patients with trauma: a systematic review and meta-analysis

Andrea Carsetti[1,2*], Riccardo Antolini[1], Erika Casarotta[1], Elisa Damiani[1,2], Francesco Gasparri[2], Benedetto Marini[2], Erica Adrario[1,2] and Abele Donati[1,2]

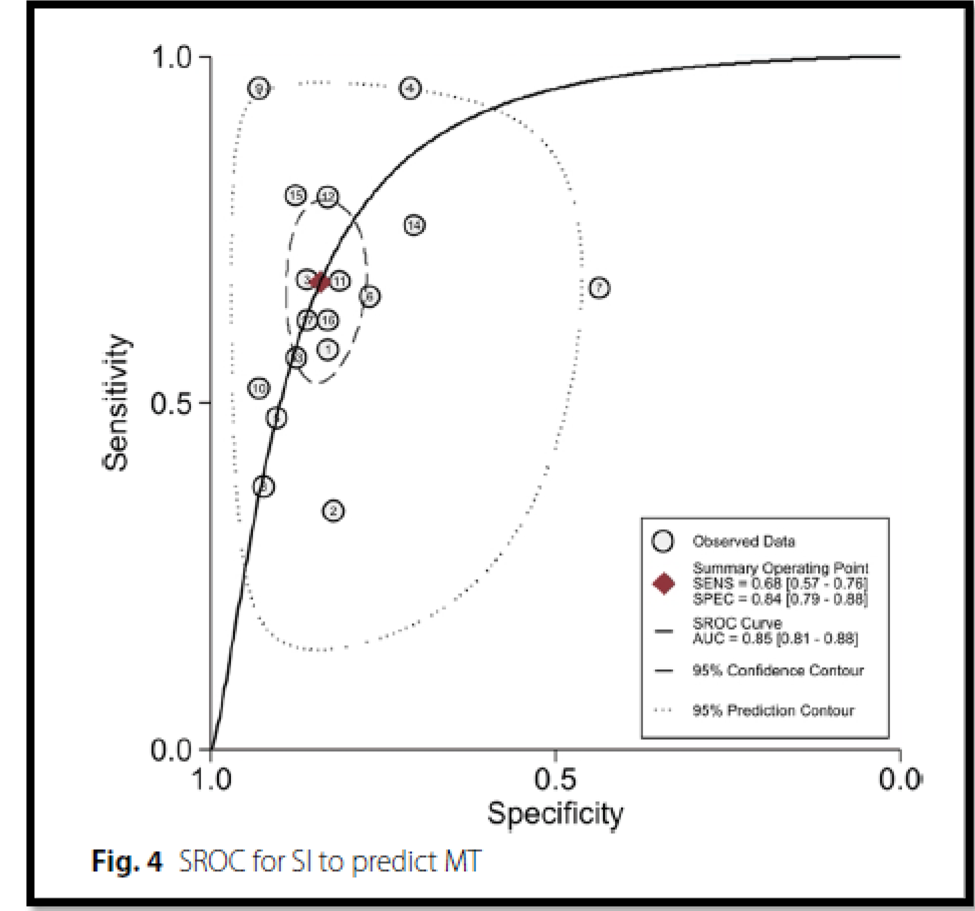


Fig. 4 SROC for SI to predict MT

FC/PAS

Bon indice en association
Intérêt prédiction transfusion
Mortalité ? (bonne VPN uniquement)

We recommend that the shock index (SI) and/or pulse pressure (PP) be used to assess the degree of hypovolaemic shock and transfusion requirements (Grade 1C).

Triage et scores

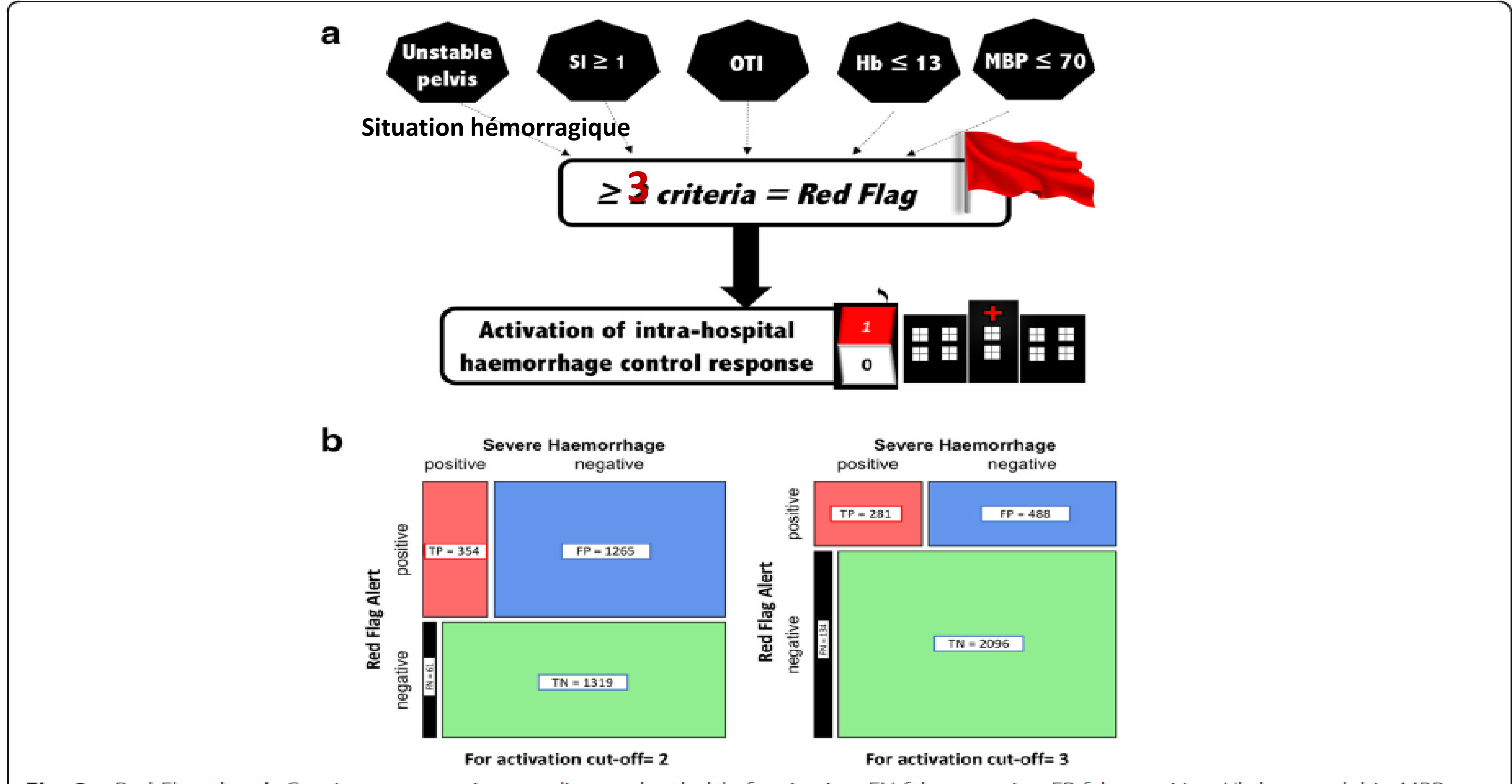


Fig. 3 **a** Red Flag alert. **b** Contingency mosaic according to threshold of activation. FN false negative, FP false positive, Hb haemoglobin MBP mean arterial blood pressure, OTI Oro-tracheal intubation, SI Shock Index, TN true negative, TP true positive

Trauma center = réduction de mortalité

The NEW ENGLAND JOURNAL of MEDICINE

SPECIALTIES TOPICS MULTIMEDIA CURRENT ISSUE LEARNING/CME AUTHOR CENTER PUBLICATIONS

SPECIAL ARTICLE

A National Evaluation of the Effect of Trauma-Center Care on Mortality

Authors: Ellen J. MacKenzie, Ph.D., Frederick P. Rivara, M.D., M.P.H., Gregory J. Jurkovich, M.D., Avery B. Nathens, M.D., Ph.D., Katherine P. Frey, M.P.H., Brian L. Egleston, M.P.P., David S. Salkever, Ph.D., and Daniel O. Scharfstein,

Eur J Trauma Emerg Surg. 2022; 48(1): 525–536. PMCID: PMC8825402

Published online 2020 Jul 27. doi: 10.1007/s00068-020-01446-6 PMID: 32719897

Mortality of trauma patients treated at trauma centers compared to non-trauma centers in Sweden: a retrospective study

Stefan Candefjord,[1] Linn Asker,[2] and Eva-Corina Caragounis[2]

Author information Article notes Copyright and License information PMC Disclaimer

Réduction mortalité 7,6 vs 9,5 %

41 à 70 % de reduction de mortalité à 30j

The Golden Hour

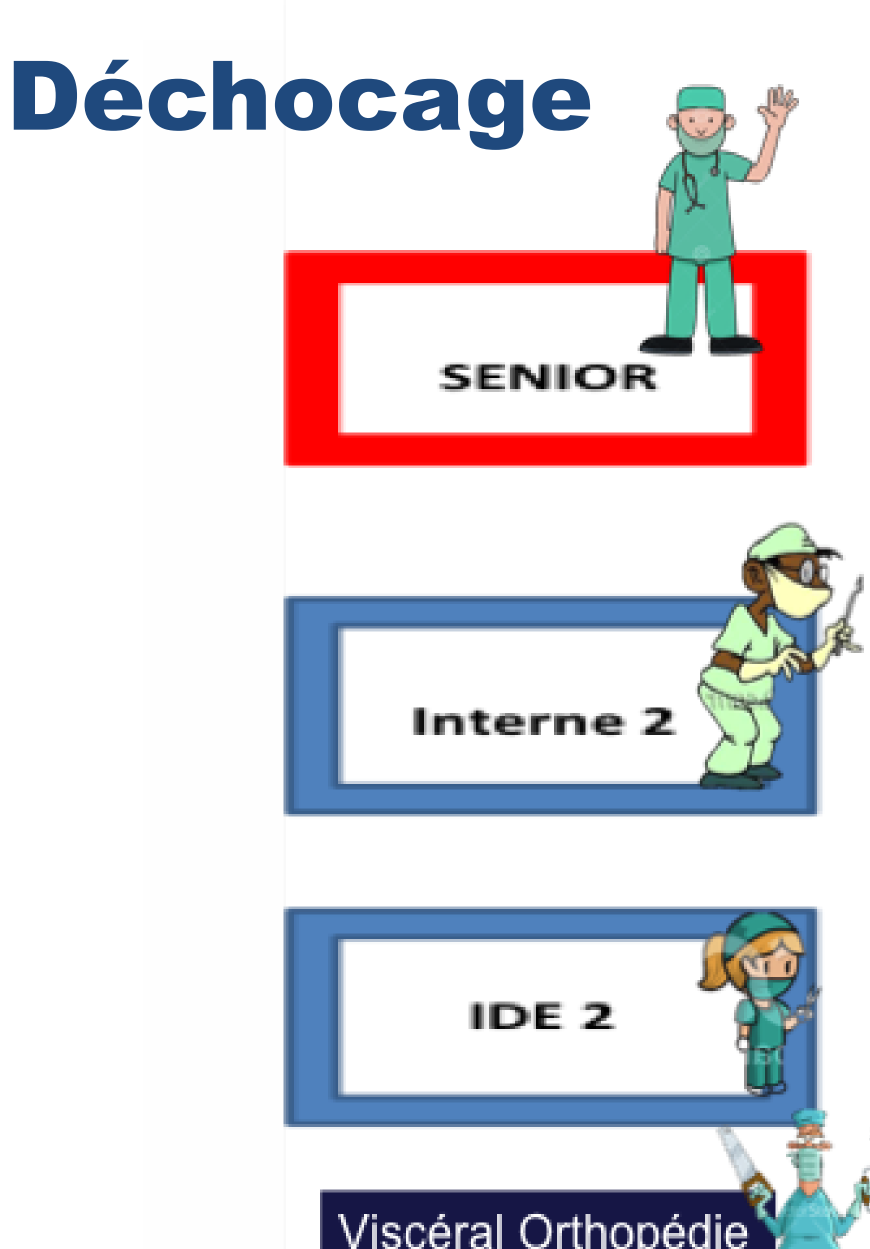
The time following a traumatic injury when prompt medical treatment has the highest likelihood to prevent death

The golden hour in trauma: Dogma or medical folklore?

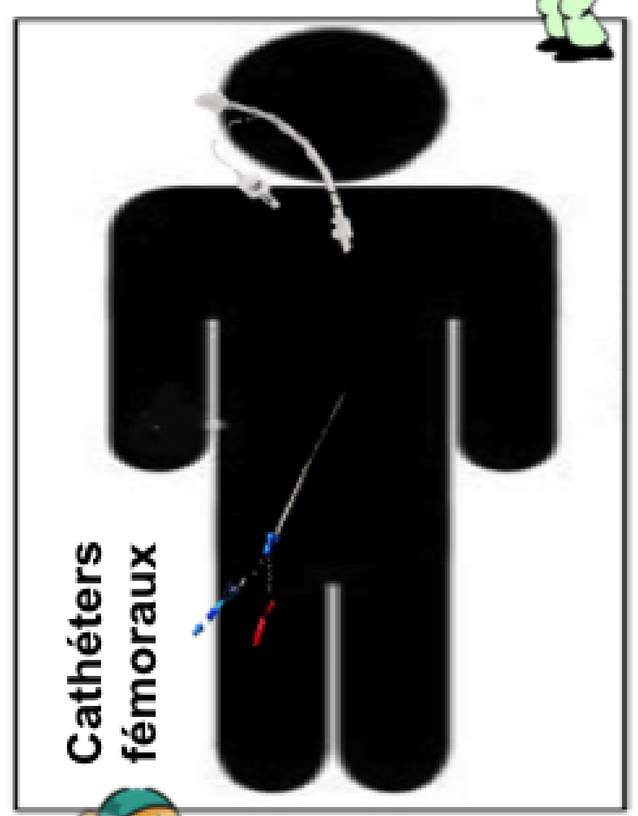
Au total
Chapitre 1

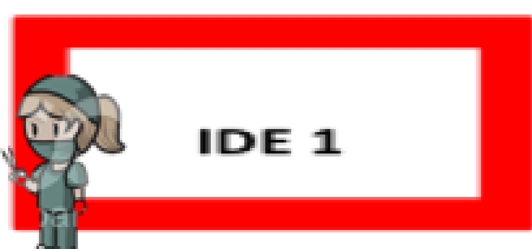
Chapitre 2 : accueil + diagnostic

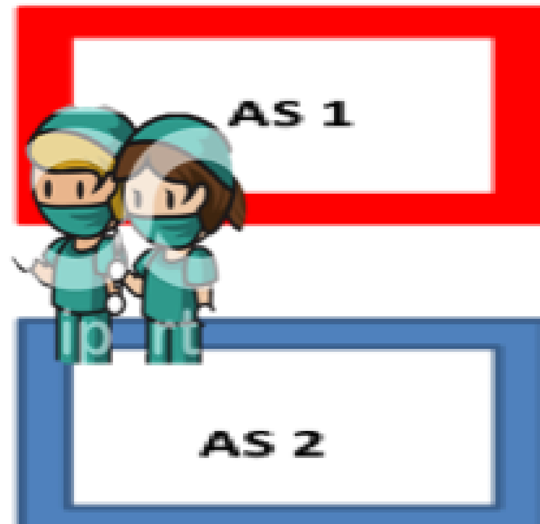
Déchocage



Multidisciplinaire
Multiprofessionnel







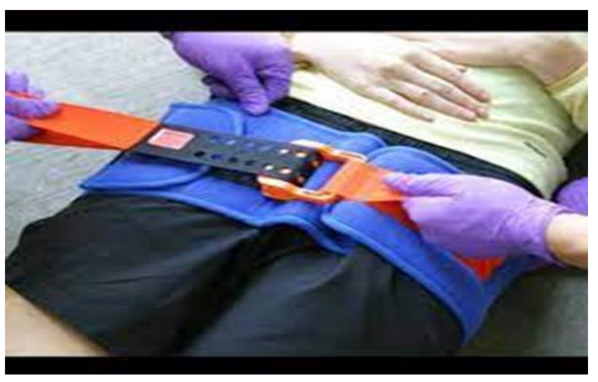
Sur demande
Neurochirurgie Vasculaire

Interférences lésionnelles : 3 types

1) Effet de sommation

2) Effet d’occultation

3) Effet d’amplification



Diagnostic et Thérapeutique

1 objectif

TDM corps entier ??

Intervention urgente ??

La nouvelle arme

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

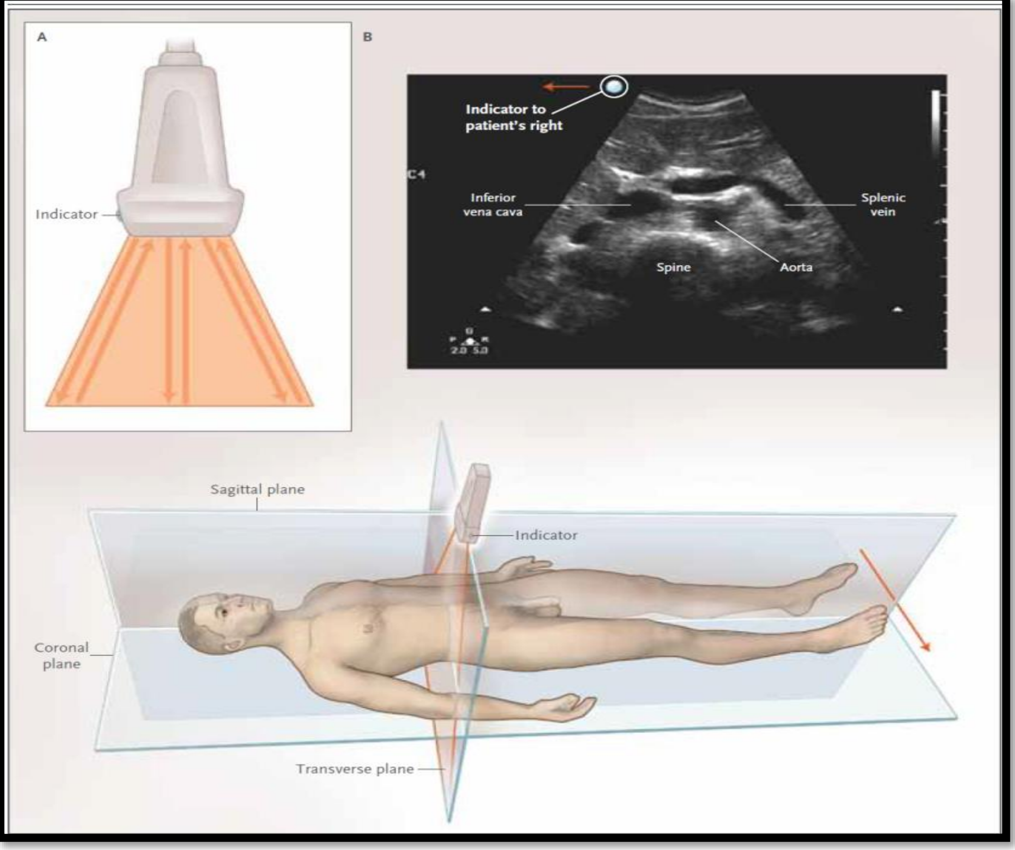
CURRENT CONCEPTS

Point-of-Care Ultrasonography

Christopher L. Moore, M.D., and Joshua A. Copel, M.D.

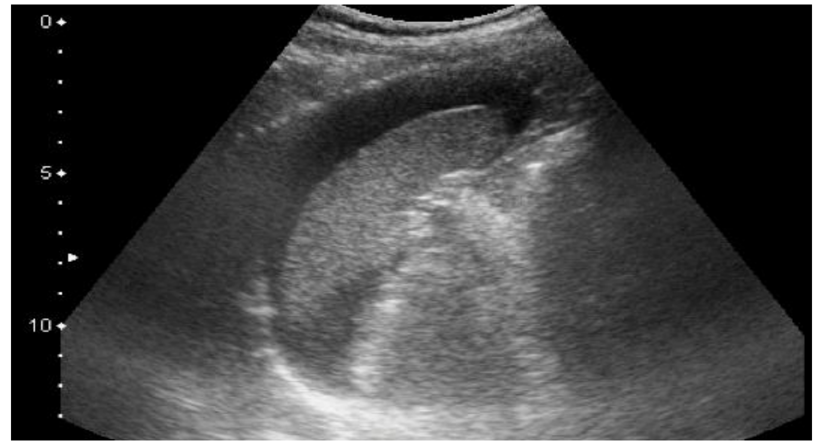
Echographie au lit du patient
Interprétée en temps réel
Par le médecin en charge

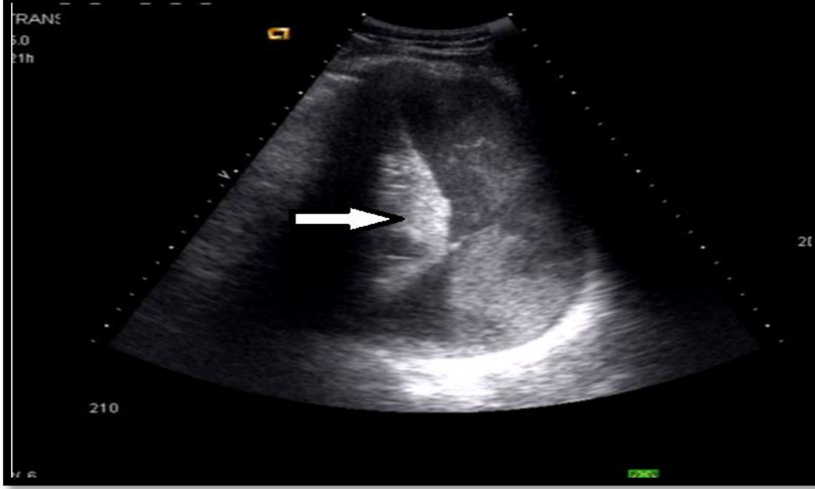
Echo diagnostique
Echo-guidage
Screening / Dépistage

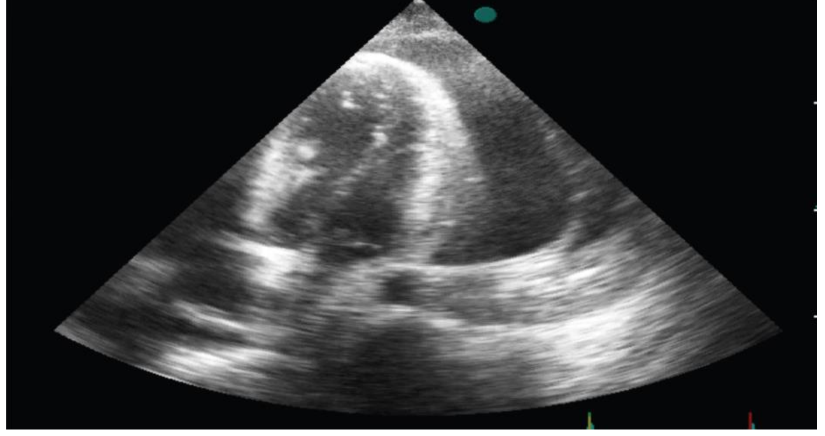


E Fast

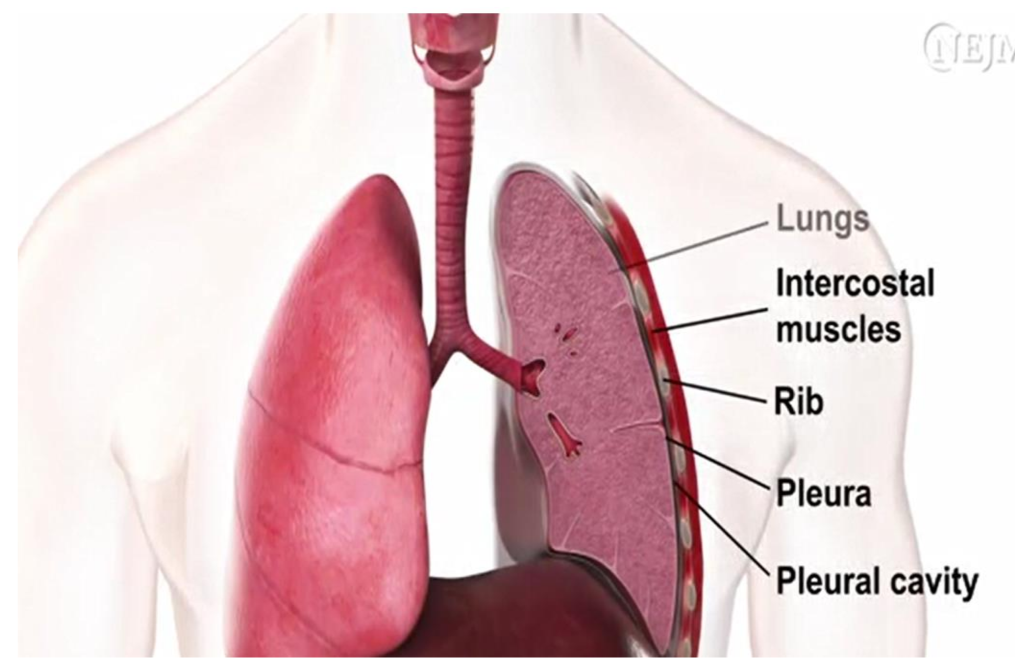
- Objectif : recherche d'un épanchement (Noir, Hypo-échogène)
- Hémopéritoine/péricarde/thorax ??
- Pas de recherche de lésion parenchymateuse ni rétro-péritoine !!

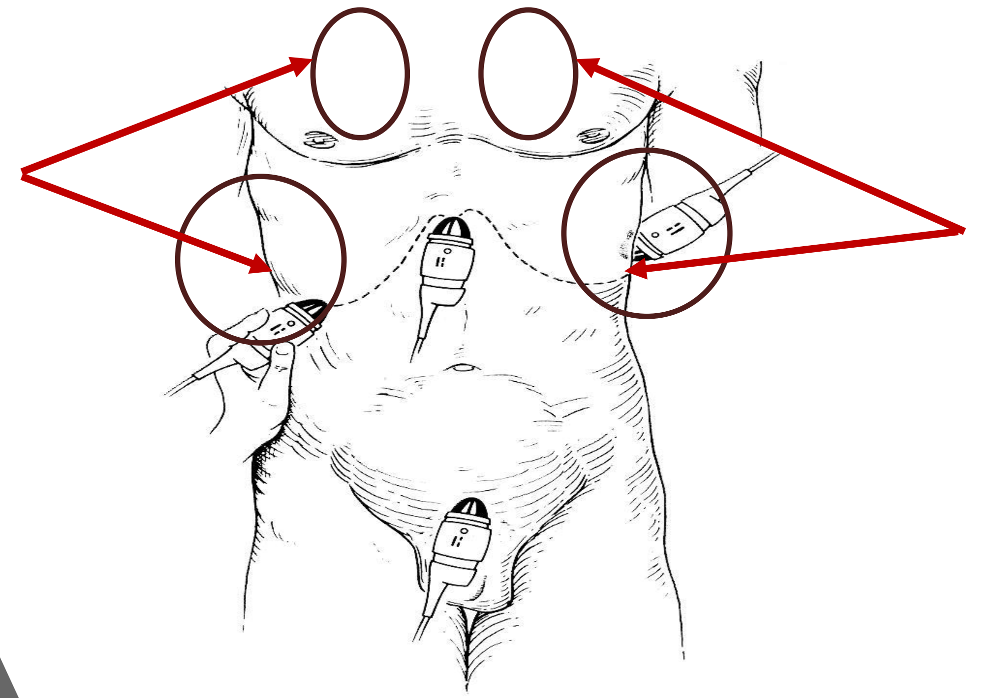




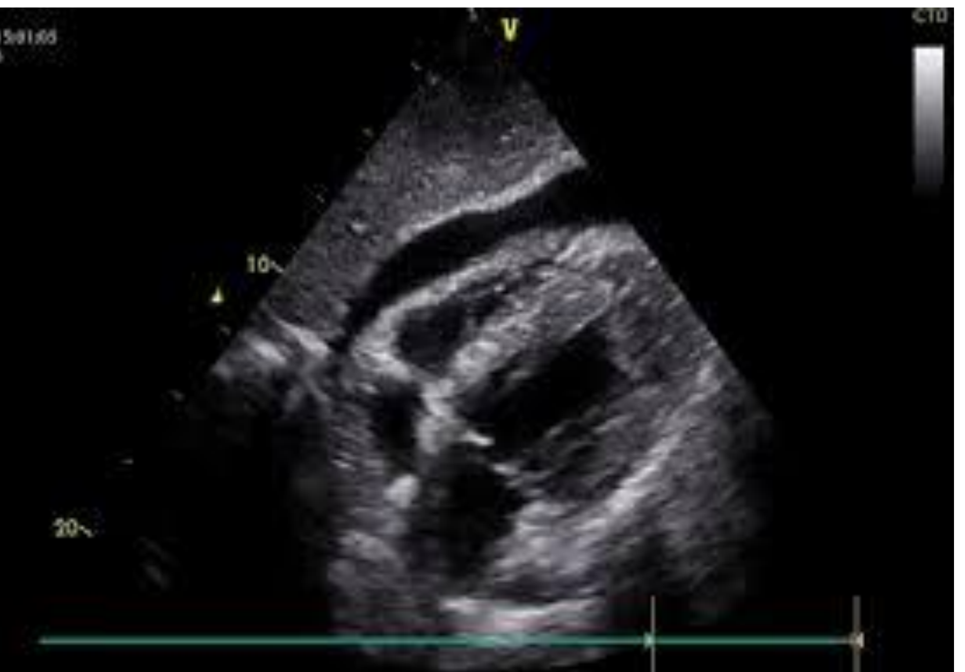


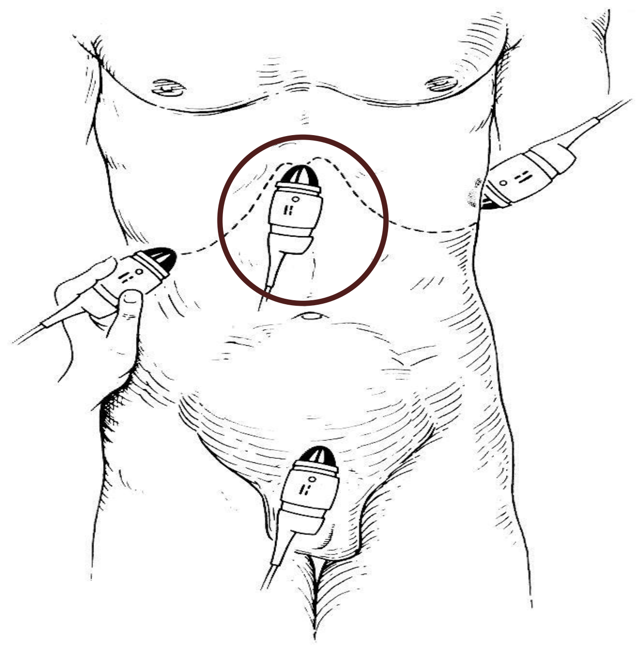
Plèvres



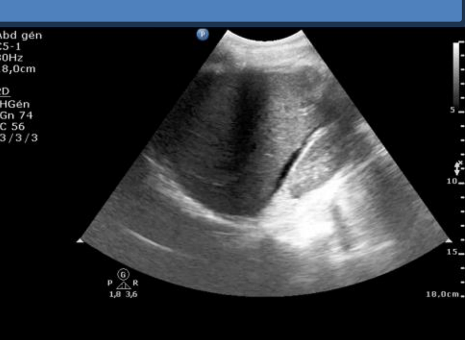


Péricarde





RFE SFAR SFMU



R2.2 – En cas de suspicion de traumatisme abdominal, il est recommandé d'utiliser l'échographie de type FAST en intra-hospitalier pour: (i) affirmer la présence d'un épanchement intra-péritonéal lorsqu'elle est positive ; (ii) éliminer un hémopéritoine supérieur à 500 mL lorsqu'elle est négative.

Grade 1+, (accord FORT)

R2.3 – En cas de suspicion de traumatisme abdominal, il n'est pas recommandé d'utiliser l'échographie de type FAST en pré- ou intrahospitalier pour (i) éliminer une lésion d'organe; (ii) affirmer ou éliminer la présence d'un épanchement rétropéritonéal.

Grade 1-, (accord FORT)

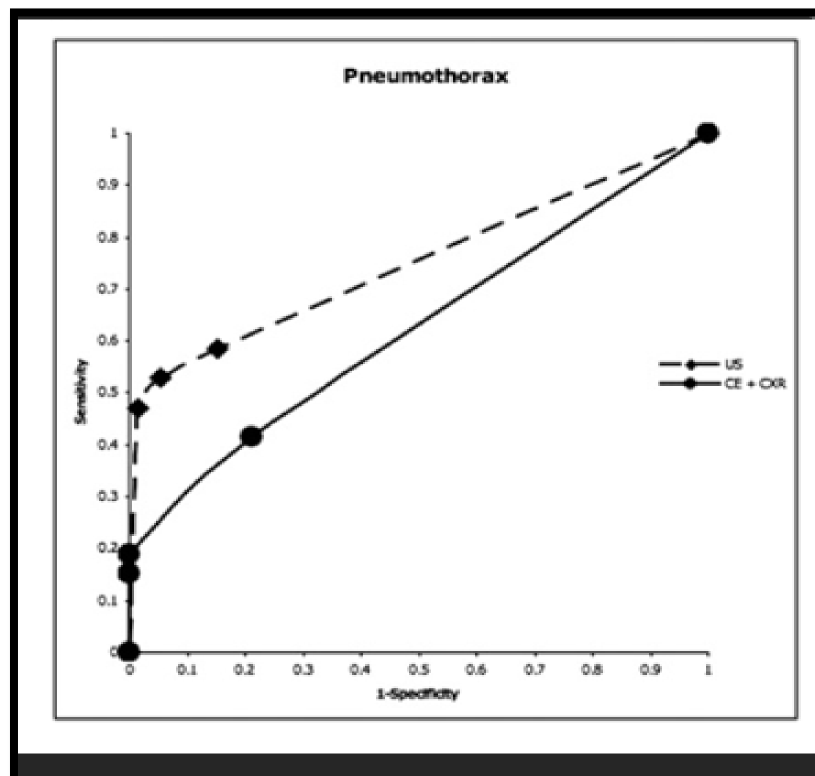
Echo> radio

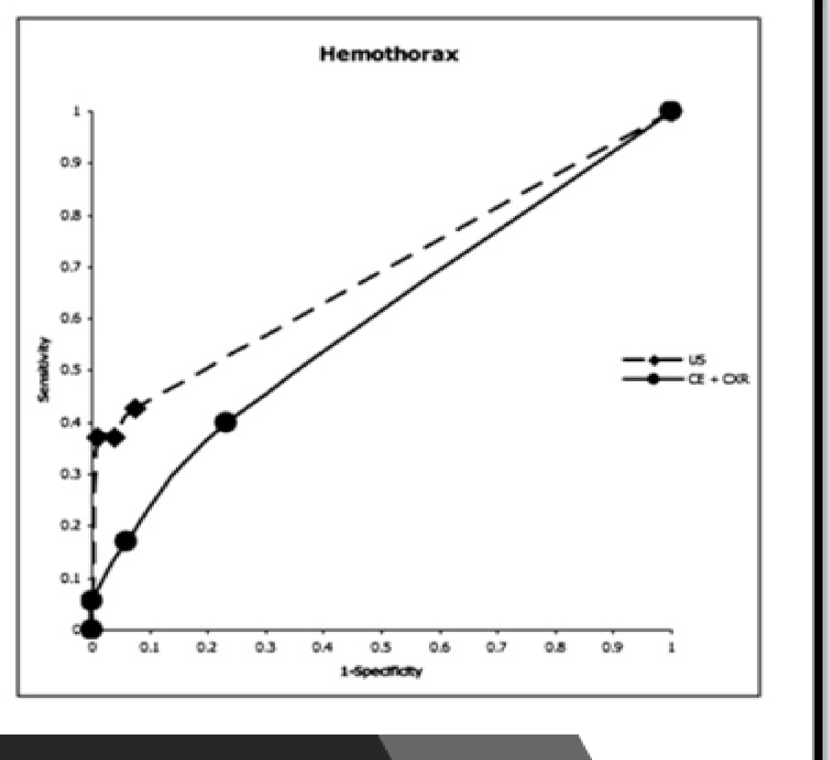
CHEST Original Research

CRITICAL CARE

Diagnostic Accuracy of Ultrasonography in the Acute Assessment of Common Thoracic Lesions After Trauma

Anne-Claire Hyacinthe, MD; Christophe Broux, MD; Gilles Francony, MD; Céline Genty, BSc; Pierre Bouzat, MD; Claude Jacquot, MD; Pierre Albaladejo, MD, PhD; Gilbert R. Ferretti, MD, PhD; Jean-Luc Bosson, MD, PhD; and Jean-François Payen, MD, PhD





Attention traumas pénétrants

Meta-Analysis > J Trauma Acute Care Surg. 2021 Feb 1;90(2):388-395.
doi: 10.1097/TA.0000000000003006.

A meta-analysis of the diagnostic accuracy of chest ultrasound for the diagnosis of occult penetrating cardiac injuries in hemodynamically stable patients with penetrating thoracic trauma

L'absence d'épanchement péricardique ne veut pas dire absence de lésion cardiaque (surtout si présence d'un hémothorax gauche)

Un hémothorax gauche isolé peut être lié à une plaie cardiaque

(trauma pénétrant avec dilacération péricardique)

Au total

Figure 2. Distribution of Appropriate and Inappropriate Course of Action per Type of Action

Inappropriate
Appropriate

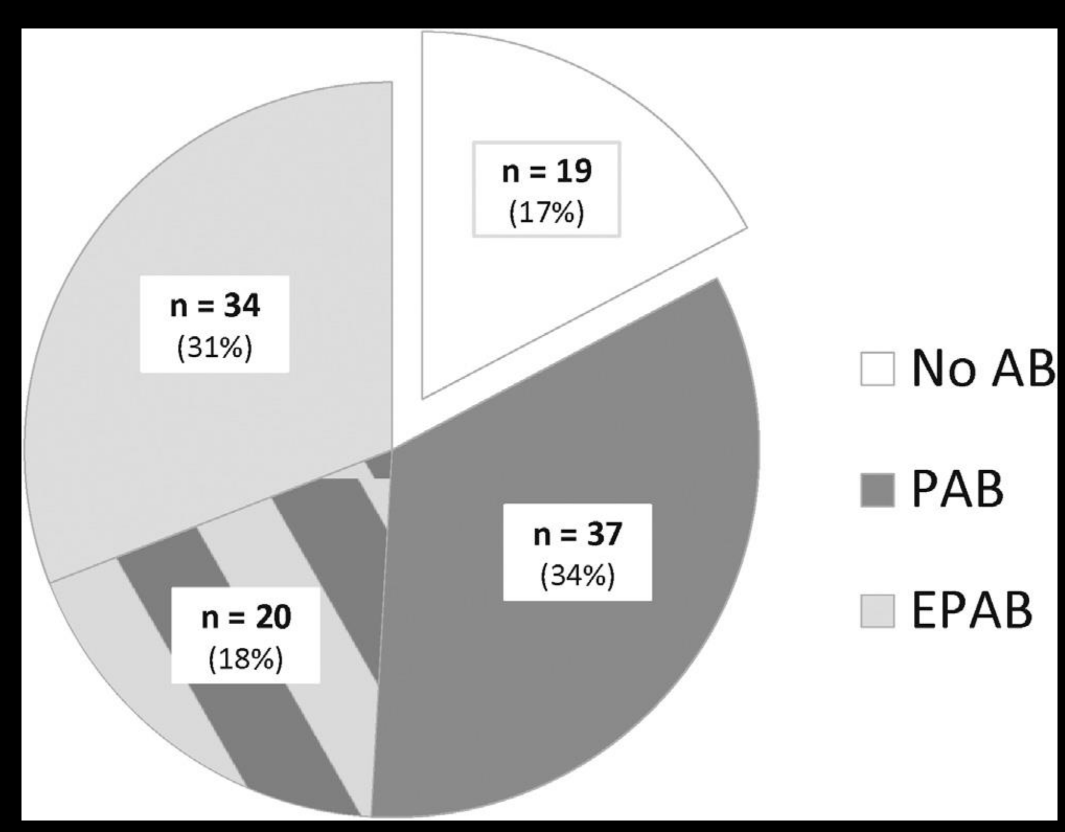
Actions, No.

500
450
400
350
300
250
200
150
100
50
0

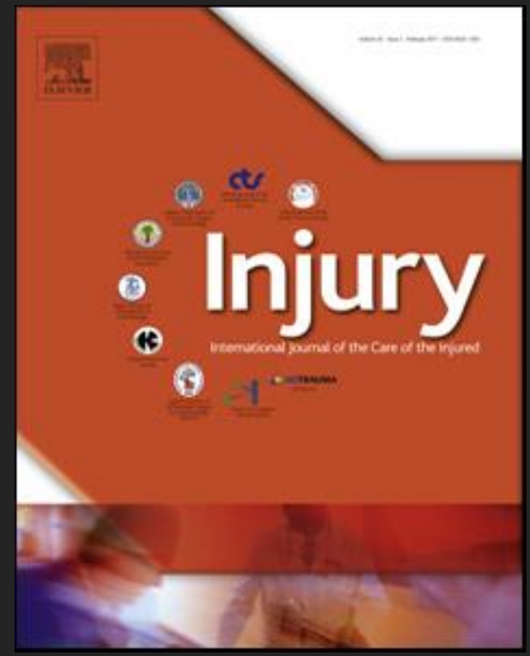
Angioembolization
Thoracotomy
Damage control laparotomy
Pelvic binder
Thoracic decompression
Cerebral blood flow
Abstention from any action
Overall course of action

Actions

Saignement rétropéritonéal = faux positifs



A haemoperitoneum does not indicate active bleeding in the peritoneum in 50% of hypotensive blunt trauma patients: A study of 110 severe trauma patients
J. Charbit et al



Le scanner à tout prix ?

Yeguiayan *et al. Critical Care* 2012, **16**:R101
http://ccforum.com/content/16/3/R101

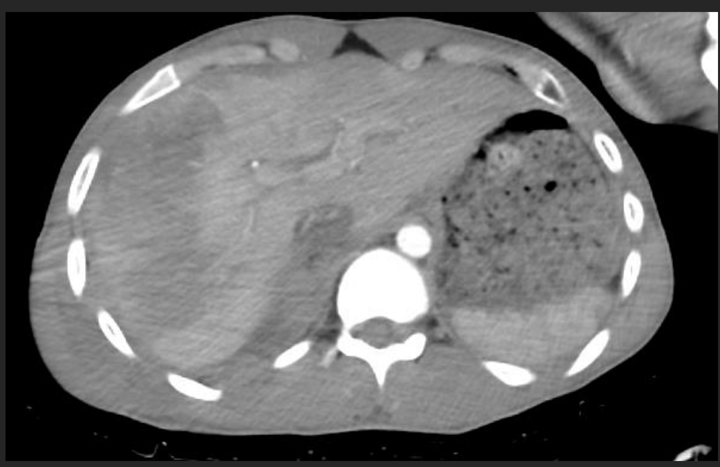
CRITICAL CARE

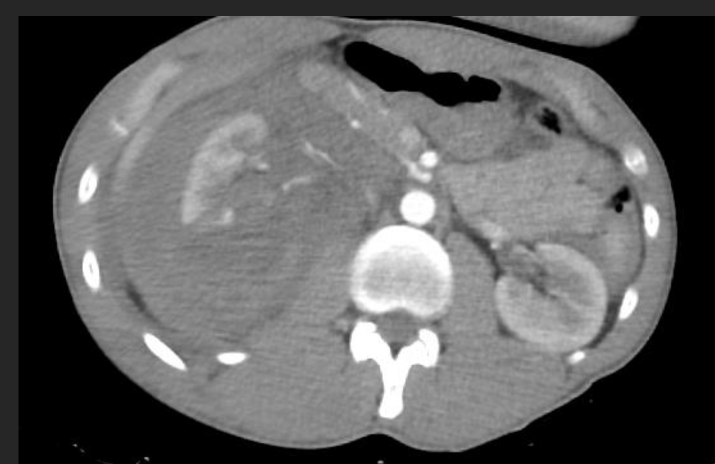
RESEARCH Open Access

Impact of whole-body computed tomography on mortality and surgical management of severe blunt trauma

Jean-Michel Yeguiayan[1,2], Anabelle Yap[2], Marc Freysz[1,2*], Delphine Garrigue[3], Claude Jacquot[4], Claude Martin[5], Christine Binquet[1,6], Bruno Riou[7] and Claire Bonithon-Kopp[1,6], for the FIRST Study Group

Sgt Actif du rein
Pas de Laparo !!!
Artério Rein





RFE SFAR SFMU

Question 4. En cas de traumatisme abdominal, dans quels cas une laparotomie sans délai permet-elle de diminuer la morbi-mortalité ?

Experts : J. Pottecher (SFAR), C. Trésallet (AFC), JA. Long (AFU)

R4 – En cas de traumatisme abdominal associé à un épanchement intra-abdominal abondant, les experts suggèrent de réaliser une laparotomie sans délai lorsque l'état hémodynamique après réanimation initiale du patient n'est pas compatible avec la réalisation d'un scanner injecté.
Avis d'experts

Importance TDM

Effect of the localisation of the CT scanner during trauma resuscitation on survival—A retrospective, multicentre study

Stefan Huber-Wagner [a,*], Carsten Mand [b], Steffen Ruchholtz [b], Christian A. Kühne [b], Konstantin Holzapfel [c], Karl-Georg Kanz [a], Martijn van Griensven [a], Peter Biberthaler [a], Rolf Lefering [d] the TraumaRegister DGU
Committee on Emergency Medicine, Intensive Care and Trauma Management of the German Trauma Society (Sektion NIS)

Hybrid emergency room shows maximum effect on trauma resuscitation when used in patients with higher severity

Umemura, Yutaka MD, PhD; Watanabe, Atsushi MD; Kinoshita, Takahiro MD, MPH; Morita, Natsuhiro MD; Yamakawa, Kazuma MD, PhD; Fujimi, Satoshi MD, PhD
Author Information

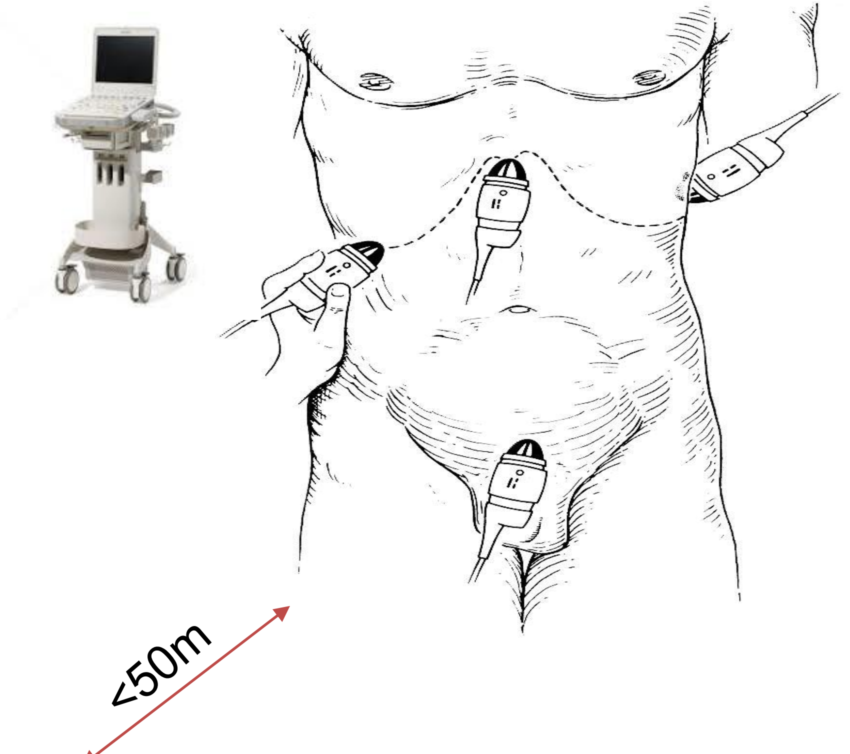
Journal of Trauma and Acute Care Surgery 90(2):p 232-239, February 2021. | DOI: 10.1097/TA.0000000000003020

Standardised Mortality Ratios (SMRs) of the 3 groups (only Level 1 trauma centres, $n = 5664$).

Group	CT in TR (group 1)	CT ≤ 50 m to TR (group 2)	CT > 50 m to TR (group 3)
Mortality	16.5%	17.2%	17.2%
SMR (CI 95%)	0.72 (0.65–0.80)	0.80 (0.74–0.86)	0.92 (0.79–1.04)
p value Group 1 vs. 2	0.130		
p value Group 2 vs. 3		0.080	
p value Group 1 vs. 3	0.005		
p value Group 1 + 2 vs. 3	0.020		

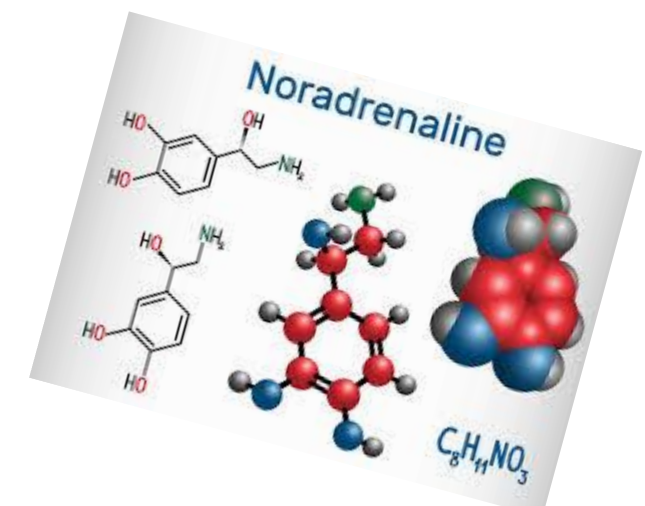
CT computer tomograph; TR trauma room; SMR standardised mortality ratio; CI confidence interval, *t*-test.

Fig. 1. CT-guided management of a major trauma patient with CT in the trauma room.



Au total
Chapitre 2

<50m



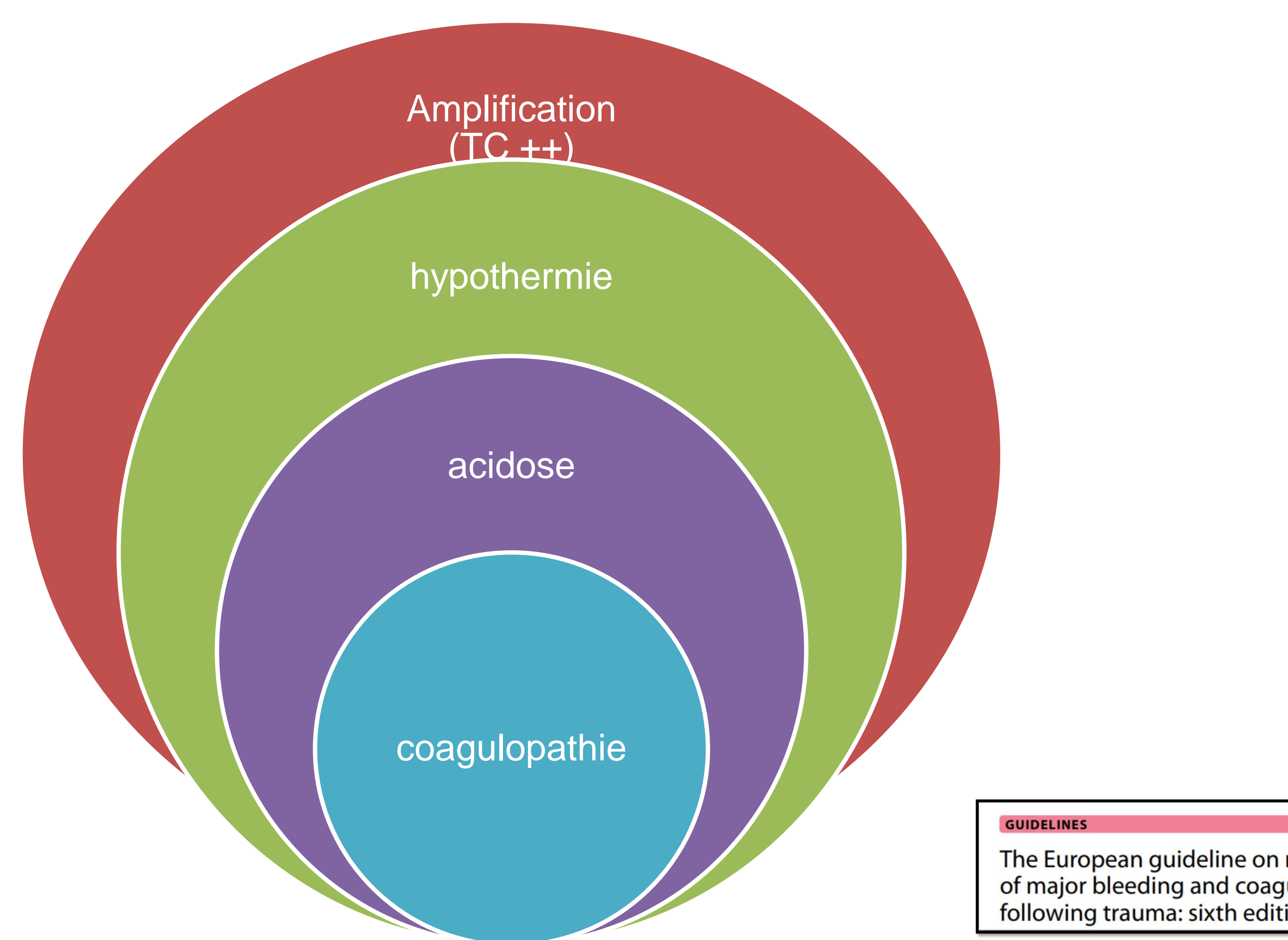
Chapitre 3 : traitement médical

(depuis le pré-hospitalier)

GUIDELINES **Open Access**

The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition

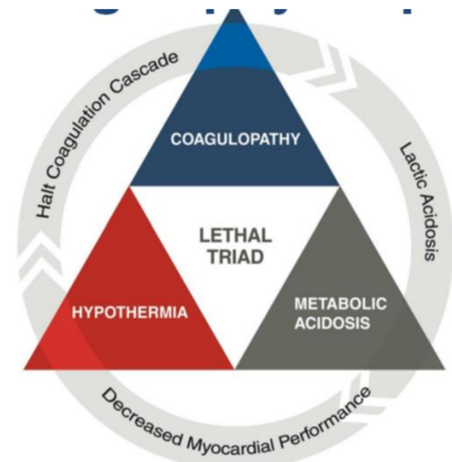
Traitement médical



GUIDELINES Open Access

The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition

Traitement médical : bases



JAMA Network | Open

Original Investigation | Emergency Medicine

Association of Early Norepinephrine Administration With 24-Hour Mortality Among Patients With Blunt Trauma and Hemorrhagic Shock

Small volume resuscitation
Cristalloïdes
Chauffés

PAM > 50-60mmhg
>70-80mmhg si TC

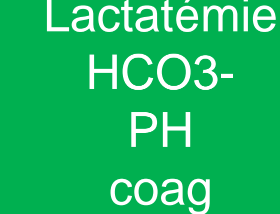
Noradrenaline concomitante si besoin

Contrôle des ACSOS si TC

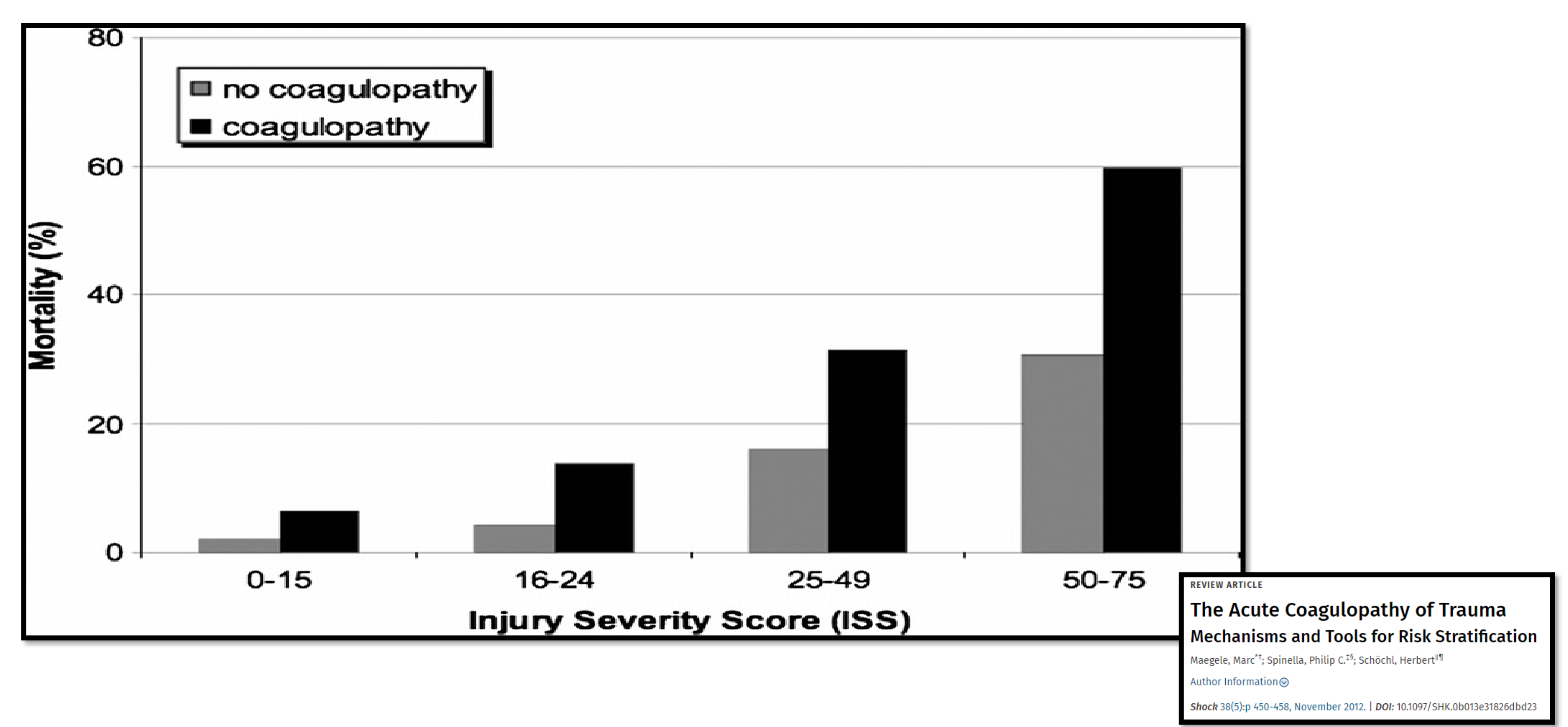
Si transfusion objectif
Hb 70-90g/dl
Plaquettes > 50
TP > 50 sauf TC

THERMO TRAUMA
Le plastron chauffant de secours avec batteries intégrées

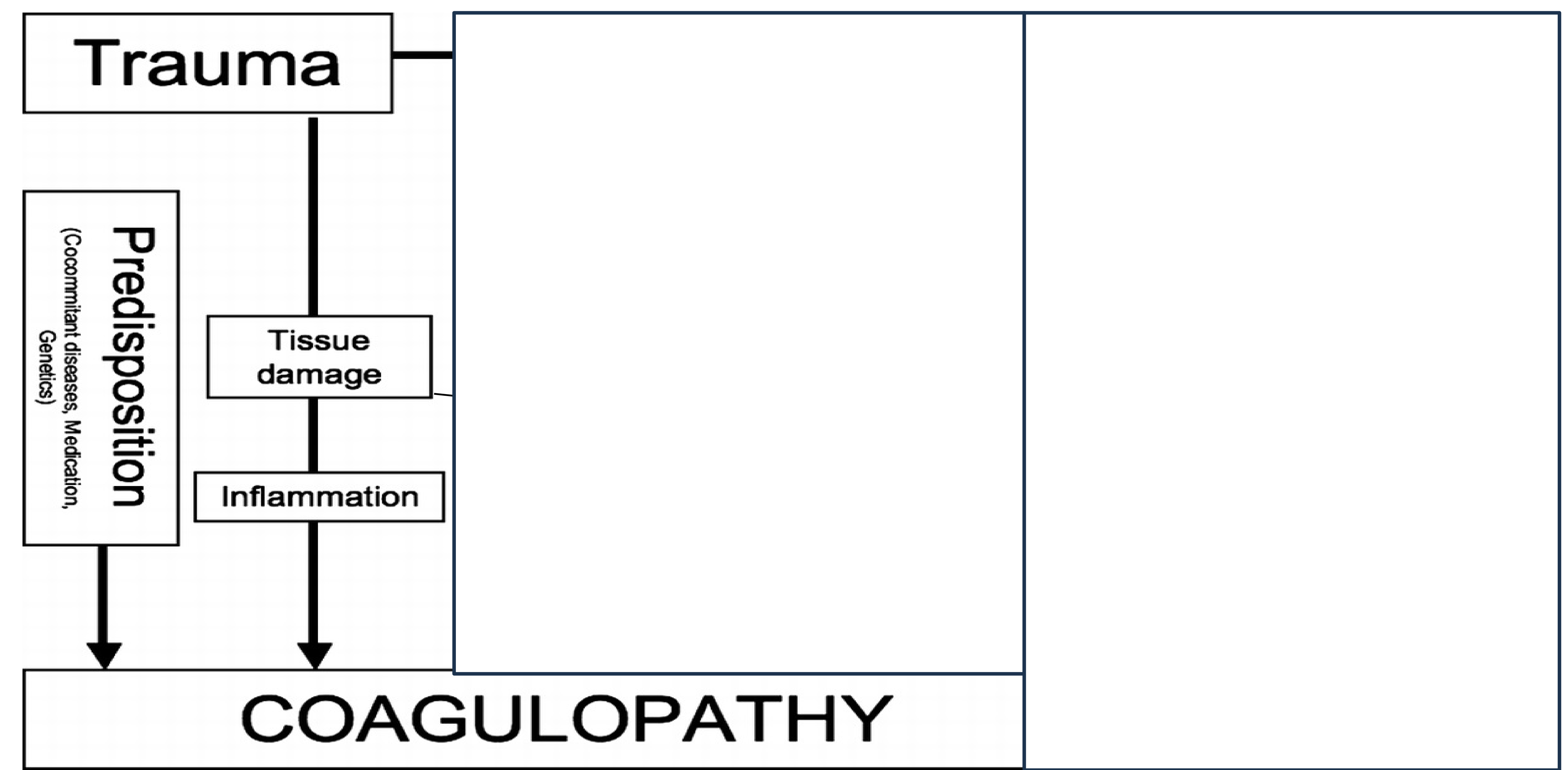
Lactatémie
HCO3-
PH
coag



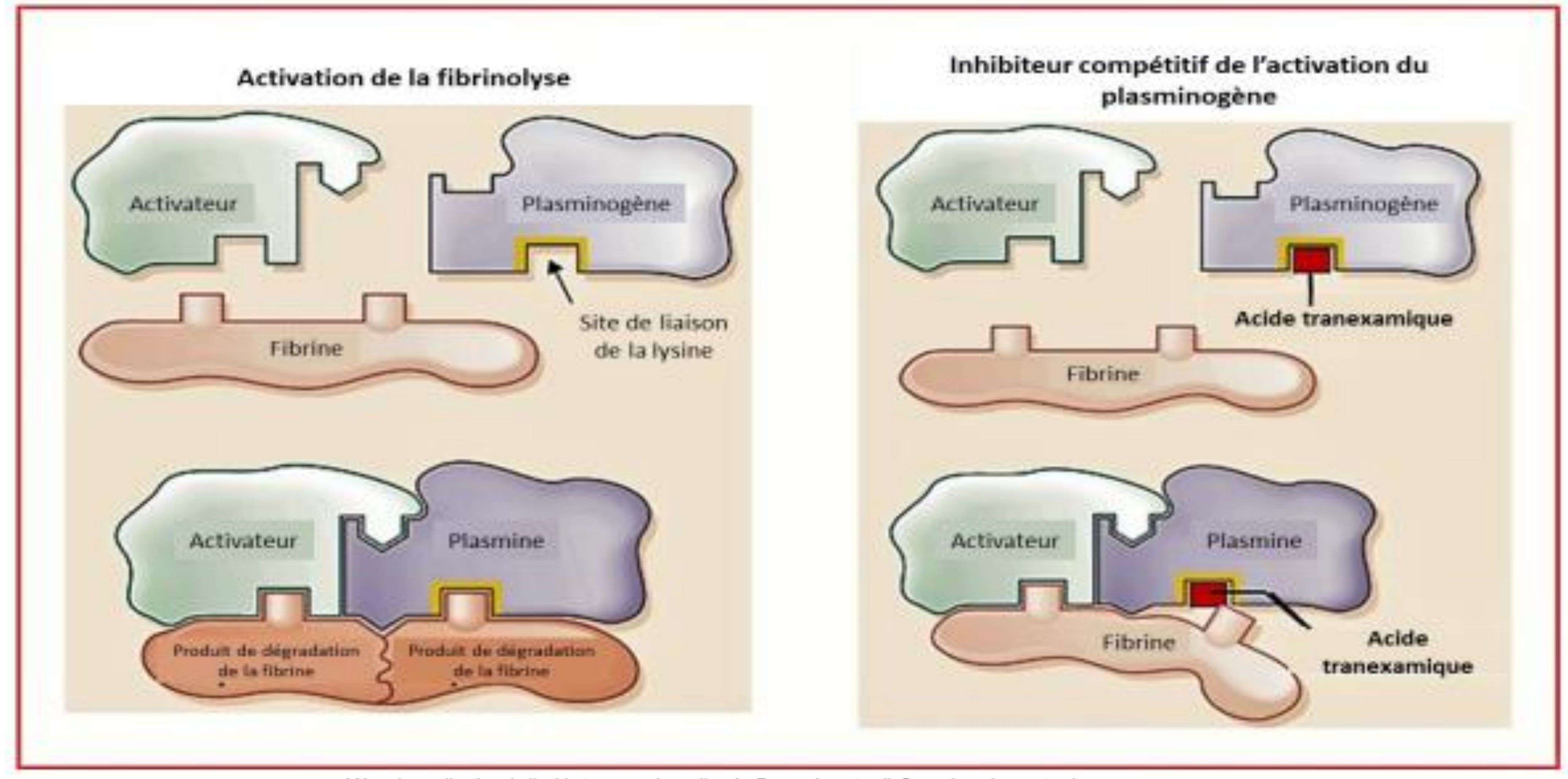
Coagulopathie = INR > 1,2 = mortalité



Coagulopathie



Acide tranexamique



Mécanisme d'action de l'acide tranexamique d'après Rosencher et coll. Sang thrombose et vaisseaux,

Etude Crash 2 (n> 20 000)

RESULTS

	PLACEBO (n = 10067)	TXA (n = 10060)
Risk of death due to bleeding	▲ 16%	▼ 14.5%
All cause mortality	▲ 5.7%	▼ 4.9%

# of Patients: 0, 825, 1650

Legend: Any cause of death · Bleeding

- TXA **did not** significantly **reduce** the need for **blood transfusions**
- TXA **does not increase risk** of vascular occlusive events
- Early TXA can **reduce** the risk of **death from** hemorrhage
- TXA significantly **reduces** all cause **mortality**

Acide tranexamique
Effet temps dépendant

The importance of early treatment with tranexamic acid in bleeding trauma patients: an exploratory analysis of the CRASH-2 randomised controlled trial

The CRASH-2 collaborators*

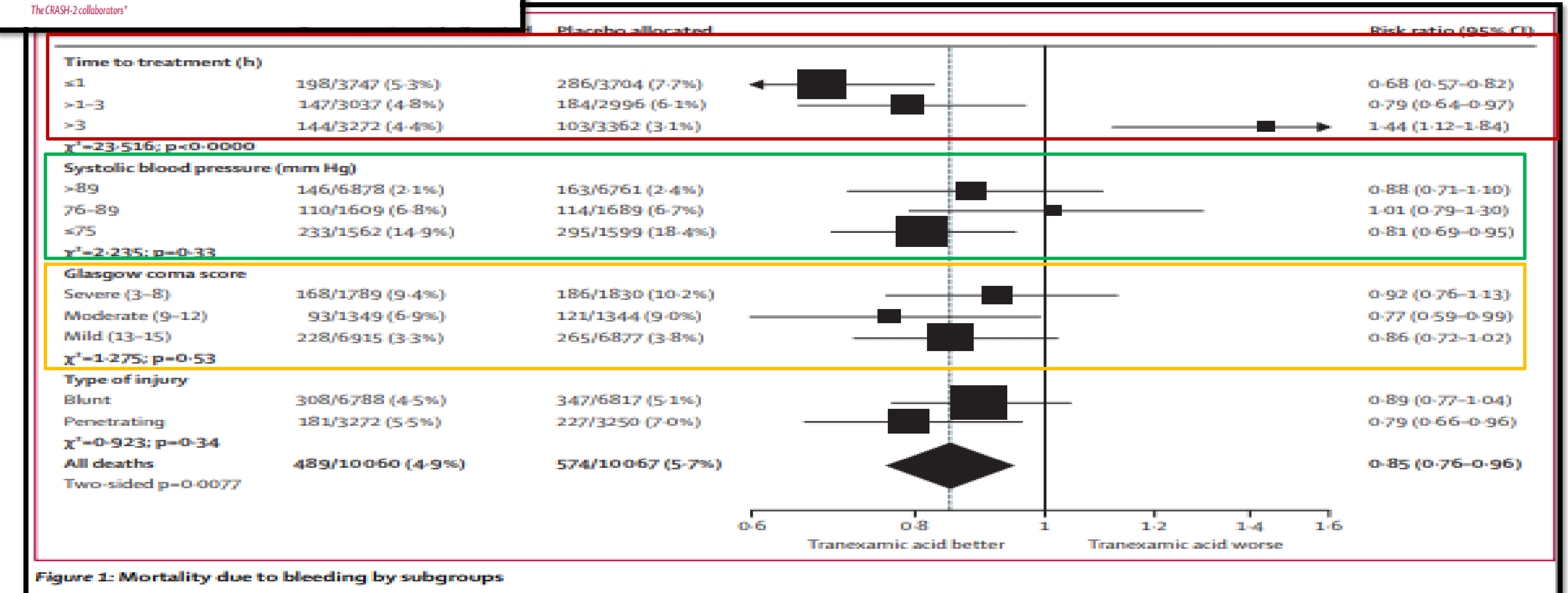
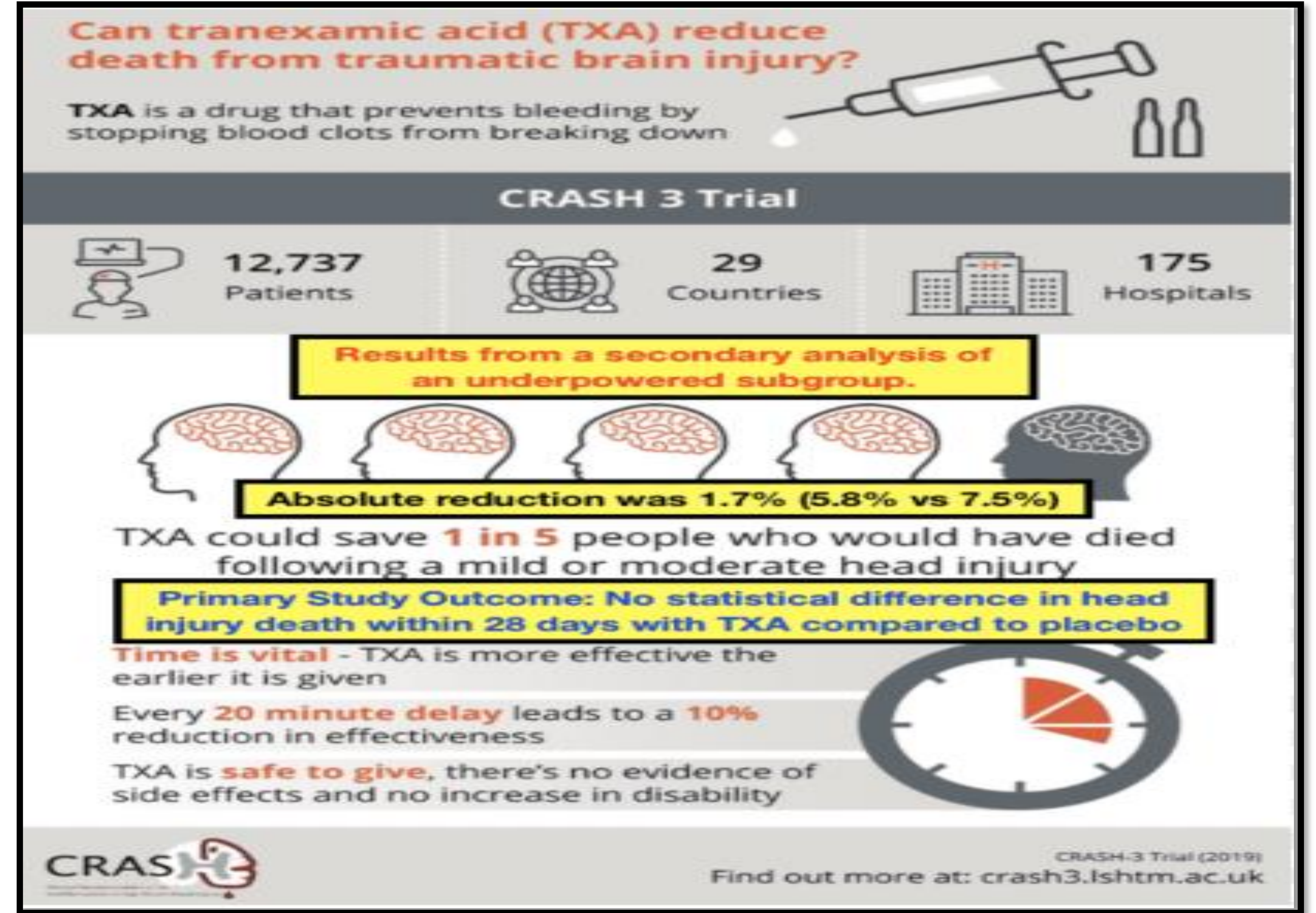
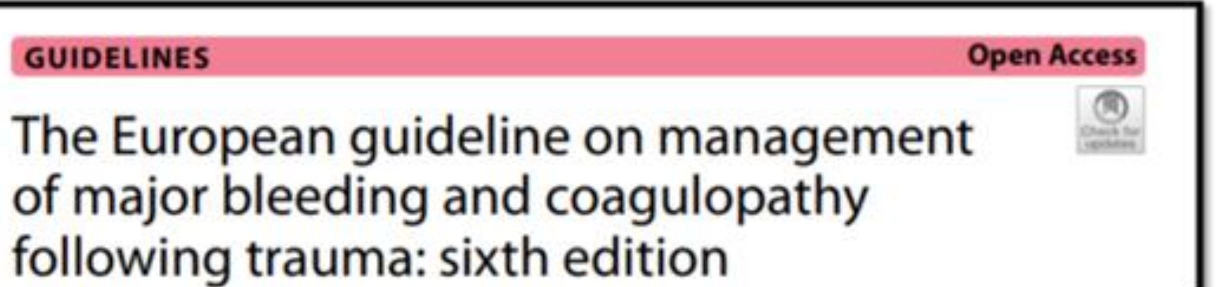


Figure 1: Mortality due to bleeding by subgroups

Acide tranexamique avec TC isolé



Acide tranexamique



GUIDELINES Open Access

The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition

Recommendation 23

TG avec saignement ou risque de saignement,

Le plus tôt possible < 3h

Ne pas attendre test de coag

1g bolus puis 1g/8h

Grade 1a

Stratégie transfusionnelle initiale

Précoce

Anticipation

Protocolisée

Ratio PFC/CGR > ½

Ratio plaquettes CGR entre ¼ et 1/8

Anticipation : red flag activation

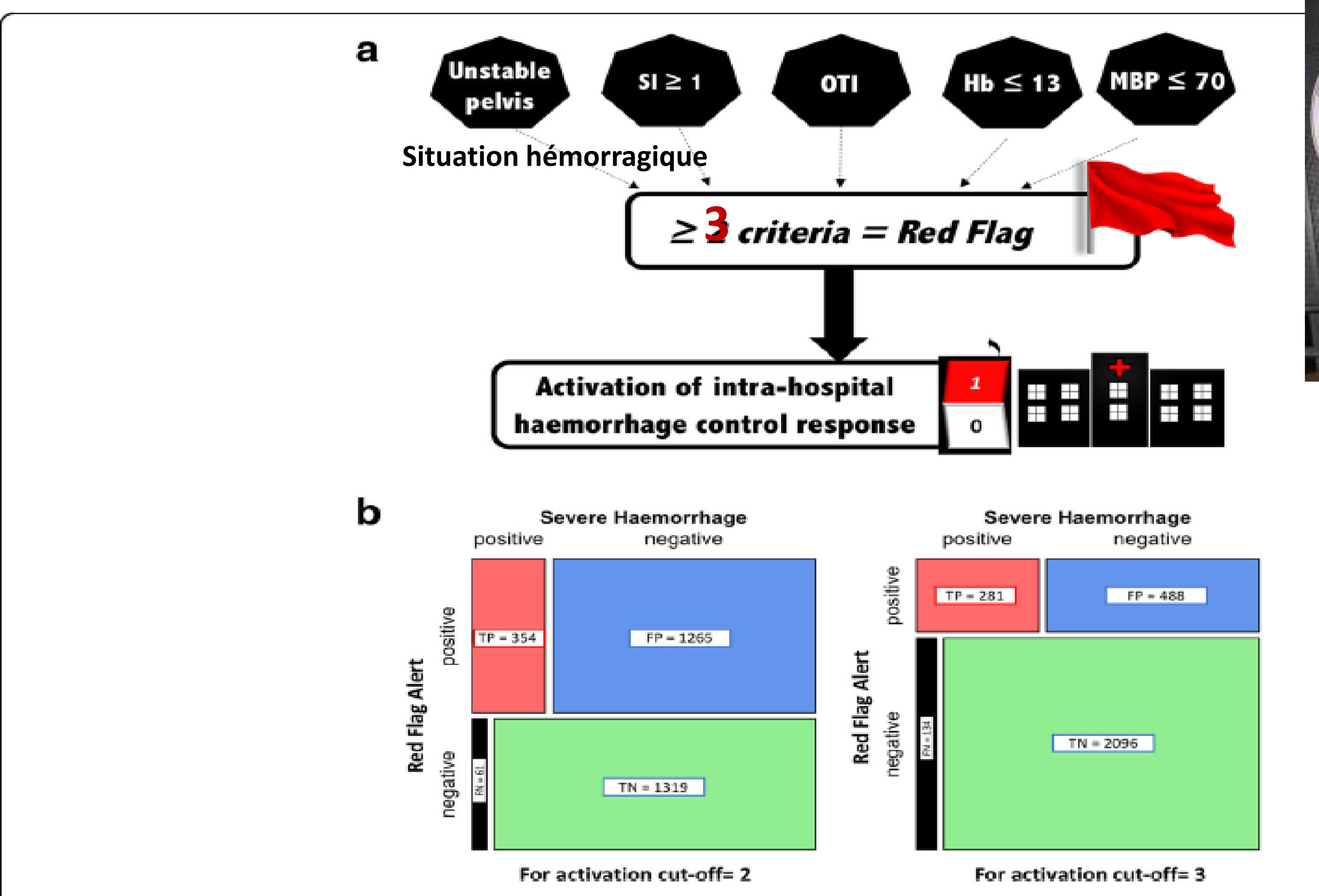


Fig. 3 a Red Flag alert. **b** Contingency mosaic according to threshold of activation. FN false negative, FP false positive, Hb haemoglobin MBP mean arterial blood pressure, OTI Oro-tracheal intubation, SI Shock Index, TN true negative, TP true positive

I love Plasma

Original Investigation FREE

February 3, 2015

Transfusion of Plasma, Platelets, and Red Blood Cells in a 1:1:1 vs a 1:1:2 Ratio and Mortality in Patients With Severe Trauma

The PROPPR Randomized Clinical Trial

John B. Holcomb, MD[1]; Barbara C. Tilley, PhD[2]; Sarah Baraniuk, PhD[2]; et al

» Author Affiliations | Article Information

JAMA. 2015;313(5):471-482. doi:10.1001/jama.2015.12

Original Investigation ONLINE ONLY FREE

December 18, 2019

Association of Prehospital Plasma Transfusion With Survival in Trauma Patients With Hemorrhagic Shock When Transport Times Are Longer Than 20 Minutes

A Post Hoc Analysis of the PAMPer and COMBAT Clinical Trials

Anthony E. Pusateri, PhD[1]; Ernest E. Moore, MD[2]; Hunter B. Moore, MD, PhD[2]; et al

» Author Affiliations | Article Information

JAMA Surg. 2020;155(2):e195085. doi:10.1001/jamasurg.2019.5085

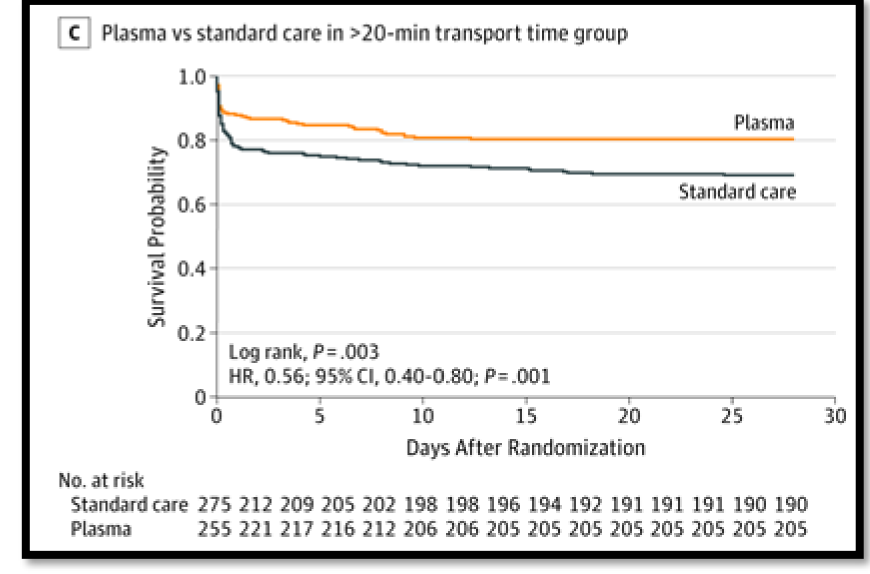
Pas de différence de mortalité

Mais

Moins d'exsanguination

Plus d'hémostase

Pas plus de complications



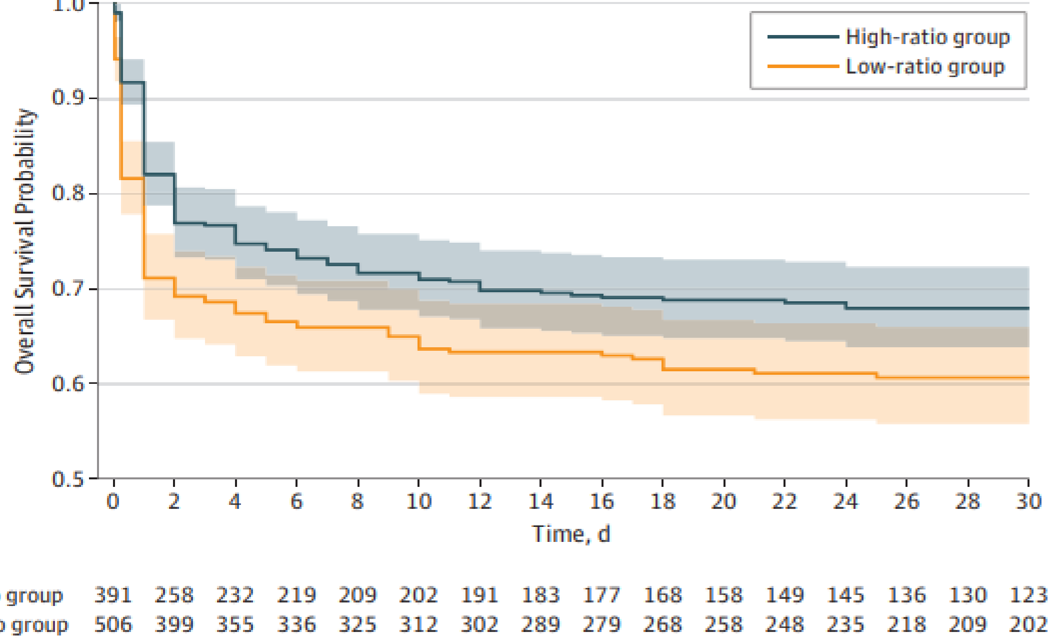
I love plasma

Original Investigation | Surgery

Association of Early, High Plasma-to-Red Blood Cell Transfusion Ratio With Mortality in Adults With Severe Bleeding After Trauma

Florian Roquet, MD; Arthur Neuschwander, MD; Sophie Hamada, MD; Gersende Favé, MD; Arnaud Follin, MD; David Marrache, MD; Bernard Cholley, MD, PhD; Romain Pirracchio, MD, PhD; for the Traumabase Group

Figure 2. Kaplan-Meier Survival Curves for the Probability of Survival During the First 30 Days Following Hospital Admission According to the Transfusion Ratio Used During the First 6 Hours



Ratio > 1/1,5

High ratio indicates a fresh frozen plasma to packed red blood cells ratio of more than 1:1.5; low ratio, 1:1.5 or less. Shaded areas around curves represent 95% CIs. Log-rank test for 30-day survival, *P* = .006.

Concentrés pro-thrombiniques : NON

Original Investigation | Caring for the Critically Ill Patient

March 21, 2023

Efficacy and Safety of Early Administration of 4-Factor Prothrombin Complex Concentrate in Patients With Trauma at Risk of Massive Transfusion

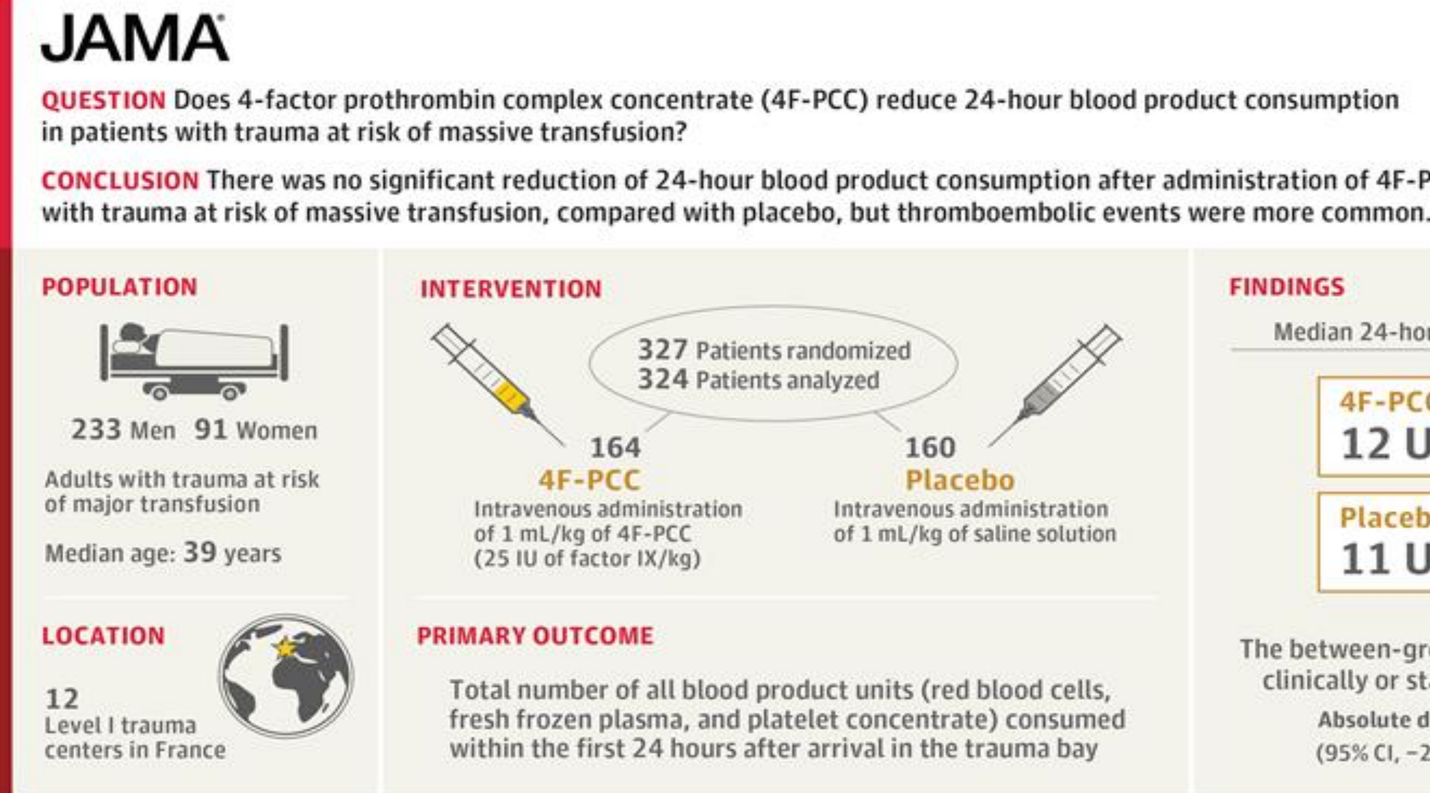
The PROCOAG Randomized Clinical Trial

Pierre Bouzat, MD, PhD[1]; Jonathan Charbit, MD[2]; Paer-Selim Abback, MD[3]; et al

» Author Affiliations | Article Information

JAMA. 2023;329(16):1367-1375. doi:10.1001/jama.2023.4080

Sauf si tt AVK et hémorragie



Stratégie transfusionnelle secondaire

Guidée sur objectifs !

Tests classiques ou viscoélastiques

Plasma si INR > 1,5

Fibrinogène si <1,5g/l

Chlorure de Ca^{2+} si Calcium ionisé <1,1mmol/l

Plaquettes 50G/l (100 si TC)

L’avenir : sang total ?

Original Investigation

FREE

January 18, 2023

Association of Whole Blood With Survival Among Patients Presenting With Severe Hemorrhage in US and Canadian Adult Civilian Trauma Centers

Crisanto M. Torres, MD, MPH[1,2]; Alistair Kent, MD, MPH[3]; Dane Scantling, DO, MPH[2]; et al

Author Affiliations | Article Information

JAMA Surg. 2023;158(5):532-540. doi:10.1001/jamasurg.2022.6978

TG multi transfusé US Canada
Rétrospectif 430 VS 2350p
Association réduction mortalité

Original Investigation

ONLINE FIRST

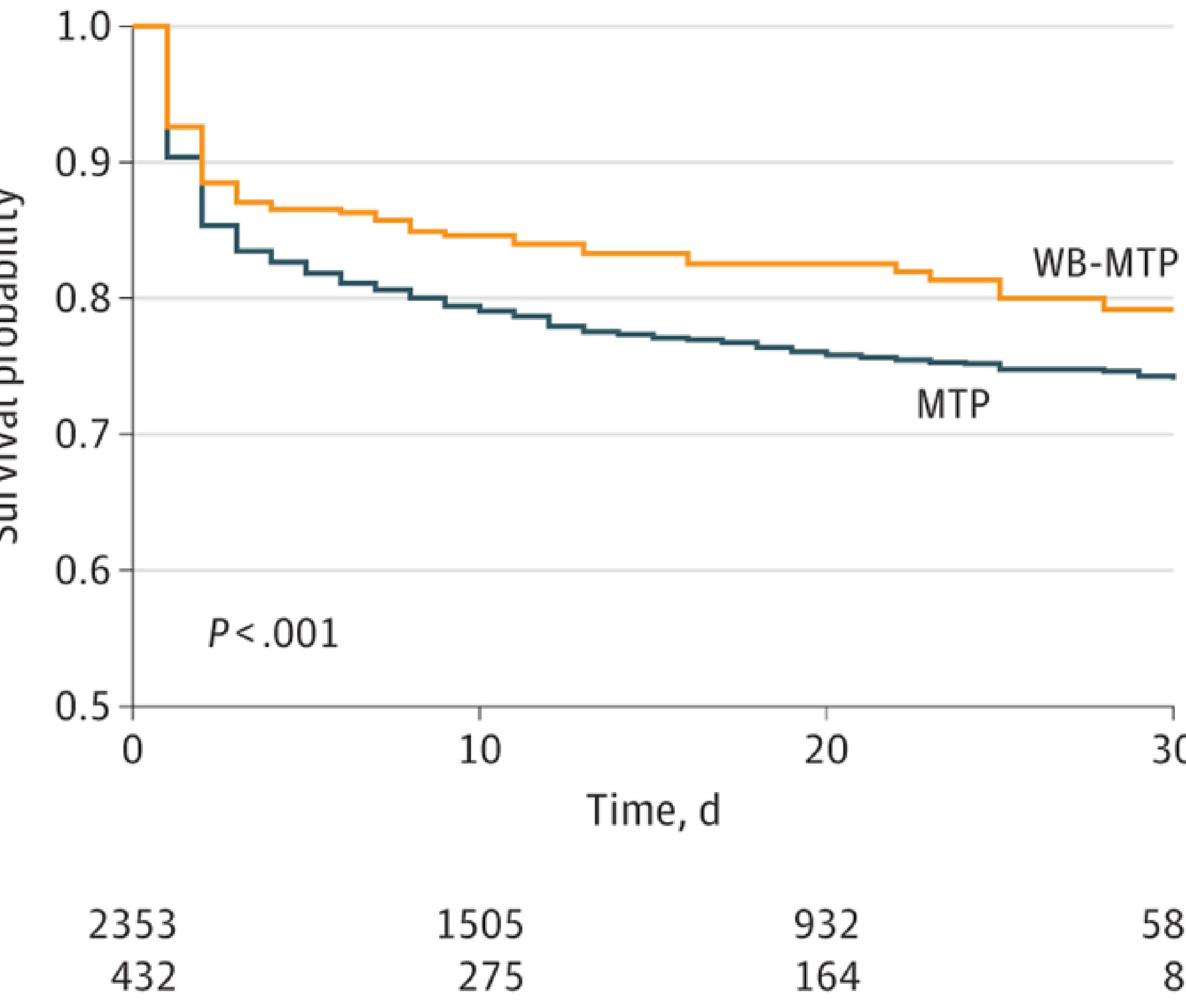
January 31, 2024

Timing to First Whole Blood Transfusion and Survival Following Severe Hemorrhage in Trauma Patients

Crisanto M. Torres, MD, MPH[1]; Kelly M. Kenzik, PhD[1]; Noelle N. Saillant, MD[1]; et al

Author Affiliations | Article Information

JAMA Surg. Published online January 31, 2024. doi:10.1001/jamasurg.2023.7178



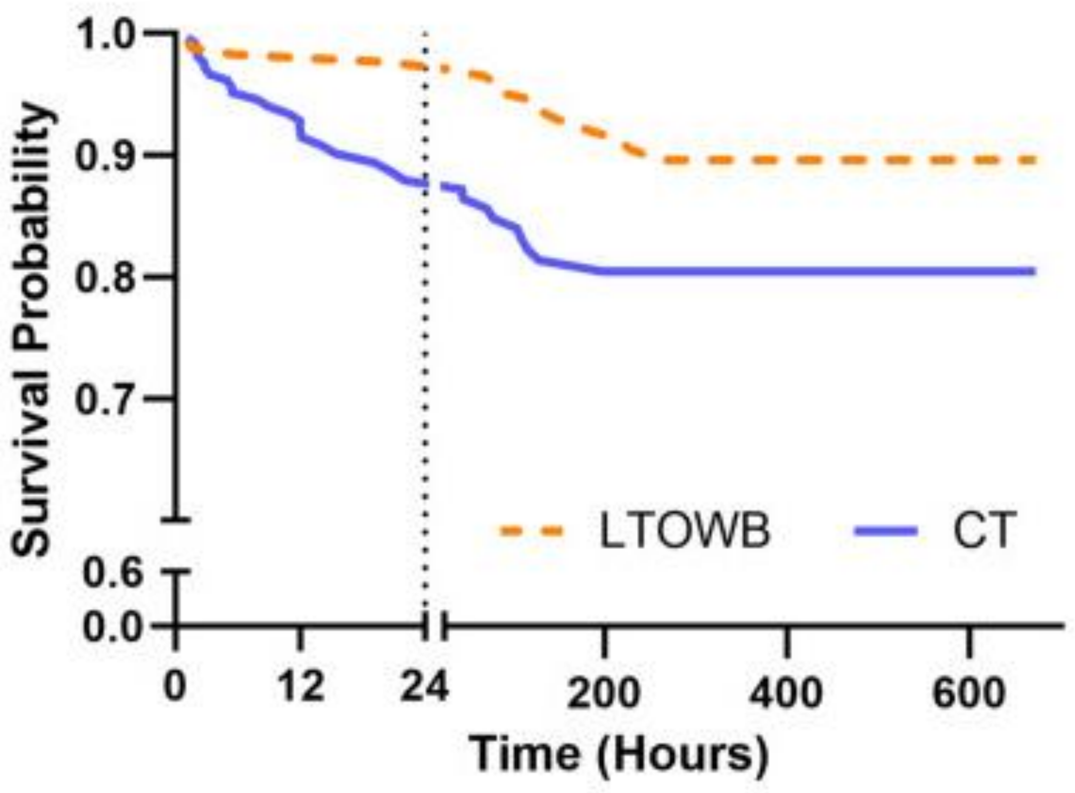
L'avenir : sang total ?

Journal of Thrombosis and Haemostasis
Volume 22, Issue 1, January 2024, Pages 140-151

Original Article

Doing more with less: low-titer group O whole blood resulted in less total transfusions and an independent association with survival in adults with severe traumatic hemorrhage

Susan M. Shea [1 2], Emily P. Mihalko [1], Liling Lu [1], Kimberly A. Thomas [3], Douglas Schuerer [4], Joshua B. Brown [1], Grant V. Bochicchio [4], Philip C. Spinella [1 5]



Ajusté sur ISS age, GCS, Plaquettes, solidité caillot

L'avenir : sang total ?

Outcomes of Transfusion With Whole Blood, Component Therapy, or Both in Adult Civilian Trauma Patients: A Systematic Review and Meta-Analysis

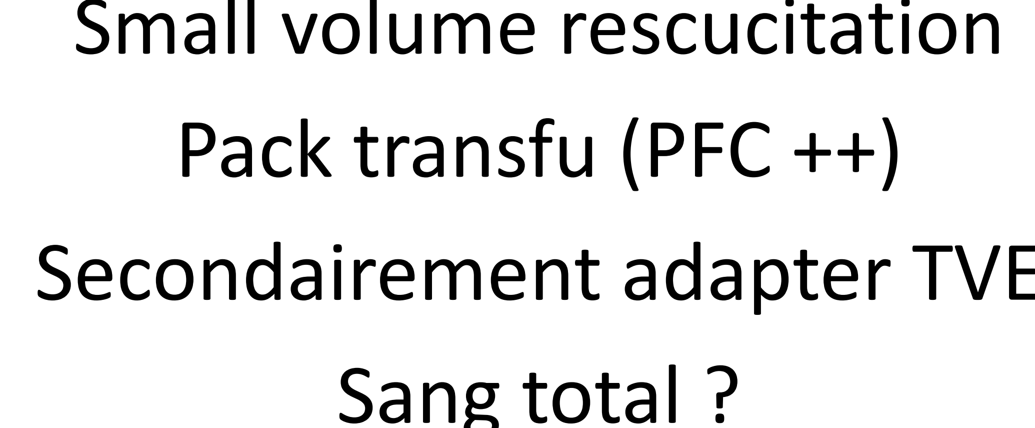
Micah Ngatuvai, MBA,[a] Israel Zagales, MD,[b] Matthew Sauder, BS,[a] Ryan Andrade, BS,[c] Radleigh.G. Santos, PhD,[d] Tracy Bilski, MD, FACS,[e,f] Lucy Kornblith, MD, FACS,[g,h] and Adel Elkbuli, MD, MPH, MBA[e,f,]*

Table 2 – Mortality outcomes for WB and COMP therapy versus COMP therapy alone and WB versus COMP therapy.

Endpoint	N	RR	CI LB	CI UB
WB and COMP versus COMP				
24-h	2	1.40	1.10	1.78
30-day	3	0.93	0.79	1.10
WB versus COMP				
24-h	5	1.11	0.73	1.68
30-day	3	0.90	0.69	1.16

Problèmes à résoudre :
approvisionnement, stockage, allo immunisation des femmes Rh- etc
études en cours

Au total chapitre 3



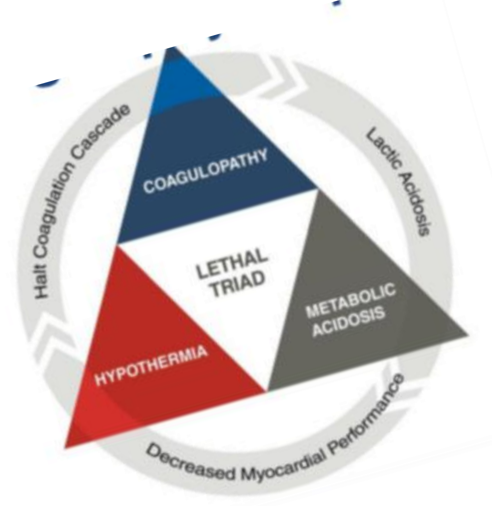
Triade létale

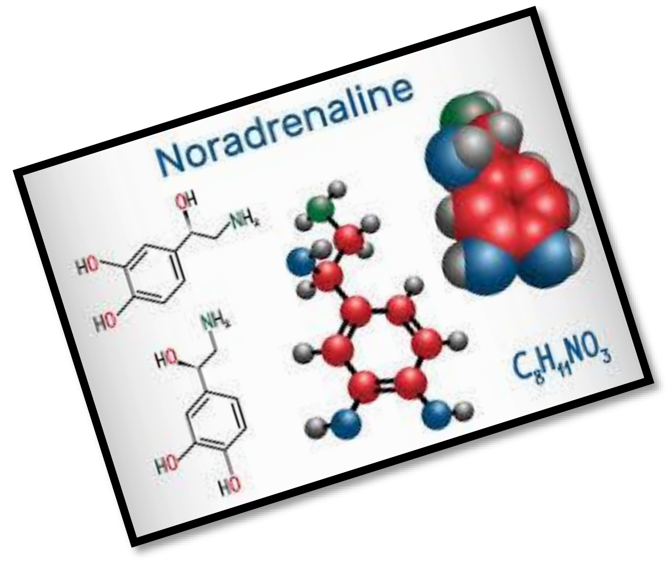
Small volume rescucitation

Pack transfu (PFC ++)

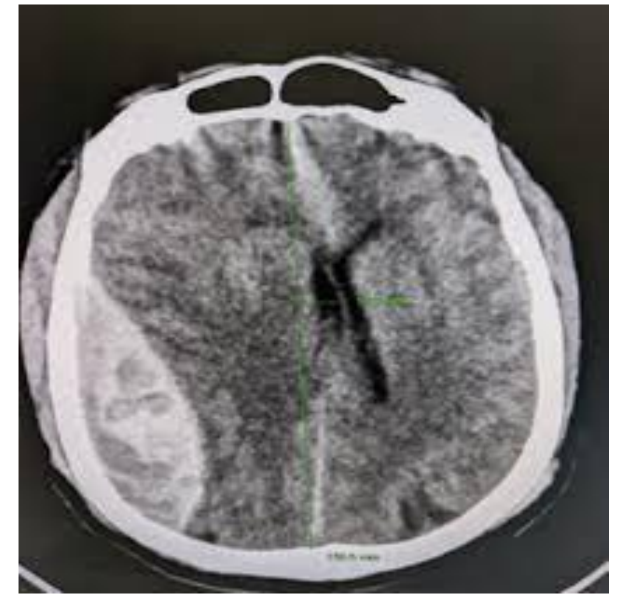
Secondairement adapter TVE

Sang total ?

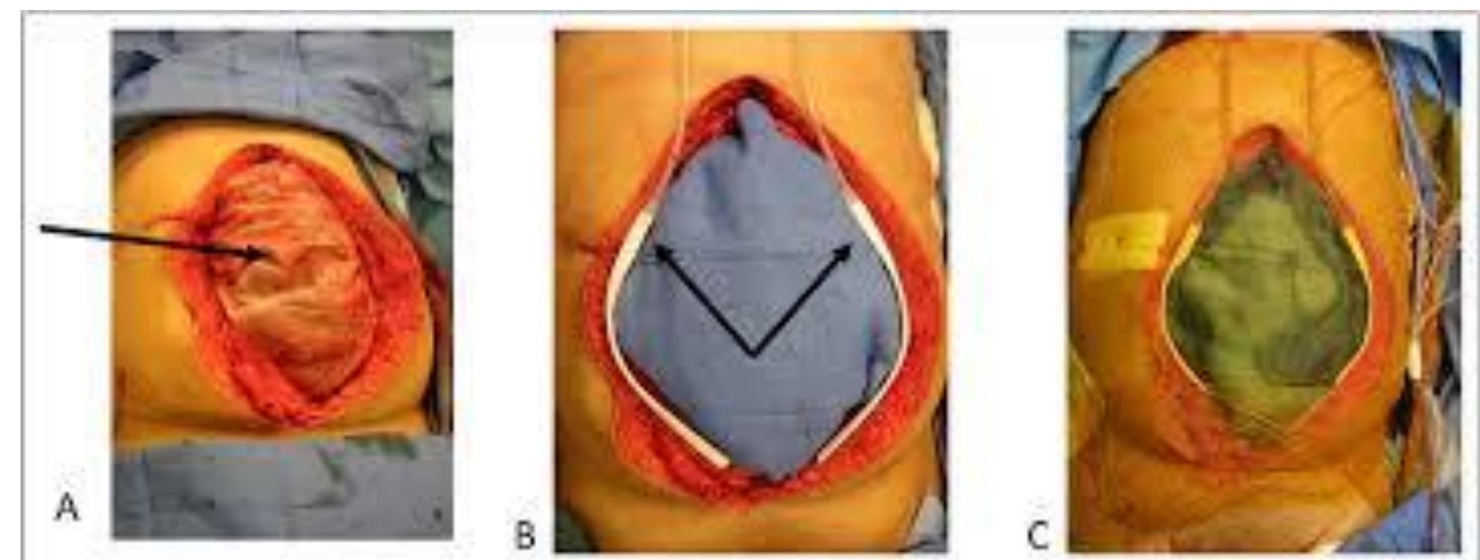


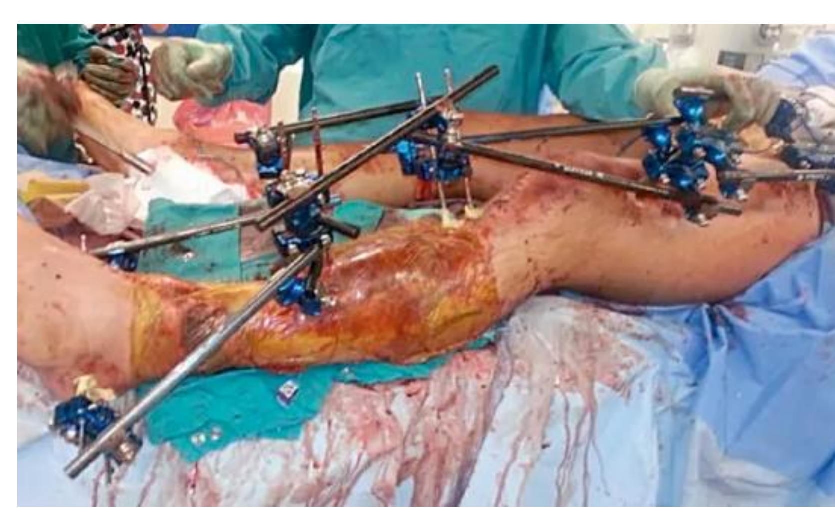


Chapitre 4 : traitement interventionnel



Damage control surgery





Damage control surgery

Quand ?

Choc hémorragique
Saignement persistant
Coagulopathie
Lésions combinées
Triade létale

GUIDELINES — Open Access

The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition

Pourquoi ?

Arrêter le saignement
Minimiser la nouvelle agression
Minimiser amplification
Améliorer le pronostic

sfmu — SFAR

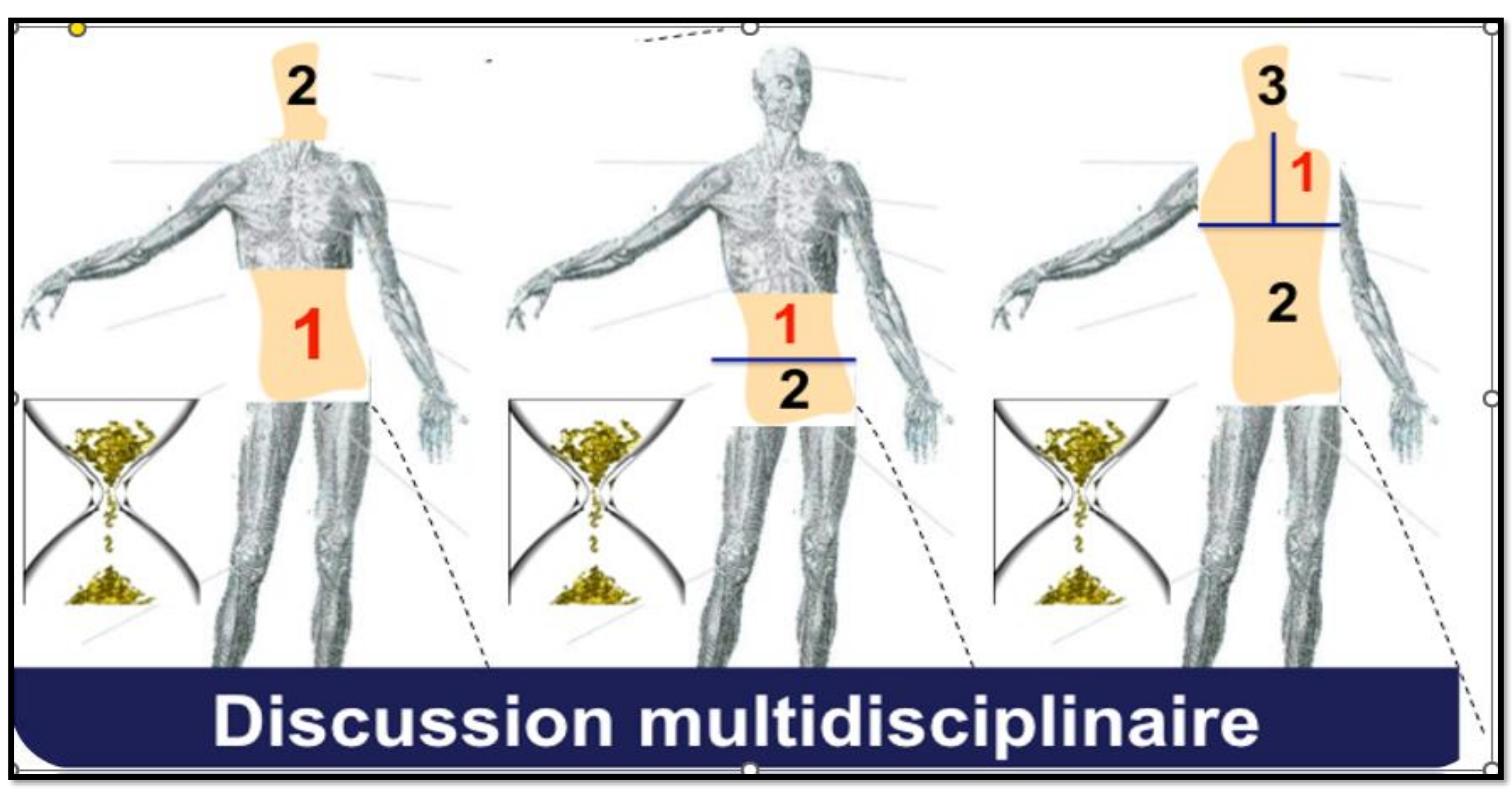
Recommandations Formalisées d'Experts

« Prise en charge du traumatisme abdominal grave de l'adulte : les 48 premières heures »

THE EARLY MANAGEMENT OF SEVERE ABDOMINAL TRAUMA

2019

Hiérarchiser la prise en charge

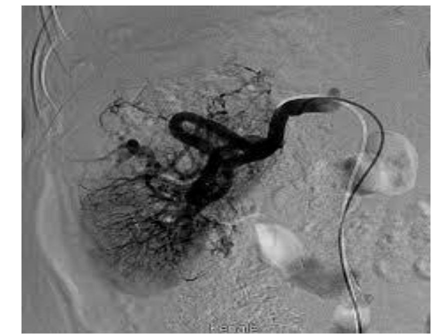


Less is more

R6.2 – En cas de traumatisme abdominal fermé grave sans état de choc, les experts suggèrent d'envisager une voie coelioscopique diagnostique et/ou thérapeutique afin de diminuer la morbidité, dans les cas suivants : (i) à la phase aigüe, lorsque l'imagerie fait suspecter une lésion diaphragmatique et/ou d'organe creux et (ii) à distance, en complément du traitement non-opératoire (TNO).

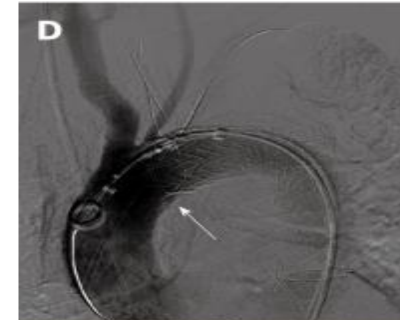
Avis d'expert

R7.2 – En présence d'une hémorragie intra-abdominale active diagnostiquée, il est probablement recommandé d'envisager, après concertation multidisciplinaire, une angio-embolisation hémostatique en urgence afin de réduire la morbi-mortalité.

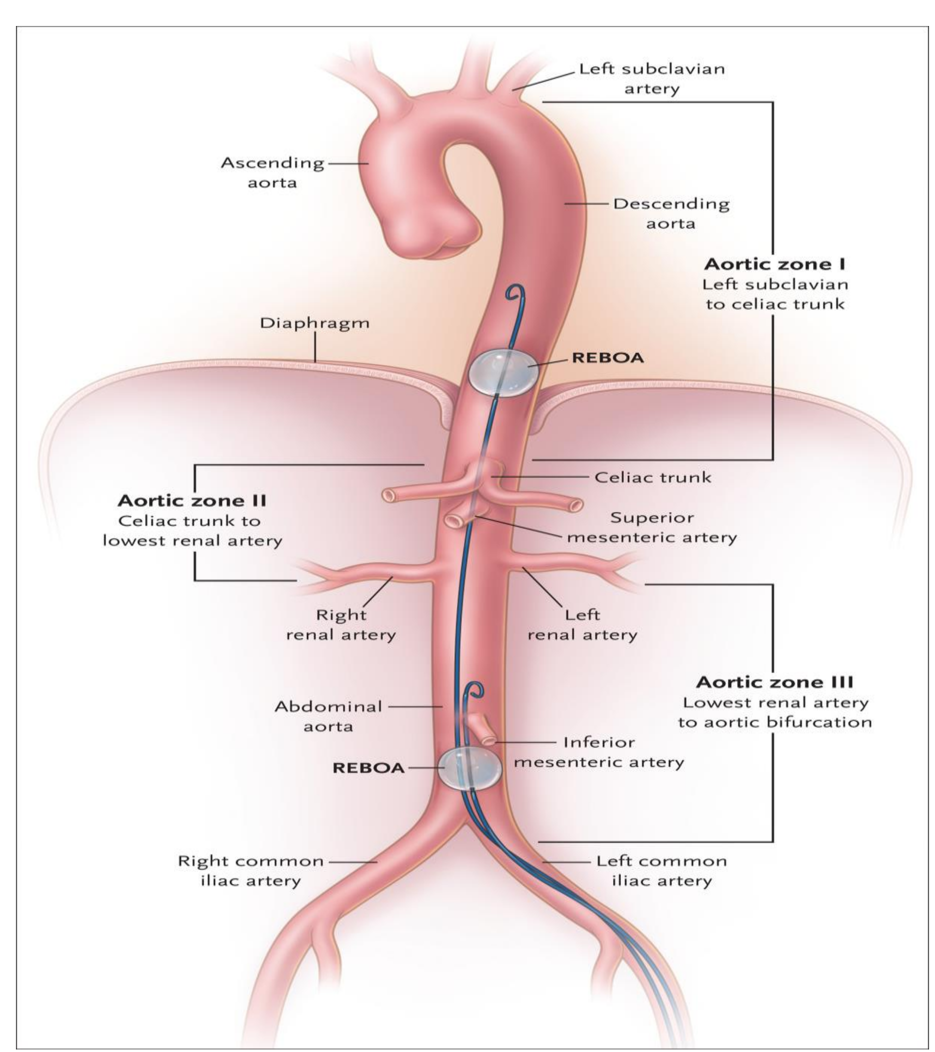


Endovascular approach to acute aortic trauma

Riyad Karmy-Jones, Desarom Teso, Nicole Jackson, Lisa Ferigno, and Robert Bloch



REBOA



Zone 1 : saignement sous diaphragmatique

Zone 2 : interdit

Zone 3 : saignement pelvien – membre inf

DR King. N Engl J Med 2019;380:763-770.

JAMA Surgery | Original Investigation

Nationwide Analysis of Resuscitative Endovascular Balloon Occlusion of the Aorta in Civilian Trauma

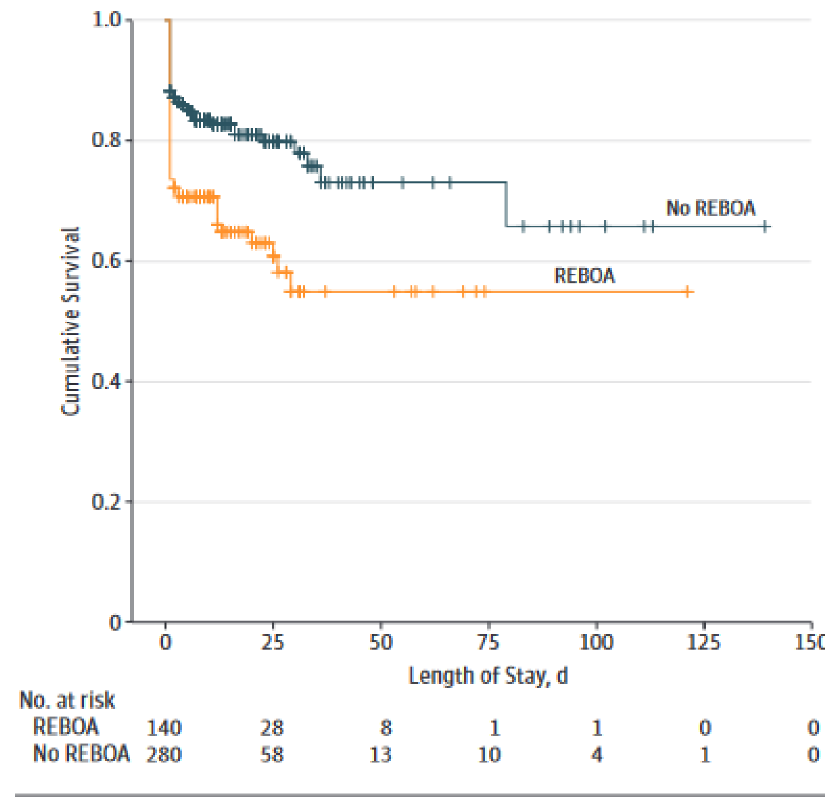
Bellal Joseph, MD; Muhammad Zeeshan, MD; Joseph V. Sakran, MD, MPH; Mohammad Hamidi, MD;
Narong Kulvatunyou, MD; Muhammad Khan, MD; Terence O'Keeffe, MD; Peter Rhee, MD

Etude cas contrôle rétrospective multicentrique – Trauma center US
Score de propension

↗ AKI ↗ temps avant d'avoir un contrôle de l'hémostase dans le groupe REBOA

Pas de différence sur transfusion

↗ mortalité dans le groupe REBOA



The probability of survival over time in the group that received resuscitative endovascular balloon occlusion of the aorta (REBOA) vs the no-REBOA group ($P < .01$).

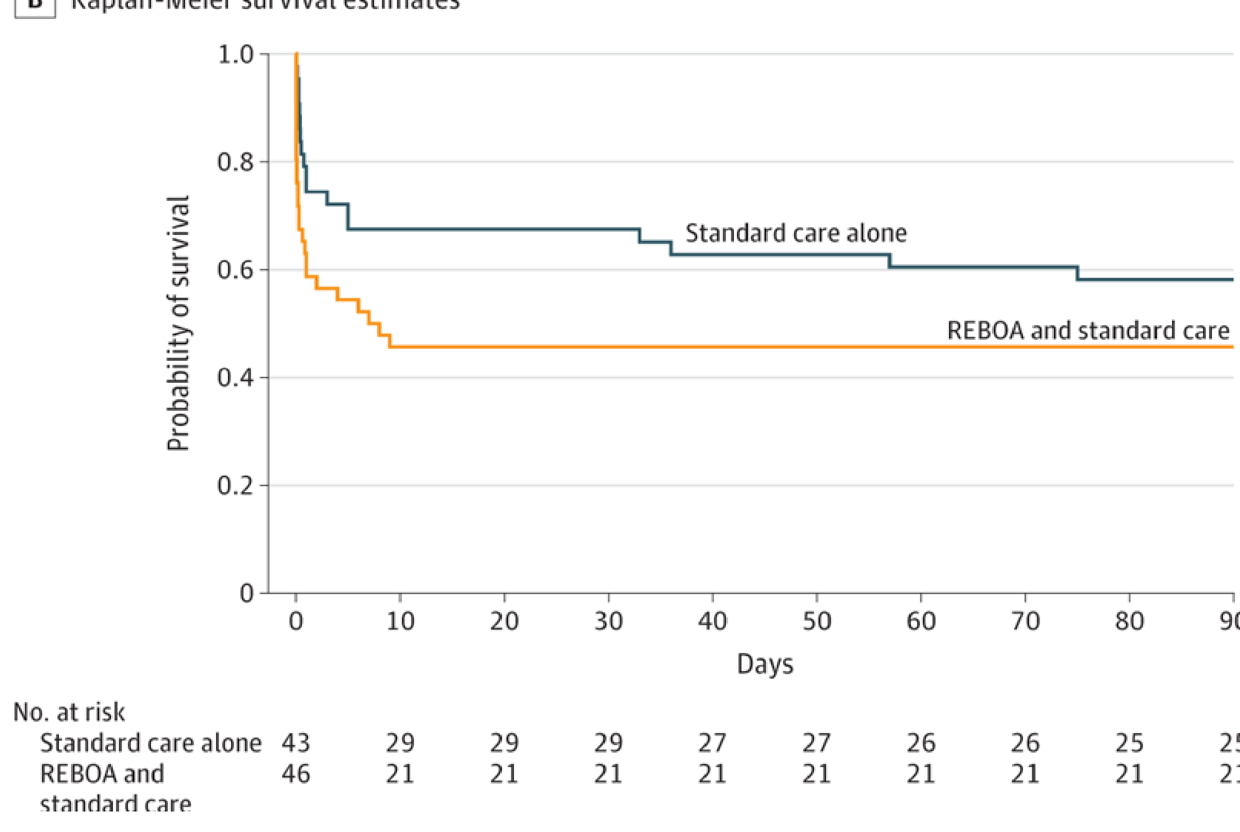
A Bianchi

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Emergency Department Resuscitative Endovascular Balloon Occlusion of the Aorta in Trauma Patients With Exsanguinating Hemorrhage

The UK-REBOA Randomized Clinical Trial

Jan O. Jansen, PhD; Jemma Hudson, PhD; Claire Cochran, MSc; Graeme MacLennan, MSc;
Robbie Lendrum, MBChB; Sam Sadek, MBBS; Katie Gillies, PhD; Seonaidh Cotton, PhD; Charlotte Kennedy, MSc;
Dwayne Boyers, PhD; Gillian Ferry, MSc; Louisa Lawrie, PhD; Mintu Nath, PhD; Samantha Wileman, PhD;
Mark Forrest, BSc; Karim Brohi, MBBS; Tim Harris, MBBS; Fiona Lecky, PhD; Chris Moran, MD;
Jonathan J. Morrison, PhD; John Norrie, MSc; Alan Paterson, DPhil; Nigel Tai, MS; Nick Welch;
Marion K. Campbell, PhD; and the UK-REBOA Study Group



Prospectif randomisé multicentrique

Arrêtée pour surmortalité dans le groupe REBOA

Mortalité à J90: 54% dans groupe REBOA vs 42% dans groupe standard

A Bianchi

Au total Chapitre 4 interventionnel

Discussion pluri-disciplinaire

Damage control (savoir s’arrêter)

Arterio embolisation salles hybrides

Techniques coelio

Reboa c’est pas encore ça

Conclusion : travail d'équipe, protocoles

Comment encore s'améliorer ?

Salles hybrides

Travailler en équipe
Staf multidisciplinaires
Protocoles +++++

S'auto évaluer
délai d'hémostase, délai avant bilan de coag, délai avant acide tranexamique, pourcentage de patients avec critères ayant eu damage control, thromboprophylaxie

S'entrainer
simulation in situ

Take home messages

Pré-hospitalière	Diagnostic	TT médical	TT interventionnel
Définitions ***Réseaux*** ***T center*** ***Echographie***	***Anticipation*** ***Echo*** ***Salle hybride*** ***TDM +++***	***Ratio CGR / PVI*** ***Acide T*** ***Hémostase délocalisée*** ***Sang total ?***	***Less is more*** ***Radio I*** ***Chir mini invasive*** ***REBOA*** ***Salle hybride***
Vite Premiers soins Orientation Transmission	Organisation « militaire »	Coag Taper fort et vite	Damage control

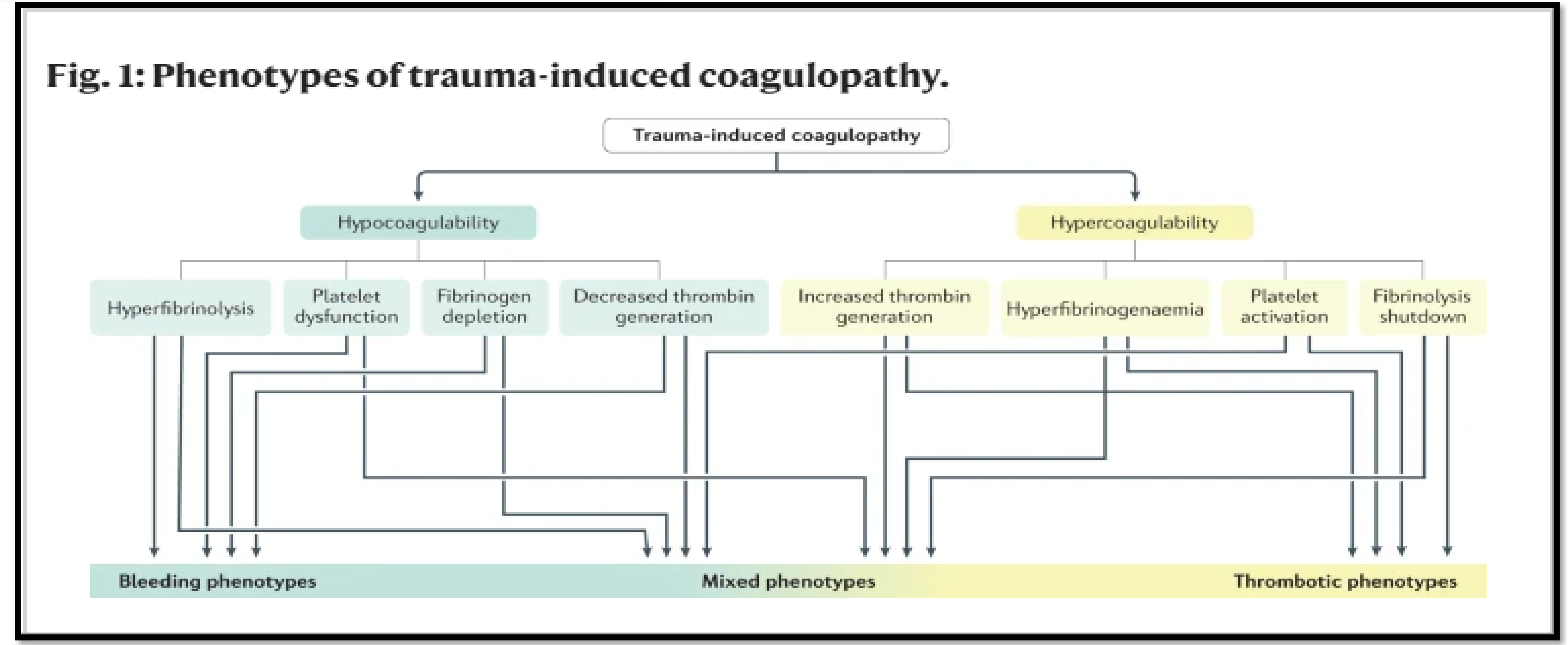
Merci

Coagulopathie

Trauma-induced coagulopathy

Ernest E. Moore, Hunter B. Moore, Lucy Z. Kornblith, Matthew D. Neal, Maureane Hoffman, Nicola J. Mutch, Herbert Schöchl, Beverley J. Hunt & Angela Sauaia

Nature Reviews Disease Primers **7**, Article number: 30 (2021) | Cite this article



L’avenir: personnalisation de l’acide tranexamique ?

Association between tranexamic acid administration and mortality based on the trauma phenotype: a retrospective analysis of a nationwide trauma registry in Japan

Jotaro Tachino, Shigeto Seno, Hisatake Matsumoto, Tetsuhisa Kitamura, Atsushi Hirayama, Shunichiro Nakao, Yusuke Katayama, Hiroshi Ogura & Jun Oda

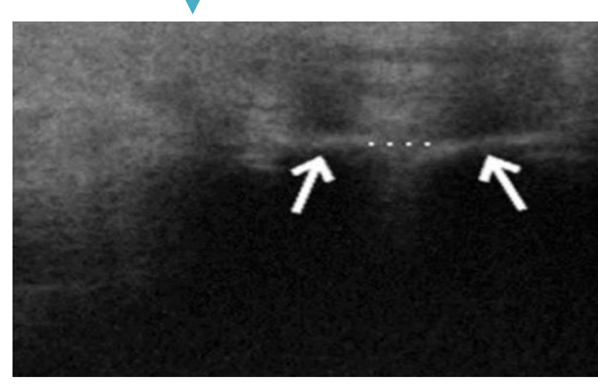
Critical Care **28**, Article number: 89 (2024) | Cite this article

	Trauma phenotype 1	• Torso trauma with haemorrhage • Blood transfusions administered within 24 h in approximately 30% of this category
	Trauma phenotype 2	• Combination of mild head injury with chest and extremities injuries • Generally stable vital signs
	Trauma phenotype 3	• Mild head injury with orthopedic injury in elderly population • High proportion of poor functional outcomes and longer hospital stays
	Trauma phenotype 4	• Predominantly chest or orthopedic injuries in relatively younger population • Generally stable vital signs
	Trauma phenotype 5	• Isolated orthopedic injury in elderly population • High proportion of orthopedic surgery performed
	Trauma phenotype 6	• Predominantly head and chest injuries • Blood transfusions administered within 24 h in approximately 20% of this categoly
	Trauma phenotype 7	• Isolated head injury in middle-aged and elderly population • Predominantly minor or moderate head injury
	Trauma phenotype 8	• Severe head injury or chest injury, or both • High mortality rate with unstable vital signs

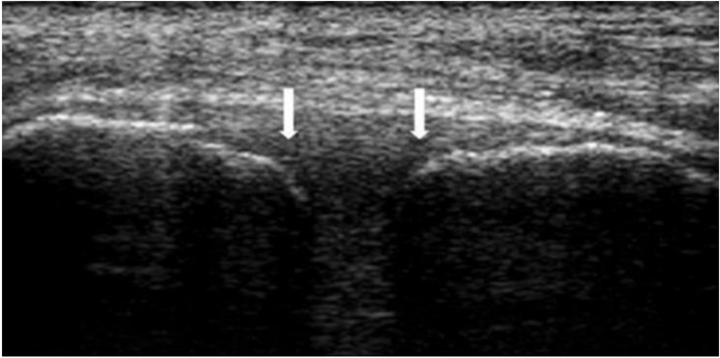
Méthode – Mesure échographique de la symphyse

Sonde linéaire

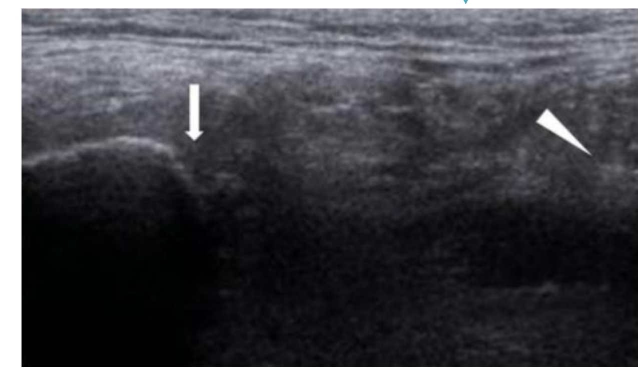
Ceinture pelvienne ouverte



Symphyse normale
Diastasis < 10mm



Doute sur une disjonction pubienne
10 mm < Diastasis < 25mm



Disjonction pubienne
Diastasis > 25mm

S. Ianniello *et al.*, « Diagnostic accuracy of pubic symphysis ultrasound in the detection of unstable pelvis in polytrauma patients during e-FAST: the value of FAST–PLUS protocol. A preliminary experience », *J. Ultrasound*

Acide tranexamique et TC isolé ?

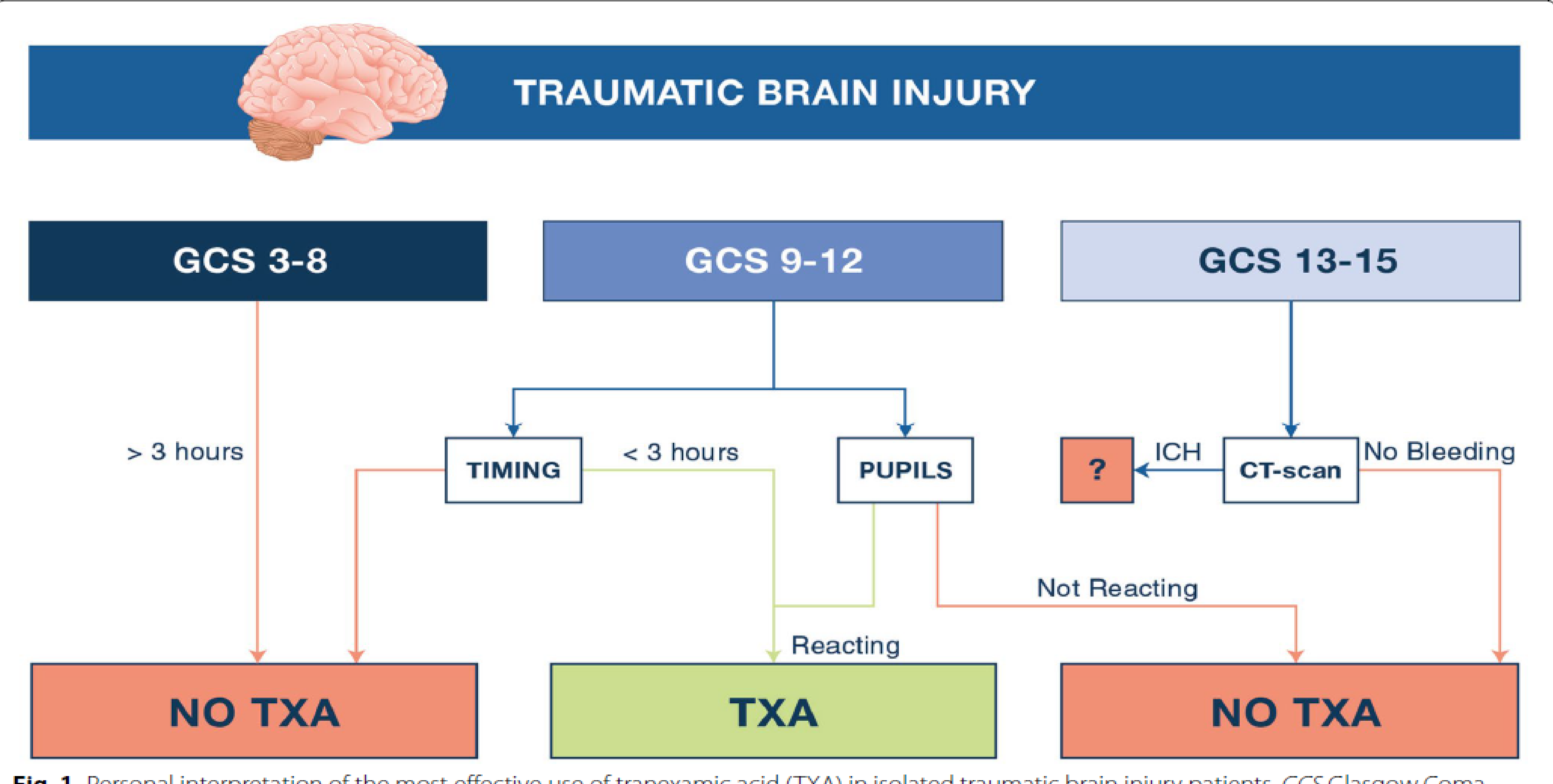


Fig. 1 Personal interpretation of the most effective use of tranexamic acid (TXA) in isolated traumatic brain injury patients. *GCS* Glasgow Coma Scale

Taccone, Citerio, Stocchetti ICM 2020

Epidémiologie

Exposition brutale a une énergie mécanique, chaleur, radiation etc

Intentionnels ou non intentionnels

Accidents de la vie quotidienne

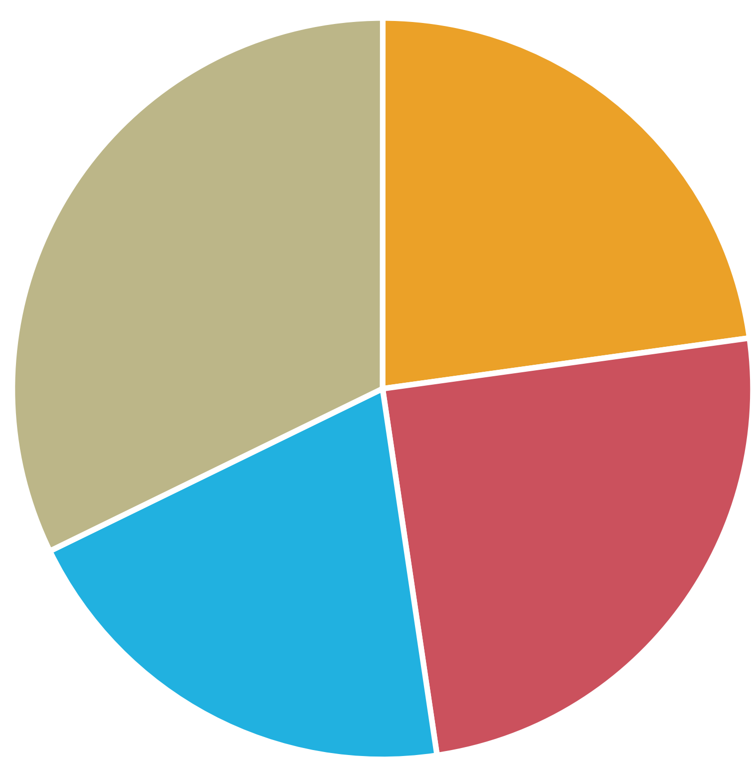
40 000 décès / Millions passages urgences/ an

Déchocage = protocolisation

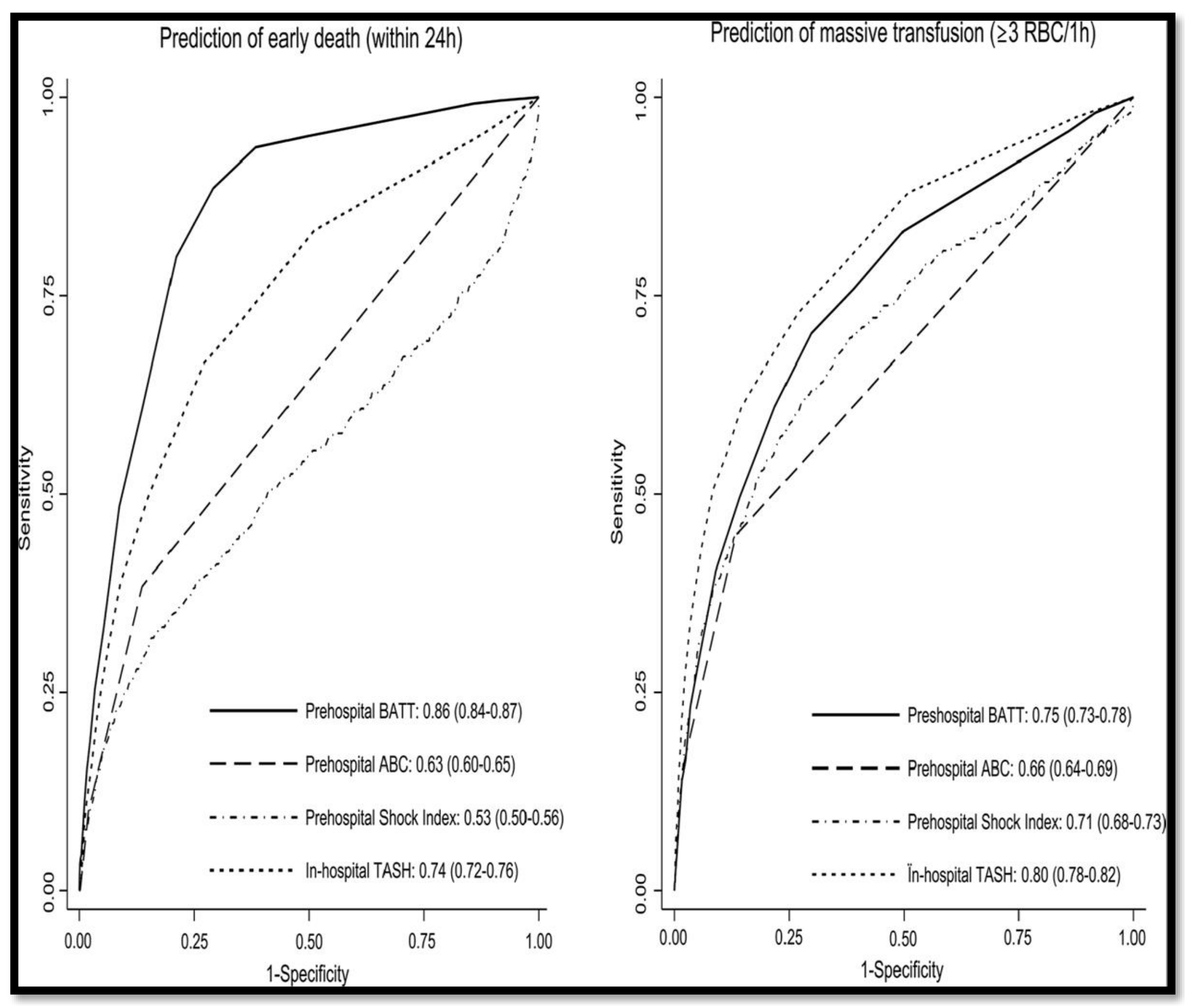
AP-HM
Assistance Publique
Hôpitaux de Marseille

Epidémiologie

n = 144,000



Triage et Scores



Choc Index
MGAP
faisables en pré hospitalier
+/- ABC
(type trauma, FC, PAS, FAST)

SCORE M-GAP	Nbre de points
Score de Glasgow	Score de Glasgow
PAS > 120 mmHg	+ 5
120 >PAS > 60 mm Hg	+ 3
PAS < 60 mm Hg	0
Trauma fermé (vs pénétrant)	+ 4
Age < 60 ans	+ 5
	Total : 3 à 29

Résultats :
M-GAP < 17 = mortalité élevée
22 ≥ M-GAP ≥17 = mortalité intermédiaire
M-GAP > 22 = mortalité basse

Interférences lésionnelles : 3 types

1) Effet de sommation

2) Effet d’occultation

3) Effet d’amplification

Transfusion plasma pré hospitalier

Original Investigation | Emergency Medicine

July 26, 2022

Prehospital Lyophilized Plasma Transfusion for Trauma-Induced Coagulopathy in Patients at Risk for Hemorrhagic Shock

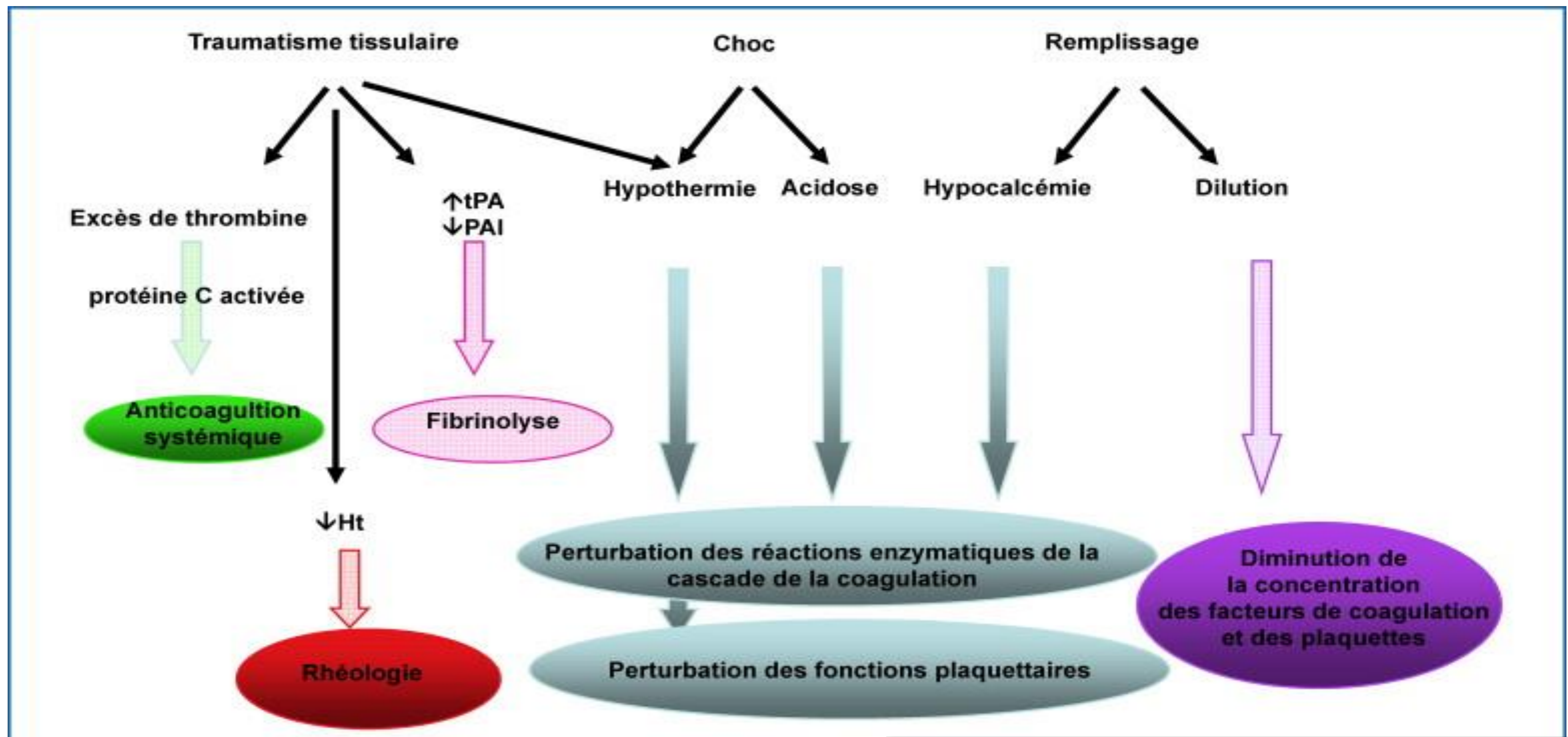
A Randomized Clinical Trial

Daniel Jost, MD[1]; Sabine Lemoine, MD[1]; Frédéric Lemoine, CRA[1]; et al

Total 6-h volume of blood components transfused, median (IQR), U[j]				
Packed red blood cells	4 (2-8)	4 (2-6)	0 (-1.9 to 1.9)	.32
Fresh frozen plasma	4 (3-7)	4 (2-6)	0 (-1.1 to 1.2)	.98
Platelets	1 (1-2)	1 (1-2)	0.99 (0.76 to 1.29)	.94
Total 24-h volume of blood components transfused, median (IQR), U[j]				
Packed red blood cells	4 (2-8)	5 (2-7)	1.0 (-0.9 to 2.9)	.65
Fresh frozen plasma	4 (3-8)	5 (3-8)	1.0 (-1.6 to 3.6)	.98
Platelets	1 (1-2)	1 (1-2)	0 (-0.87 to 0.87)	.96
Vasopressors needed within 24 h	33 (50.0)	34 (50.0)	1.03 (0.49 to 2.15)	.93
Urgent surgery during the initial 24 h[k]	47 (71.2)	49 (72.1)	1.04 (0.46 to 2.37)	.91
Duration of stay in the ICU, median (IQR), d	2 (1-7)	3 (1-9)	1.0 (-1.6 to 3.6)	.45

NS

Coagulopathie



Management of coagulopathy in massive bleedings

Anne Godier [a b], Marc Samama [a b], Sophie Susen [c d]

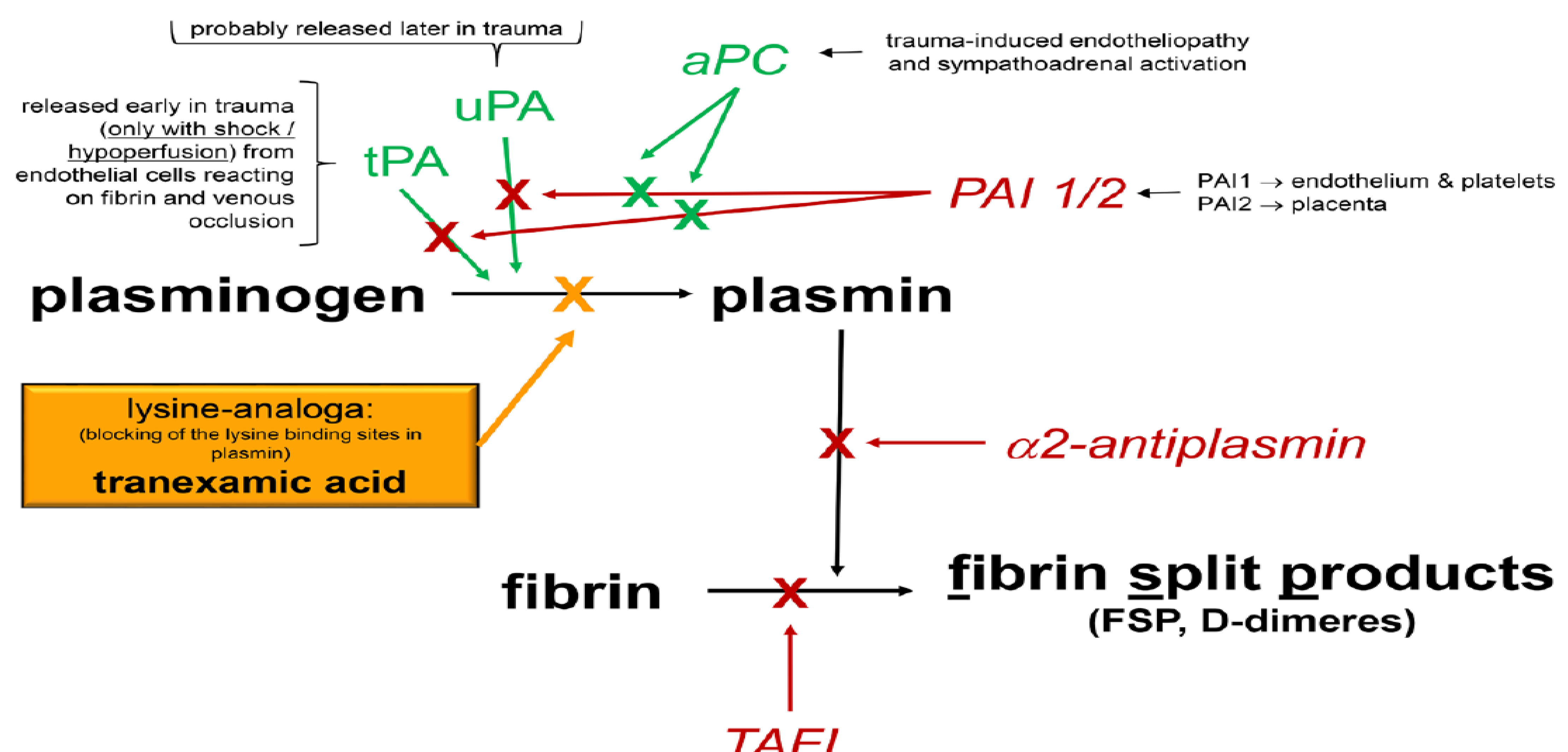
Acide Tranexamique

NARRATIVE REVIEW ARTICLE

CME **Tranexamic Acid for Acute Hemorrhage: A Narrative Review of Landmark Studies and a Critical Reappraisal of Its Use Over the Last Decade**

Heiko Lier, MD,* Marc Maegele, MD,† and Aryeh Shander, MD‡

See Editorial, p 1459



Interférences lésionnelles : 3 types

1) Effet de sommation

2) Effet d'occultation

3) Effet d'amplification

Diagnostic

Routine : CXR, Fast, CT…