Choc hémorragique: stratégie de prise en charge en préhospitalier et aux urgences

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Hospices Civils de Lyon

UNIVERSITÉ DE LYON

HESPER
Health Services and Performance Research

Conflits d’intérêts

- LFB
- Lilly
- Sanofi
- Roche

Plan

- Détection et triage = Evaluation initiale !
- Management
- Orientation

Hémorragies graves

- Digestif
- Traumatisme
- Parturiente

Causes de décès des traumatisés graves

Traumatisme crânien grave	52% (H24)
Hémorragie non contrôlée	**30 % (H2)**
Airway	10%
SDMV	**10 % (J15)**

Dutton RP J Trauma 2010

Haemorrhage control in severely injured patients

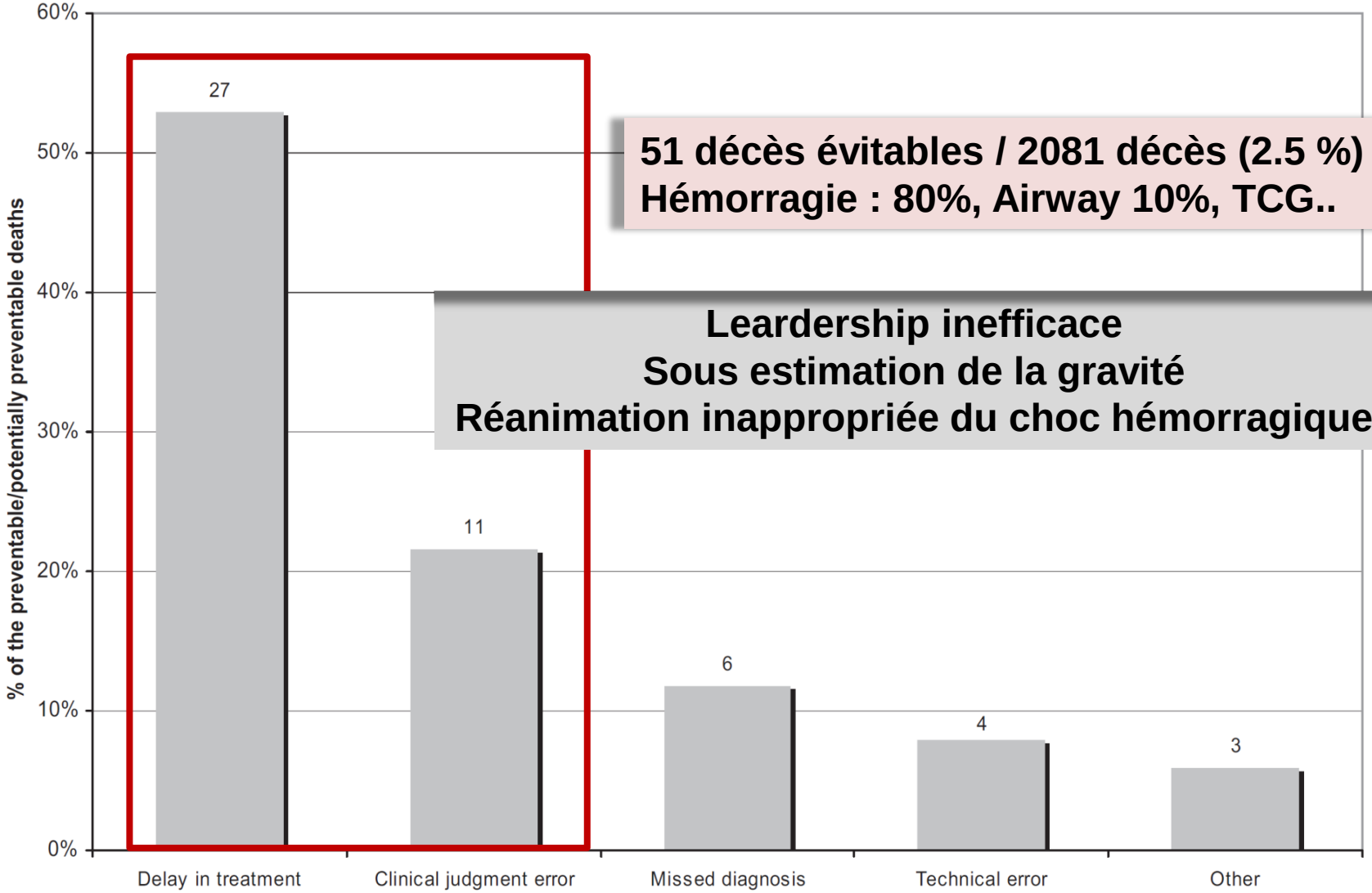
Gruen RL Lancet 2012

Contemporary approaches to haemorrhage control combine with **early control of bleeding,**

- 1) **management of coagulopathy,**
- 2) **maintenance of critical perfusion,**
- **3) management of the inflammatory response caused by shock and resuscitation**

Les décès évitables

Texeira J Trauma 2007

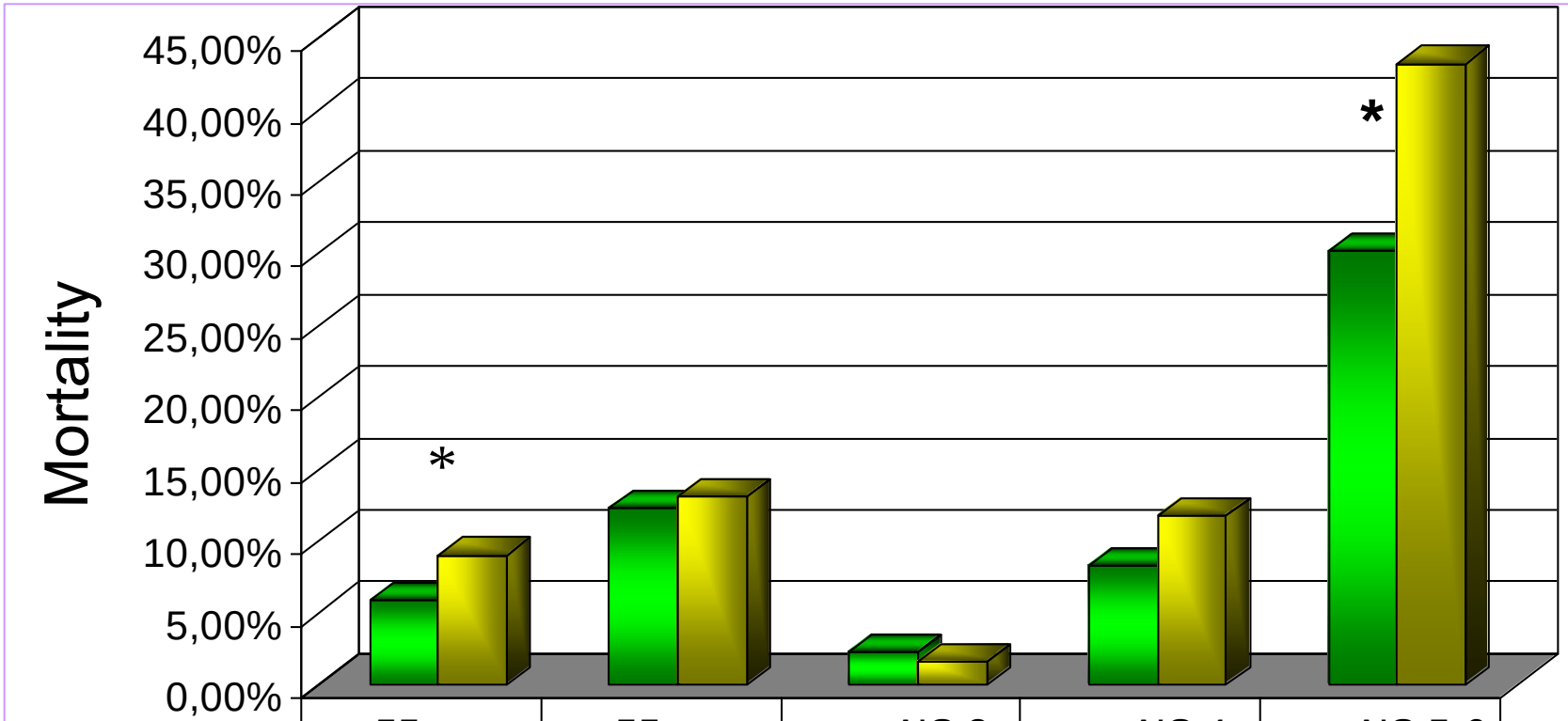


51 décès évitables / 2081 décès (2.5 %)
Hémorragie : 80%, Airway 10%, TCG..

Leardership inefficace
Sous estimation de la gravité
Réanimation inappropriée du choc hémorragique

National evaluation of the effect of trauma-center care on mortality

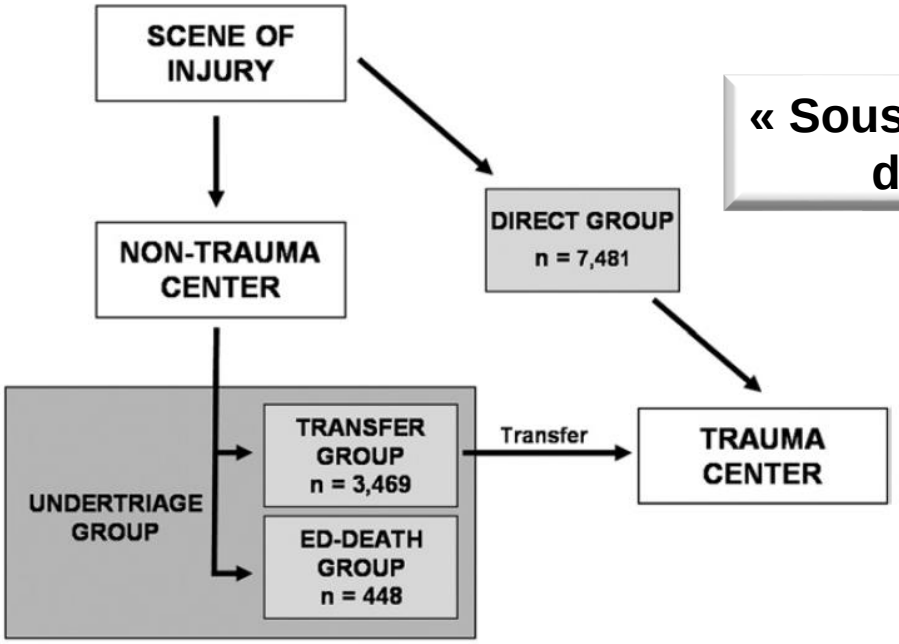
MacKenzie EJ N Eng J Med 2006



	< 55 ans	> 55 ans	max AIS 3	max AIS 4	max AIS 5-6
TC	5,90%	12,30%	2,30%	8,30%	30,20%
Non TC	9%	13,10%	1,60%	11,80%	43,20%

Survival of the Fittest: The Hidden Cost of Undertriage of Major Trauma

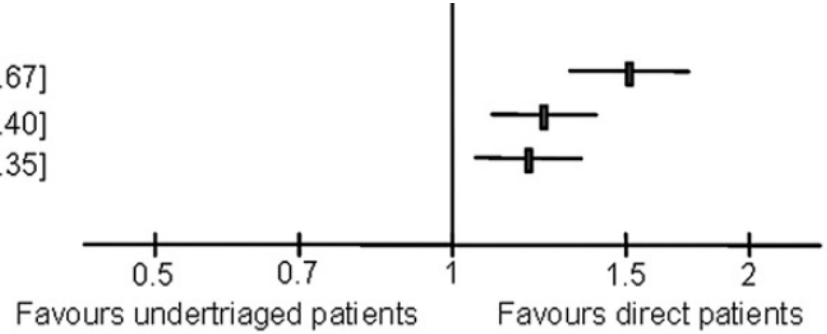
Barbara Haas J Am Coll Surg 2010



« Sous-triage » : majoration de la mortalité de 25% dans le groupe Transfert

Population-based analyses

All patients (unadjusted mortality)	1.51 [1.37, 1.67]
All patients (risk-adjusted mortality)	1.24 [1.10, 1.40]
1h survivors (risk-adjusted mortality)	1.20 [1.06, 1.35]

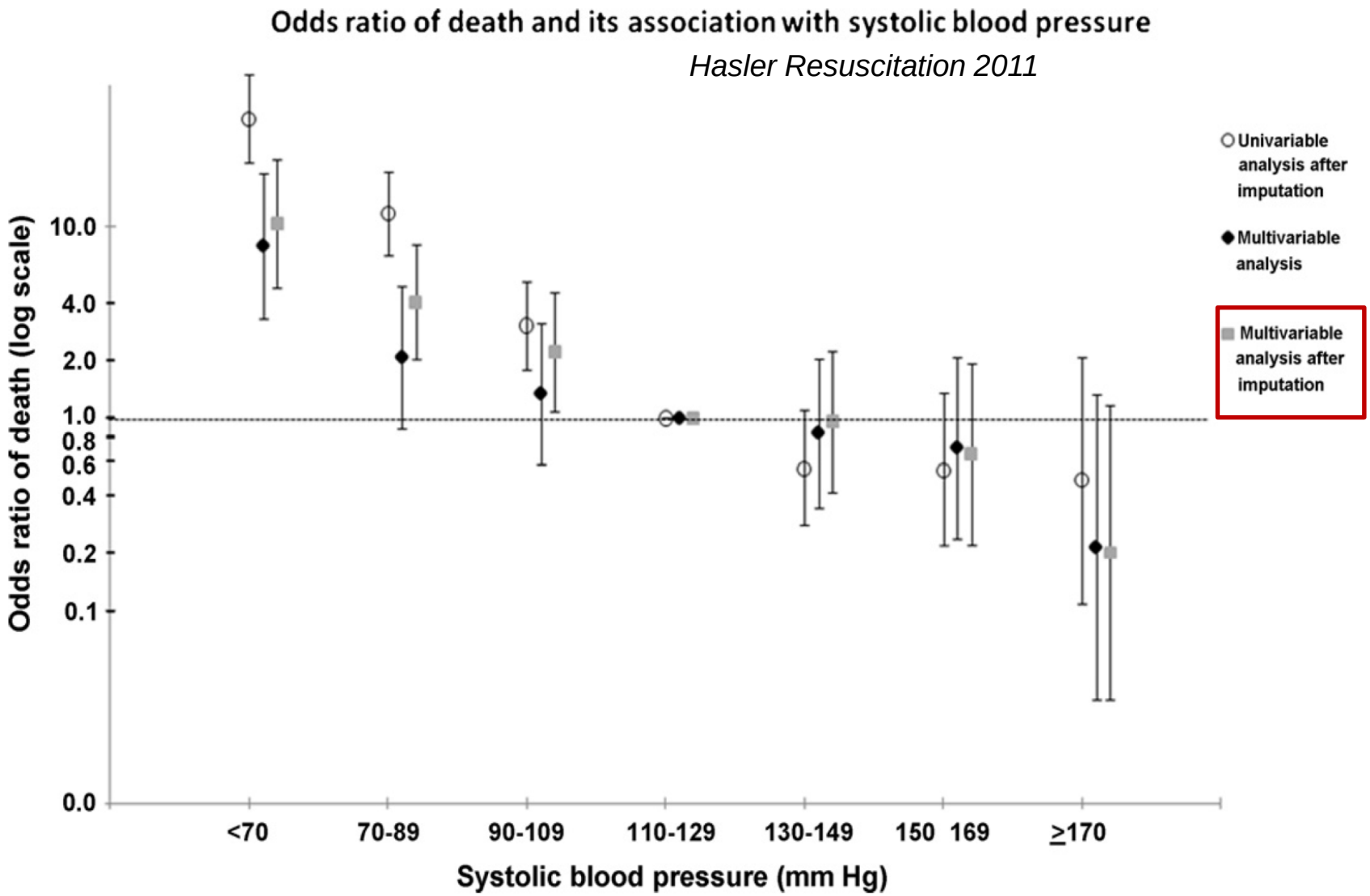


Predictive factors for **undertriage**

Nakahara S J Trauma 2010

- Age of 45 years to 54 years (odds ratio [OR], 6.76)
- **Injury Severity Score of 16** (OR 3.67)
- Glasgow coma scale score of 13 to 15 (OR 4.79)
- **Nighttime** (OR 2.31)
- **Pelvic injuries** (OR 14.2)

Systolic blood pressure below 110 mmHg is associated with increased mortality in penetrating major trauma patients: Multicentre cohort study (n=3444;2000-2009)



Prehospital Hypotension is a Predictor of the Need For an Emergent, Therapeutic Operation in Trauma Patients With Normal Systolic Blood Pressure in the Emergency Department

Ari M. Lipsky, MD, Marianne Gausche-Hill, MD, Philip L. Henneman, MD, Anthony J. Loffredo, MD, Patricia B. Eckhardt, RN, H. Gill Cryer, MD, PhD, Christian de Virgilio, MD, Stanley L. Klein, MD, Frederic S. Bongard, MD, and Roger J. Lewis, MD, PhD

J Trauma. 2006

	All Patients N = 1,028	Hypotensive in Field N = 71	Normotensive in Field N = 957	
Age, years, median (IQR)	28 (18–39)	30 (22–44)	27 (18–39)	$p = 0.01$
Male, N (%)	784 (76)	54 (76)	730 (76)	OR 1.0 (95% CI 0.6–1.7)
Blunt mechanism, N (%)	746 (73)	41 (58)	705 (74)	OR 0.5 (95% CI 0.3–0.8)
ISS, median (IQR)*	4 (1–10)	9 (4–19)	4 (1–10)	$p < 0.0001$
Prehospital i.v. fluid, ml, median (IQR)†	100 (0–300)	400 (100–700)	100 (0–300)	$p < 0.0001$
Underwent surgery				
Any surgery, N (%)	285 (28)	38 (54)	247 (26)	OR 3.3 (95% CI 2.0–5.4)
Within 6 h, N (%)	168 (16)	27 (38)	141 (15)	OR 3.6 (95% CI 2.1–5.9)
Therapeutic, N (%)	135 (13)	26 (37)	109 (11)	OR 4.5 (95% CI 2.7–7.6)
Mortality, N (%)‡	27 (3)	4 (6)	24 (3)	OR 2.3 (95% CI 0.8–6.9)

Les éléments de prédiction d'une procédure urgente à l'accueil hospitalier

Raux M J Trauma 2011

Variables	Odds Ratio (95% CI)	*p*
Penetrating trauma	2.46 (1.61–3.67)	<0.001
Intravenous administration of colloids >750 mL	2.20 (1.68–2.88)	<0.001
Systolic arterial blood pressure <100 mm Hg	1.42 (1.10–1.84)	0.006
Heart rate ≥100 bpm	1.42 (1.12–1.79)	0.004

Désamorçage cardiaque : bradycardie paradoxale

- 7 % des chocs hémorragiques
- Hémorragie rapide et massive
- Réflexe vago-vagal
- Mécanorécepteurs intracardiaques

Barrriot Intensive Care Med 1987

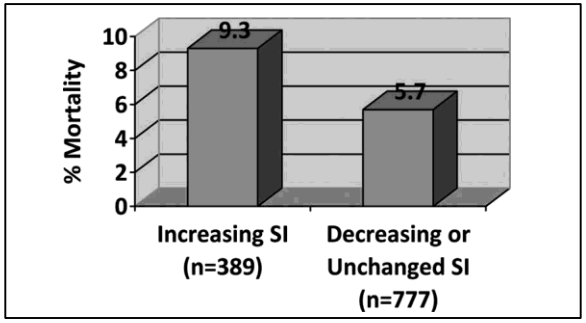
Remplissage vasculaire en urgence

Utility of the Shock Index in Predicting Mortality in Traumatically Injured Patients

Chad M. Cannon, MD, Carla C. Braxton, MD, FACS, Mendy Kling-Smith, MD, Jonathan D. Mahnken, PhD, Elizabeth Carlton, RN, MSN, and Michael Moncure, MD, FACS

$$\text{Prehospital Shock Index (PHSI)} = \frac{\text{prehospital pulse rate}}{\text{prehospital systolic blood pressure}}$$

Quel score ?
Pour prédire quoi ?



ORIGINAL ARTICLE

Prehospital shock index and pulse pressure/heart rate ratio to predict massive transfusion after severe trauma: Retrospective analysis of a large regional trauma database

Julien Pottecher, MD, PhD, François-Xavier Ageron, MD, Clémence Fauché, MD, Denis Chemla, MD, PhD, Eric Noll, MD, Jacques Duranteau, MD, PhD, Laurent Chapiteau, MD, Jean-François Payen, MD, PhD, *and* **Pierre Bouzat, MD, PhD**, *Strasbourg, France*

TABLE 1. Field (Prehospital), n = 1,166*

	SI >0.9, (n = 392)	SI ≤0.9, (n = 774)	*p*
Mortality	8.9%	5.8%	0.05
Injury Severity Score (median)	10.0	9.0	<0.0001
Penetrating	38.5%	22.8%	<0.0001
Age in years (median)	33.0	28.0	<0.0001
Female	32.4%	22.5%	<0.001

Open Access Research

BMJ Open

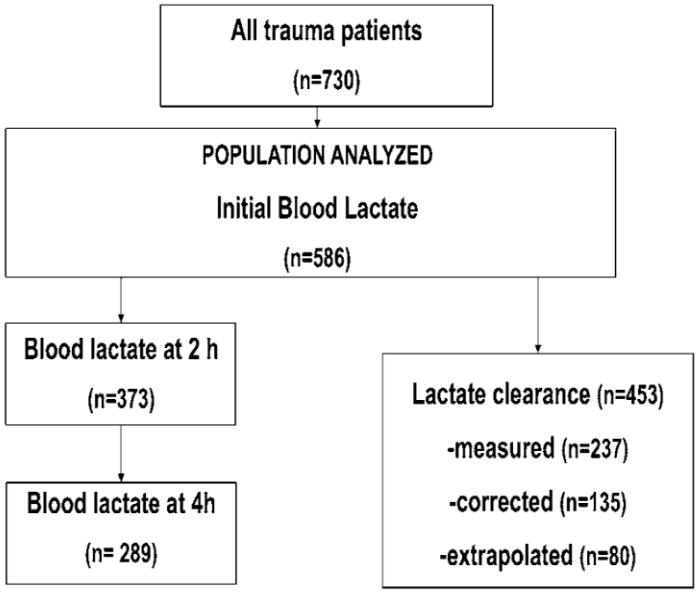
The use of the reverse shock index to identify high-risk trauma patients in addition to the criteria for trauma team activation: a cross-sectional study based on a trauma registry system

Spencer C H Kuo,[1,2] Pao-Jen Kuo,[3] Shiun-Yuan Hsu,[1,2] Cheng-Shyuan Rau,[4] Yi-Chun Chen,[1,2] Hsiao-Yun Hsieh,[1,2] Ching-Hua Hsieh[1,2]

Anesthesiology 2012

Prognostic Significance of Blood Lactate and Lactate Clearance in Trauma Patients

Marie-Alix Régnier, M.D.,* Mathieu Raux, M.D., Ph.D.,† Yannick Le Manach, M.D.,‡
Yves Asencio, M.D. M.Sc,* Johann Gaillard, M.D.,* Catherine Devilliers, Pharm. D.,§
Olivier Langeron, M.D., Ph.D.,‖ Bruno Riou, M.D., Ph.D.#



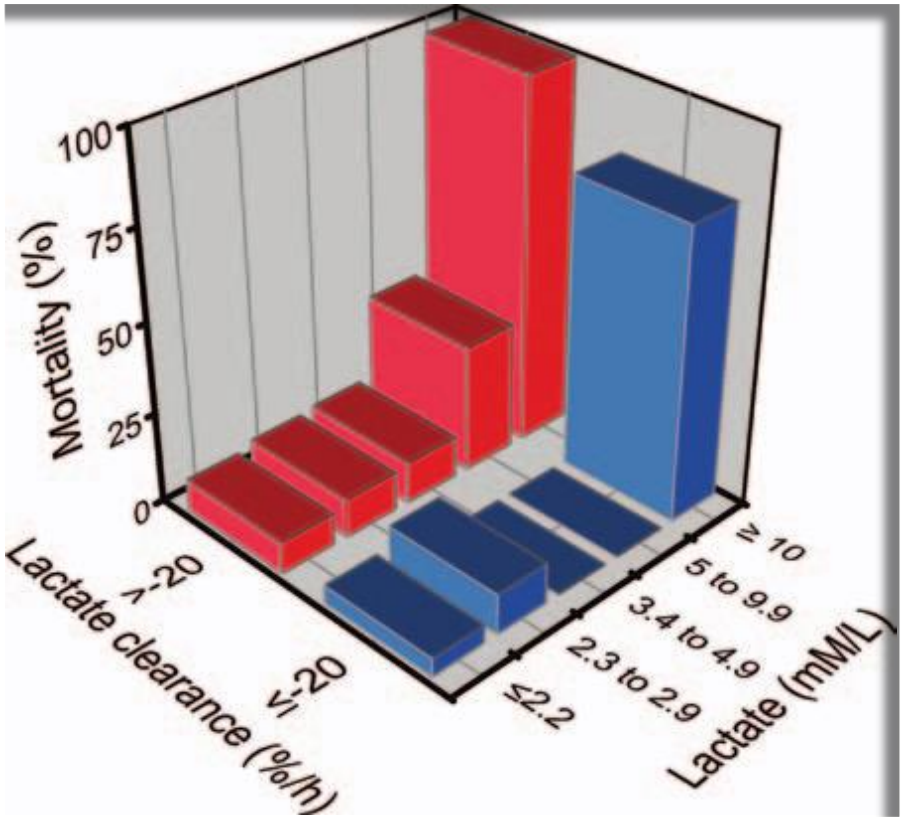
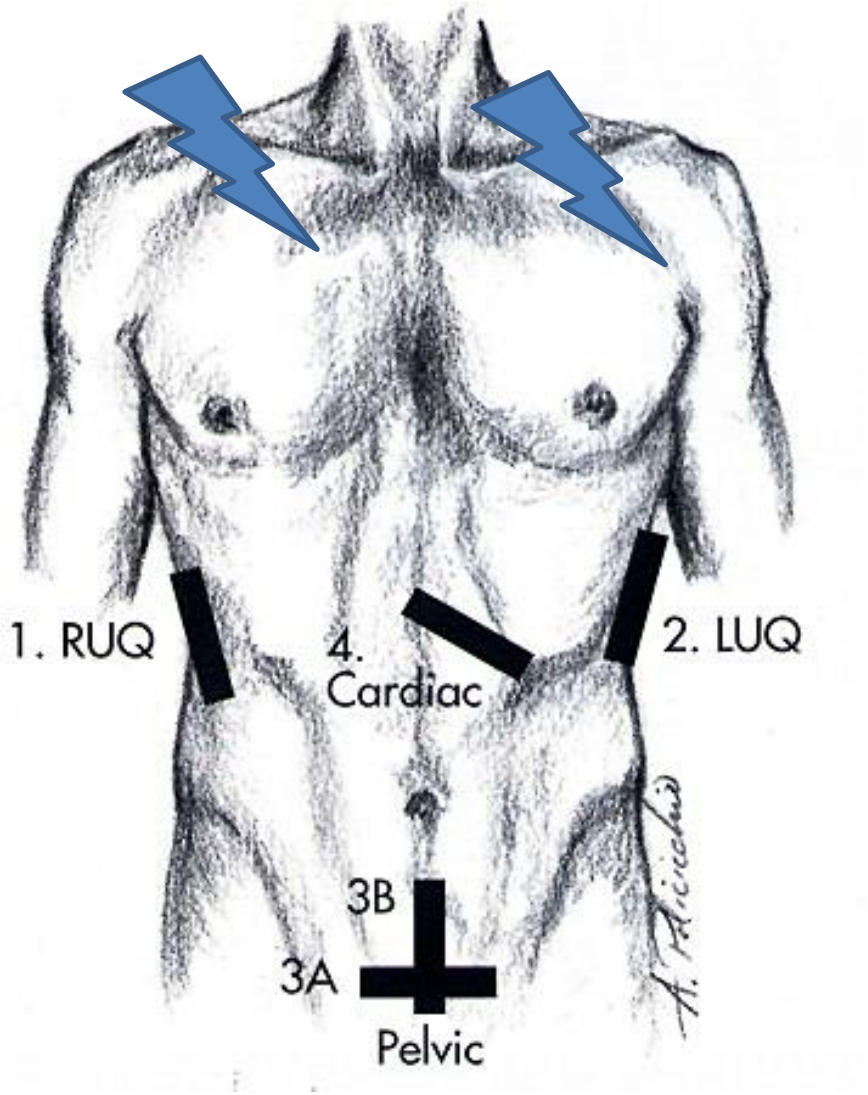


Fig. 6. Mortality in the predefined categories of initial levels and lactate clearance (n = 453). NRI = net reclassification improvement.

Echographie préhospitalière en aide au diagnostic et triage



FAST

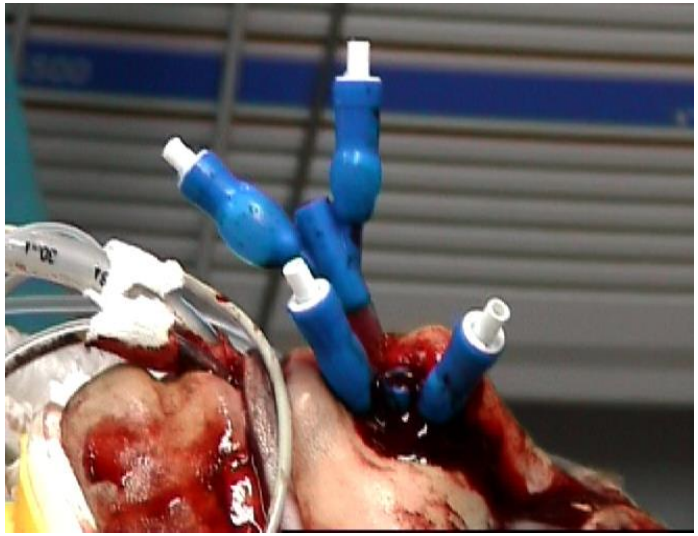
Focused Abdominal Sonography for Trauma

Tazarourte K Critical Care Med 2010
Lapostolle F Am J Emerg Med 2005

Management of bleeding following major trauma: an updated European guideline

CRITICAL CARE

Rossaint R et al. Critical Care 2014

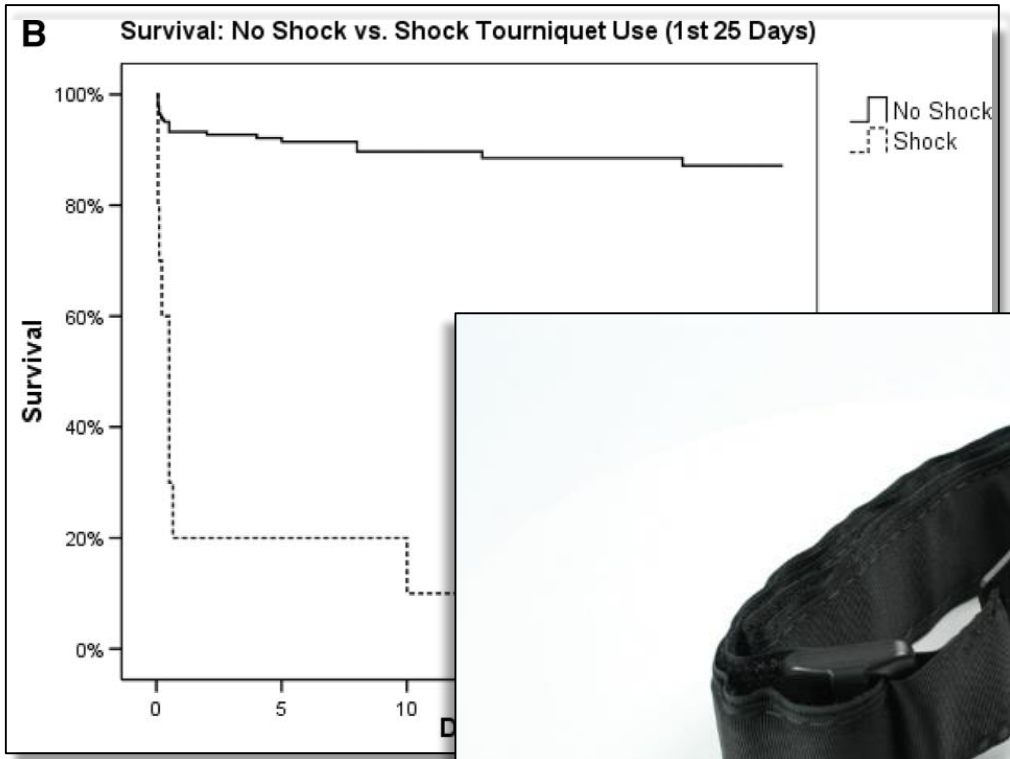


Antagoniser des Anticoagulants

Survival With Emergency Tourniquet Use to Stop Bleeding in Major Limb Trauma

COL John F. Kragh, Jr., MC, USA, Thomas J. Walters, PhD,* David G. Baer, PhD,* LTC Charles J. Fox, MC, USA,† Charles E. Wade, PhD,* Jose Salinas, PhD,* and COL John B. Holcomb, MC, USA**

Ann Surg 2009



Topical hemostatic agents and dressings in the prehospital setting

Curr Opin Anaesthesiol. 2015

1. Hémostase externe : Pansements hémostatiques

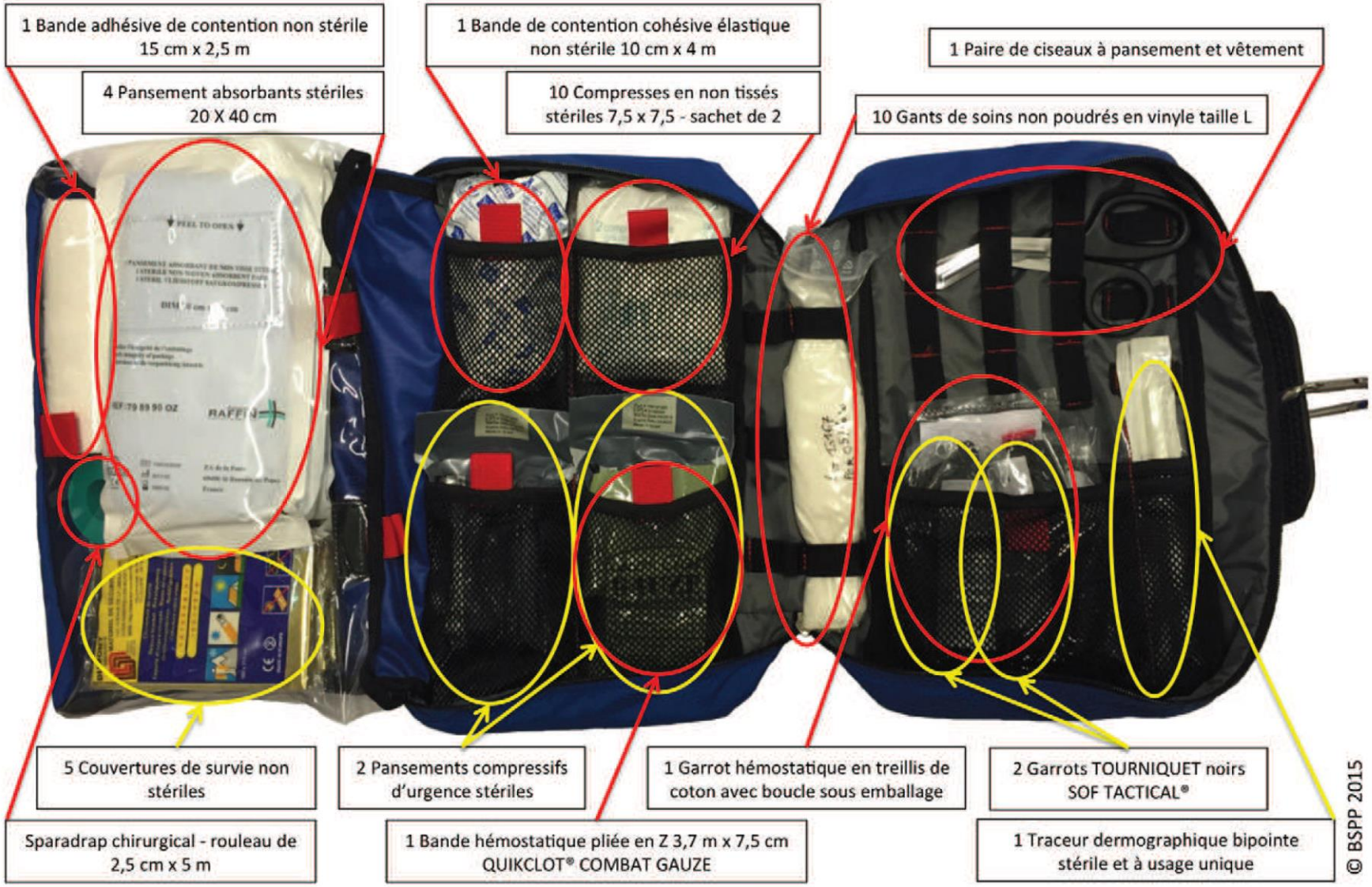
Quicklot™ (Z-Medica)

- Zéolithes (ACS et ACS +)
- Kaolin (Combat Gauze et QuikClot Combat Gauze XL)

- Silicate d'aluminium
- Absorption d'eau et concentration des facteurs de coagulation + plaquettes
- Activation voie intrinsèque de la coagulation

Grandville-Chapman et al. Injury 2010
Benett et al. Military Medicine 2014
Smith et al. Emerg Med j 2013

Stop bleeding



Damage Control Resuscitation: The New Face of Damage Control

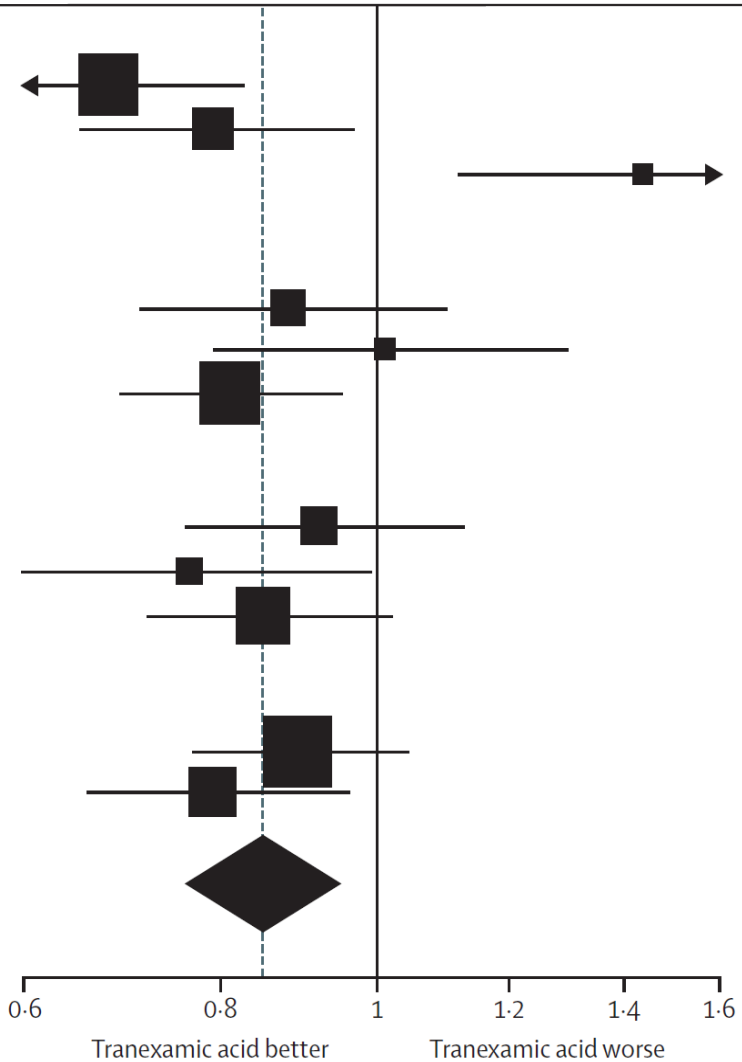
Maintenir un Ta02 minimal

Tourtier JP Ann Fr Anesth Réanim 2013
Tazarourte K Ann Fr Anesth Réanim 2013

- Hypotension artérielle permissive
  - PAM 60 mmhg
  - Si TCG ….. Adapter avec DTC
- Remplissage vasculaire modéré et adapté…
- Introduction **précoce** de catécholamines associée à un remplissage vasculaire
- **Politique transfusionnelle (Plyo, Autres..) ?**
- Exacyl en Préhospitalier

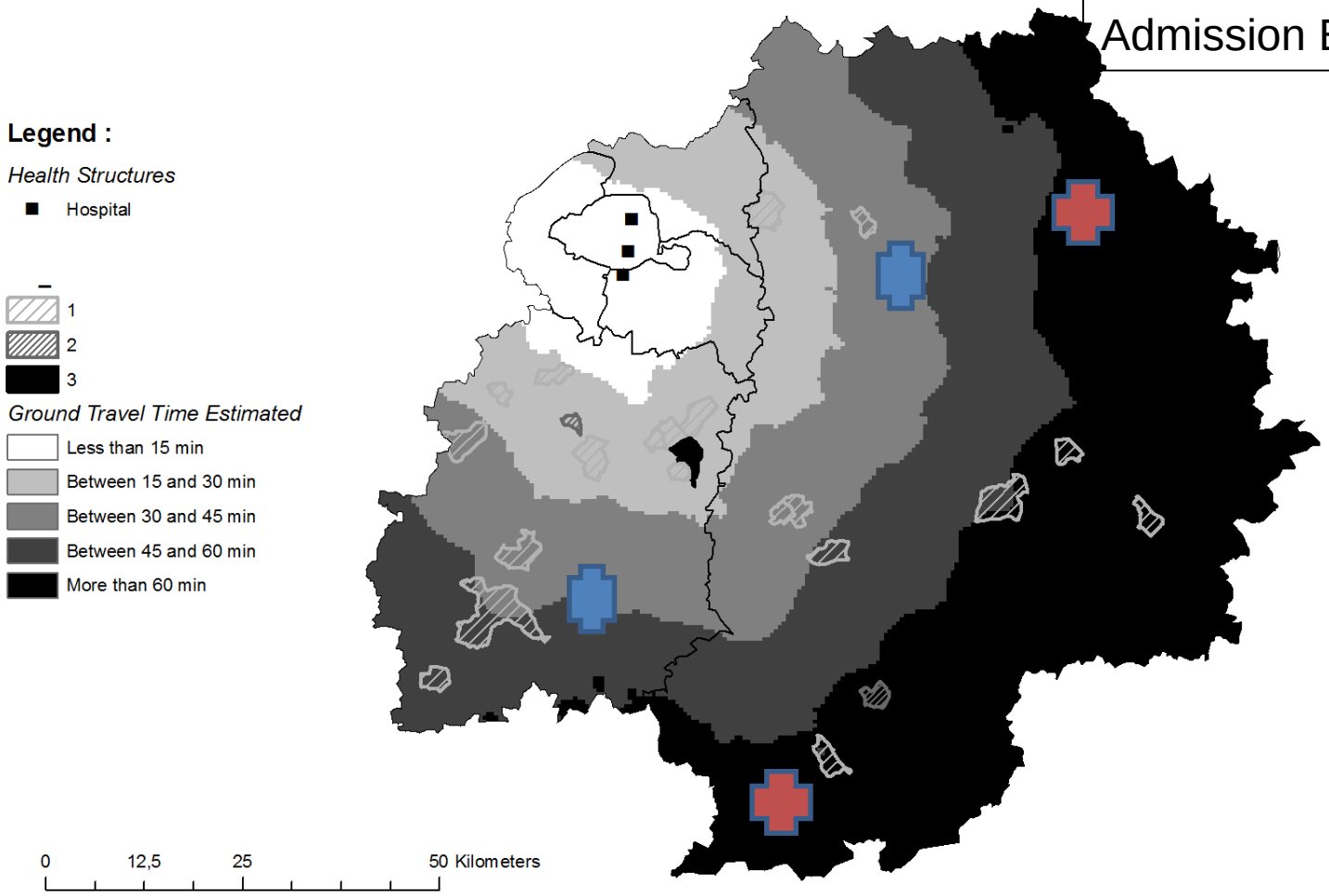
Exacyl….Crash 2 *Lancet 2011*

	Tranexamic acid allocated	Placebo allocated	Risk ratio (95% CI)
Time to treatment (h)			
≤1	198/3747 (5·3%)	286/3704 (7·7%)	0·68 (0·57–0·82)
>1–3	147/3037 (4·8%)	184/2996 (6·1%)	0·79 (0·64–0·97)
>3	144/3272 (4·4%)	103/3362 (3·1%)	1·44 (1·12–1·84)
χ^2=23·516; p<0·0000			
Systolic blood pressure (mm Hg)			
>89	146/6878 (2·1%)	163/6761 (2·4%)	0·88 (0·71–1·10)
76–89	110/1609 (6·8%)	114/1689 (6·7%)	1·01 (0·79–1·30)
≤75	233/1562 (14·9%)	295/1599 (18·4%)	0·81 (0·69–0·95)
χ^2=2·235; p=0·33			
Glasgow coma score			
Severe (3–8)	168/1789 (9·4%)	186/1830 (10·2%)	0·92 (0·76–1·13)
Moderate (9–12)	93/1349 (6·9%)	121/1344 (9·0%)	0·77 (0·59–0·99)
Mild (13–15)	228/6915 (3·3%)	265/6877 (3·8%)	0·86 (0·72–1·02)
χ^2=1·275; p=0·53			
Type of injury			
Blunt	308/6788 (4·5%)	347/6817 (5·1%)	0·89 (0·77–1·04)
Penetrating	181/3272 (5·5%)	227/3250 (7·0%)	0·79 (0·66–0·96)
χ^2=0·923; p=0·34			
All deaths	**489/10 060 (4·9%)**	**574/10 067 (5·7%)**	**0·85 (0·76–0·96)**
Two-sided p=0·0077			



La stratégie d'orientation d'un patient non stabilisé ?

Echelons intermédiaires
Admission Bloc directe



Tazarourte et al Acta Anesth Scandinav 2013

Première pierre du réseau !

Se parler et connaitre l’autre….

- 1. Le patient est stabilisé (sous catécholamines)
- 2- Le patient est non stabilisé
  - Pénétrant = bloc direct
  - Fermé = imagerie diagnostique au mieux

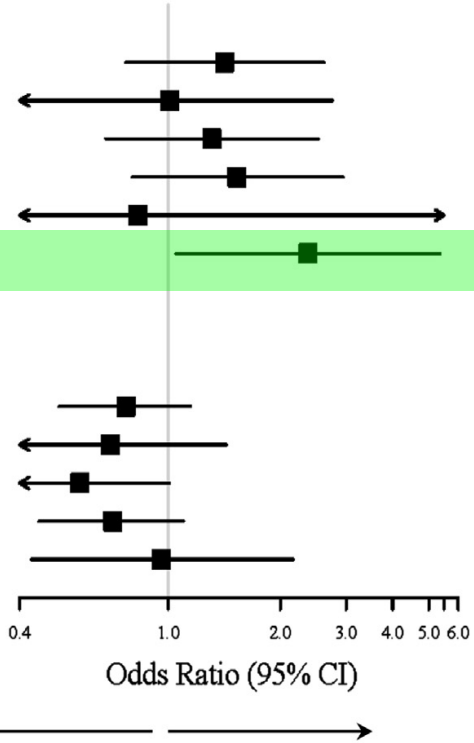
Revisiting the "Golden Hour": An Evaluation of Out-of-Hospital Time in Shock and Traumatic Brain Injury

Craig D. Newgard, MD, MPH*; Eric N. Meier, MS; Eileen M. Bulger, MD; Jason Buick, MSc, PCPf; Kellie Sheehan, BSN; Steve Lin, MD, MSc; Joseph P. Minei, MD; Roxy A. Barnes-Mackey, RN; Karen Brasel, MD, MPH; and the ROC Investigators

Ann Emerg Med. 2015

Shock subgroups	N	OR (95% CI)
All patients	778	1.42 (0.77–2.62)
Ground	567	1.01 (0.37–2.76)
ISS > 15	544	1.31 (0.68–2.53)
Blunt	485	1.53 (0.80–2.95)
Penetrating	293	0.83 (0.10–6.79)
Required critical intervention	484	2.37 (1.05–5.37)

TBI subgroups	N	OR (95% CI)
All patients	1,239	0.77 (0.51–1.15)
Ground	742	0.70 (0.35–1.43)
Air	497	0.58 (0.33–1.01)
ISS > 15	951	0.71 (0.45–1.10)
Required critical intervention	393	0.96 (0.43–2.16)



Decrease adverse outcome with total OOH time > 60 minutes

Increase adverse outcome with total OOH time > 60 minutes

Injury, Int. J. Care Injured 45S (2014) S76–S82

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

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

Take Home Message

- Evaluation initiale et score
- Attention aux patients peu symptomatiques initialement
- Echographe
- Toujours réaliser un remplissage vasculaire
- Noradrénaline après 500 ml et poursuivre, QSP….PAM 60
- Exacyl
- Eviter l’hypothermie
- Pression non invasive à privilégier
- **Raccourcir les délais**

van Oostendorp *et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* (2016) 24:110
DOI 10.1186/s13049-016-0301-9

Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine

REVIEW Open Access

Prehospital control of life-threatening truncal and junctional haemorrhage is the ultimate challenge in optimizing trauma care; a review of treatment options and their applicability in the civilian trauma setting

Fig. 5 SAM-JT™. Image provided by manufacturer

Injury, Int. J. Care Injured 42 (2011) 870–873

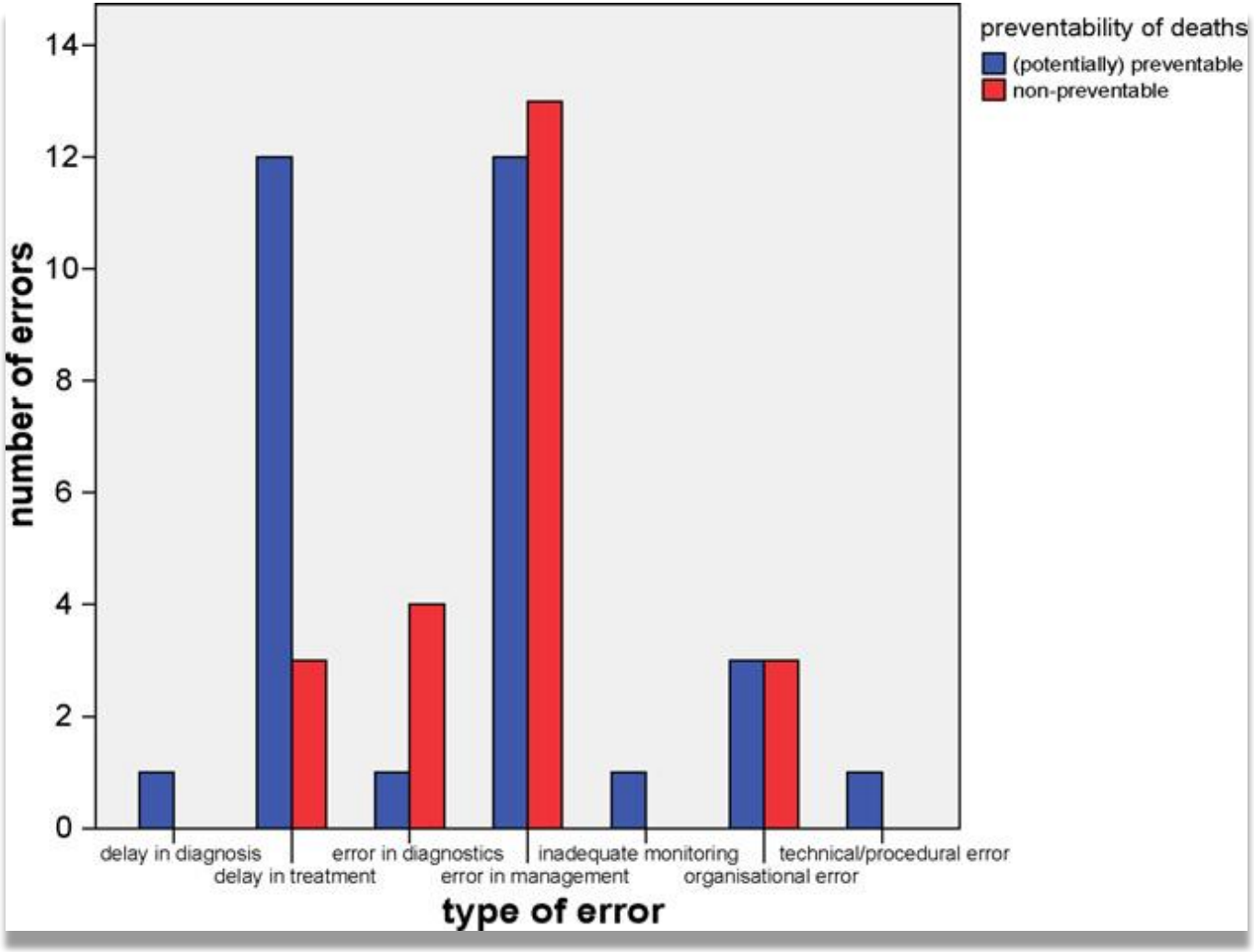
Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Preventability of trauma deaths in a Dutch Level-1 trauma centre

T.P. Saltzherr [a,*], K.W. Wendt [b], P. Nieboer [b], M.W.N. Nijsten [c], J.P. Valk [d], J.S.K. Luitse [a], K.J. Ponsen [a], J.C. Goslings [a]



The evolving role of lyophilized plasma in remote damage control resuscitation in the French Armed Forces Health Service

Saillol A Transfusion 2013

TABLE 2. In vitro properties of FLYP compared with other French therapeutic plasmas

Parameters	Units	PFC-SD	PFC-IA	PFC-Se	FLYP	Physiological norms
Fibrinogen	g/L	2.8	2.7	2.8	2.4	2-4
Factor V	IU/mL	0.9	1.0	1.0-1.1	0.7	0.7-1.2
Factor VIII	IU/mL	0.7	0.8	0.9-1.1	0.7	0.5-1.5
Factor XI	IU/mL	0.8	0.6	0.9-1.0	0.7	0.5-1.4
Protein C	IU/mL	1.0	0.9	1.1-1.2	0.9	0.7-1.2
Protein S	IU/mL	0.6	1.0	1.3-1.4	0.9	0.7-1.4
Antithrombin III	IU/mL	0.9	1.0	1.0	1.0	0.8-1.2
α2 antiplasmin	IU/mL	0.2	0.8	1.0	0.9	0.8-1.2

PFC-SD = frozen solvent-detergent plasma; PFC-IA = frozen amotosalen/UV-treated plasma; PFC-Se = frozen secured by quarantine plasma; FLYP = lyophilized amotosalen/UV-treated plasma.

Temps de reconstitution < 6 minutes
Stockage en T° ambiante
1100 poches utiliséés depuis 10 ans
Pas encore disponible en pratique civile…

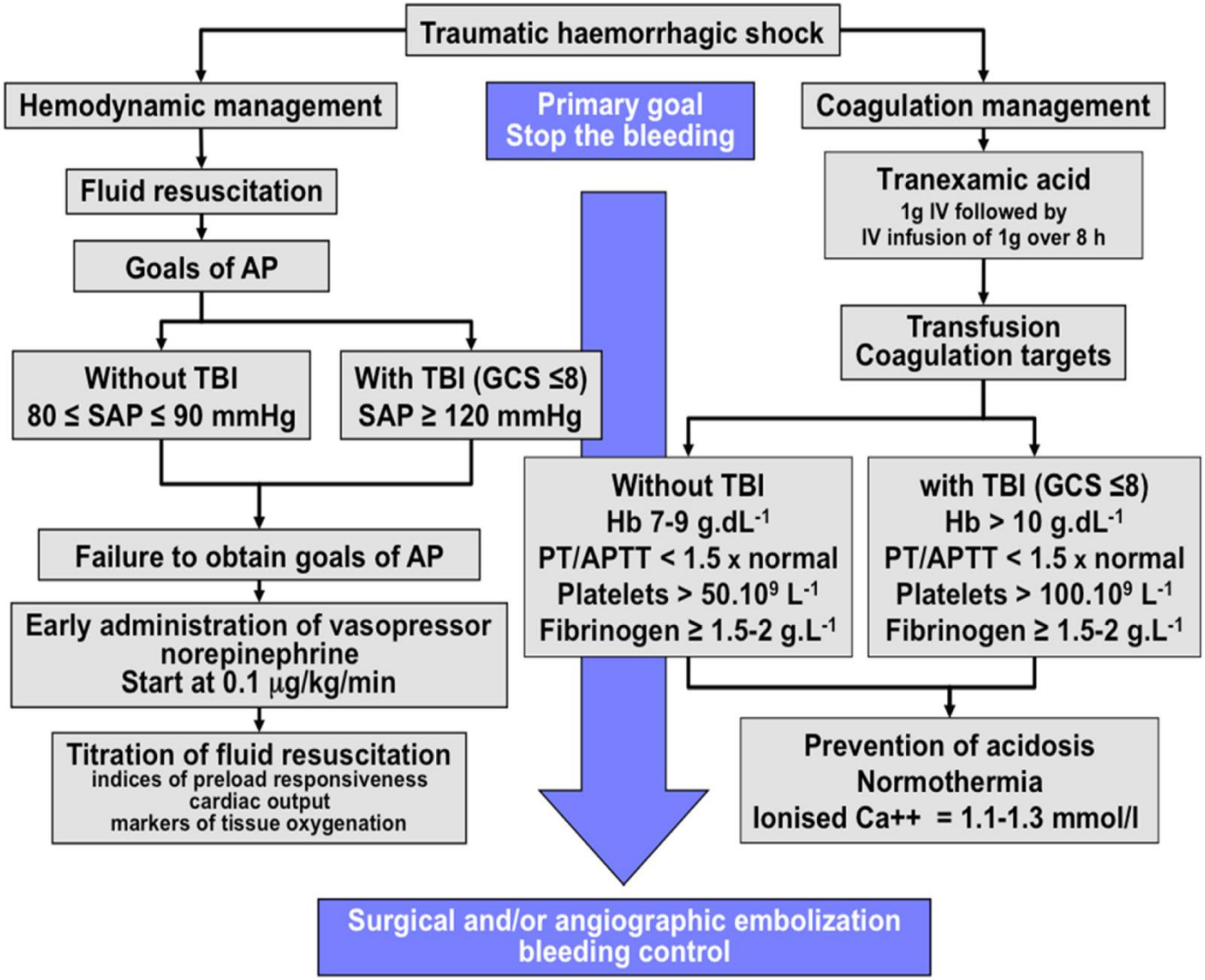
Bouglé et al. Annals of Intensive Care 2013, 3:1
http://www.annalsofintensivecare.com/content/3/1/1

Annals of Intensive Care
a SpringerOpen Journal

REVIEW Open Access

Resuscitative strategies in traumatic hemorrhagic shock

Adrien Bouglé[1,2], Anatole Harrois[1] and Jacques Duranteau[1*]



In Vitro Hemostatic Properties of French Lyophilized Plasma

Anesthesiology. 2012;117:339–46

Christophe Martinaud, M.D.,* Corinne Civadier, Pharm.D.,† Sylvain Ausset, M.D.,‡
Catherine Verret, M.D., M.P.H., Ph.D.,§ Anne-Virginie Deshayes, Pharm.D.,† Anne Sailliol, M.D.†

24 batches of plasma before and after lyophilization were tested for coagulation proteins. Thrombin generation time, thrombin antithrombin concentration, prothrombin fragment 1+2, and thromboelastography were assessed.

Table 1. Coagulation Factors and Inhibitors in FFP *versus* FLyP

Analyte	FFP (n = 24)	FLyP (n = 24)	Reference Range	% Variation	*P* Value
Prothrombin time (ratio test/control)	1.1 ± 0.1	1.2 ± 0.1	<1.5	8 ± 3	<0.05
Activated partial thromboplastin time (s)	35.0 ± 1.3	39.0 ± 2.4	30–40	11 ± 5	<0.001
Fibrinogen (g/l)	2.4 ± 0.2	2.4 ± 0.3	2–4	0	0.39
Factor VIIIc (U/ml)	0.77 ± 0.11	0.62 ± 0.10	0.5–1.5	−20 ± 7	<0.001
Factor V (U/ml)	85 ± 18	51 ± 16	70–120	−25 ± 12	<0.05
Factor XI (U/ml)	76 ± 12	79 ± 11	50–140	6 ± 5	0.74
Factor XIII (U/ml)	101 ± 17	103 ± 12	20–120	3 ± 7	0.94
Protein C (U/ml)	96 ± 8	96 ± 9	70–120	0	0.72
Protein S (U/ml)	84 ± 13	77 ± 16	70–140	−7 ± 12	0.12
Antithrombin (U/ml)	103 ± 4	101 ± 5	80–120	−3 ± 2	0.18
$Alpha_2$ antiplasmin (U/ml)	94 ± 3	95 ± 3	80–120	1 ± 3	0.67

Significant decrease of factors V and VIII in FLyP.
However, the global capacity to induce clot formation in vitro seems to be preserved.
The clinical relevance of these decreased factors is not known.