



Faut-il aller toujours plus vite

Tobias Gauss
PAR/Dechoc/Bloc Urgence
CHU Grenoble Alpes

COI

**Laboratoire Biomédicament Français
(Présentation dans le passé)**

**Cap Gemini Invent
(Coopération scientifique)**



**DIESEL IS
THE ONLY
FLUID**



Twitter 
@Twitter



#GoldenHour of Trauma saves lives

Bring patient to **DEFINITIVE** treatment within
an hour

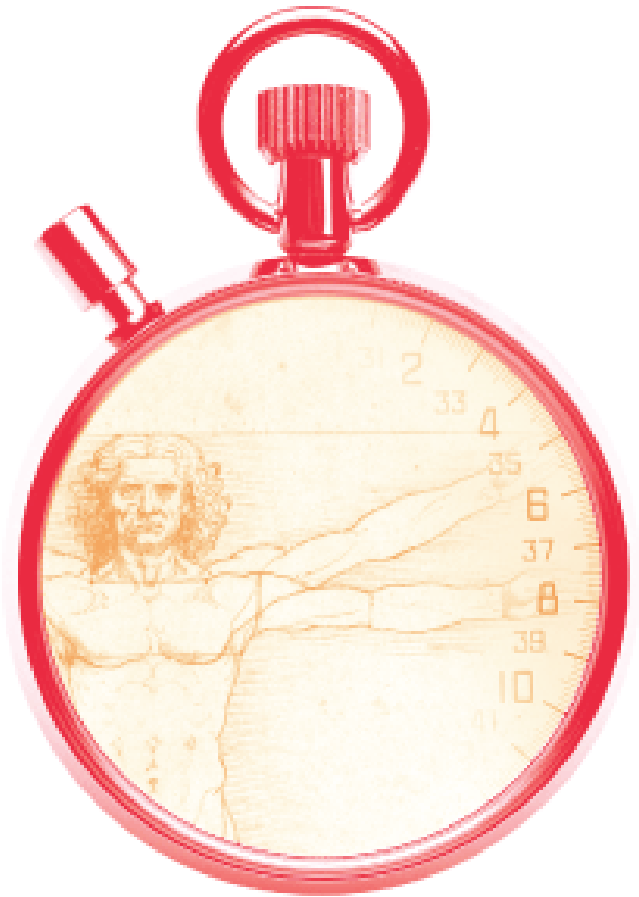
♡ 46.6K

10:05am

1972



Trauma is a disease of time



ATLSTM
ADVANCED TRAUMA LIFE SUPPORT



1h!!

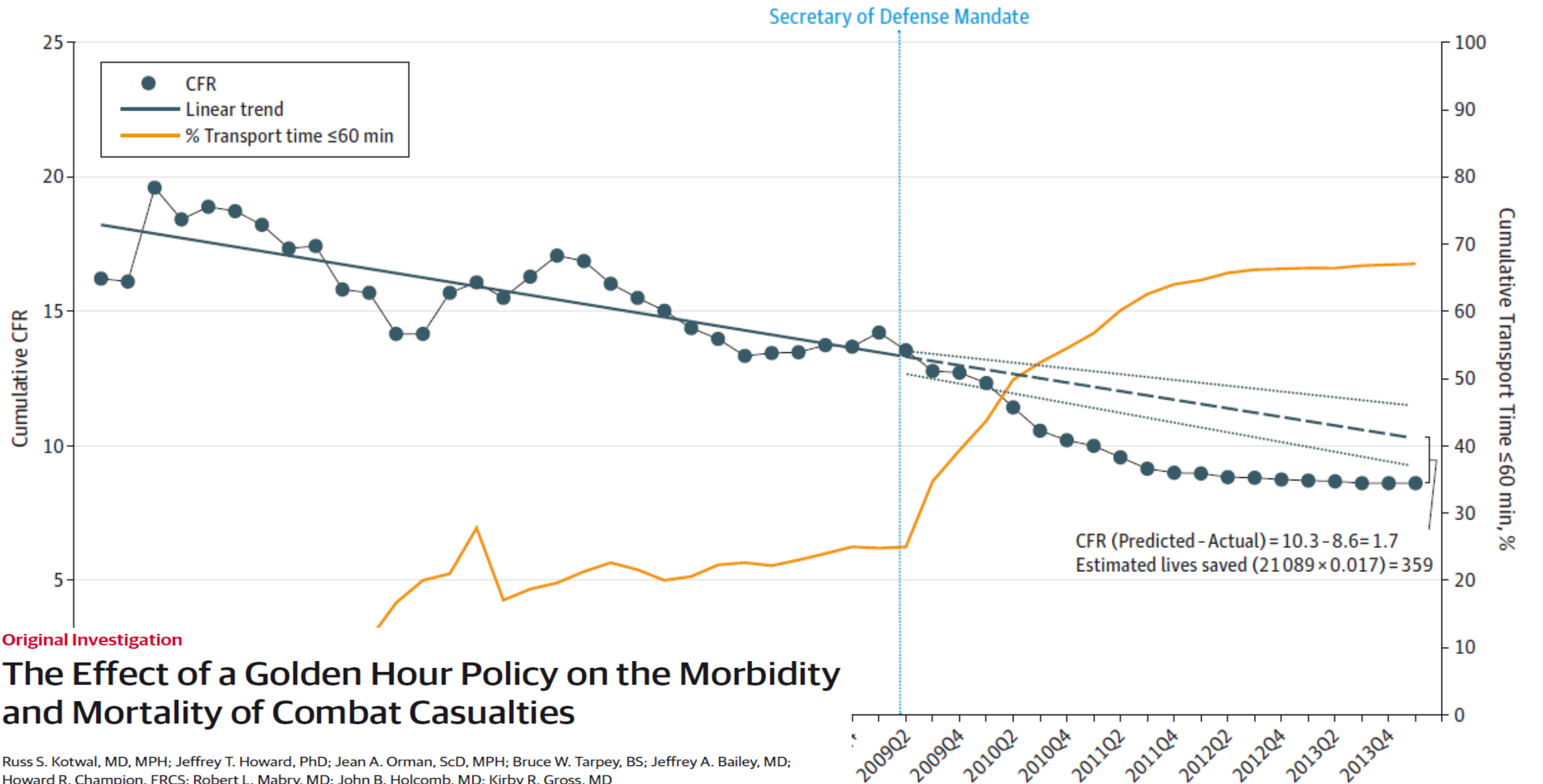


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MERT

***Medical
Emergency
Response
Team***

Figure 1. Case Fatality Rate and Transport Time



Association Between Geospatial Access to Care and Firearm Injury Mortality in Philadelphia

James P. Byrne, MD, PhD; Elinore Kaufman, MD, MS; Dane Scantling, DO, MPH; Vicky Tam, MA; Niels Martin, MD; Shariq Raza, MD; Jeremy W. Cannon, MD, SM; C. William Schwab, MD; Patrick M. Reilly, MD; Mark J. Seamon, MD

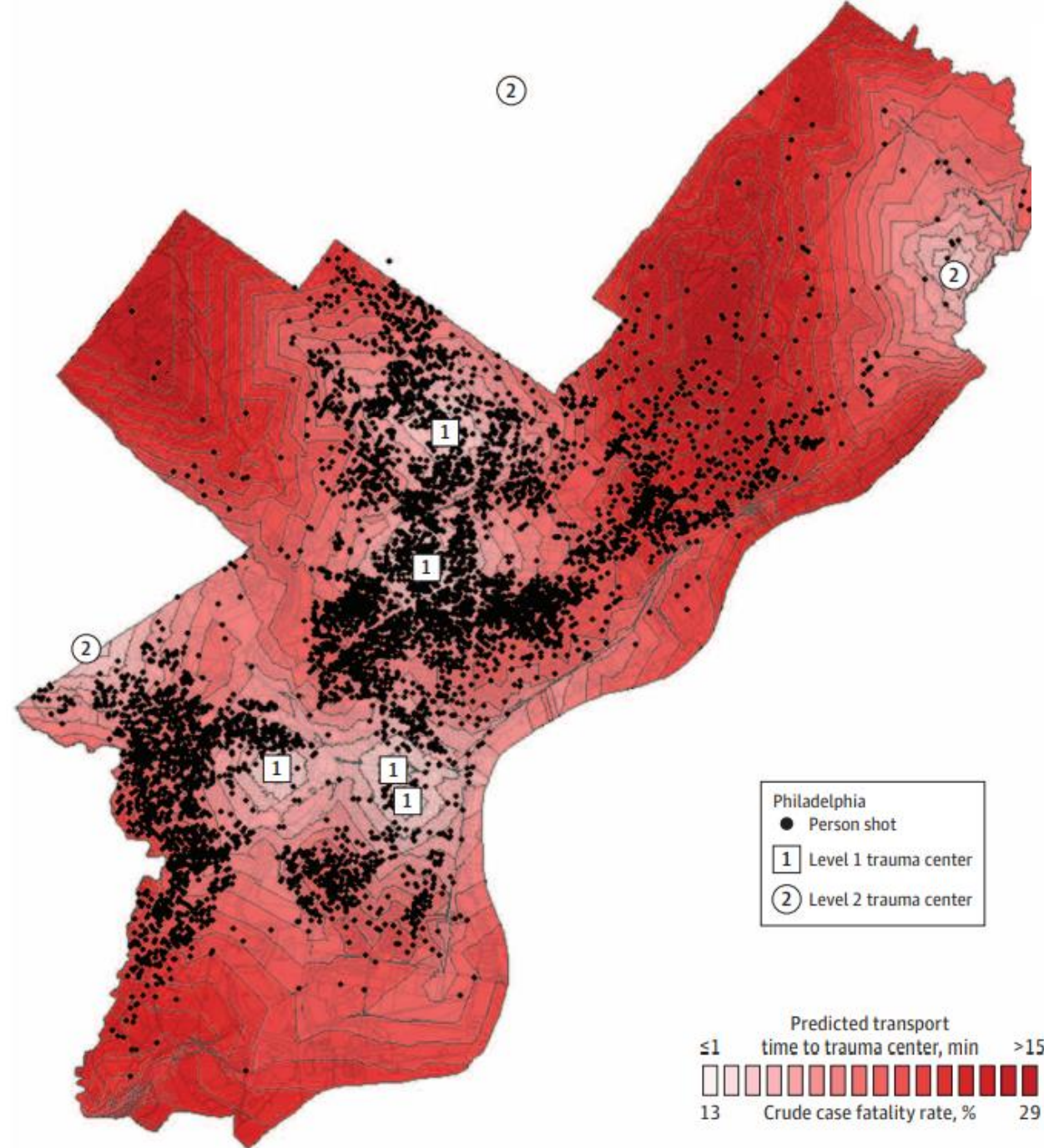
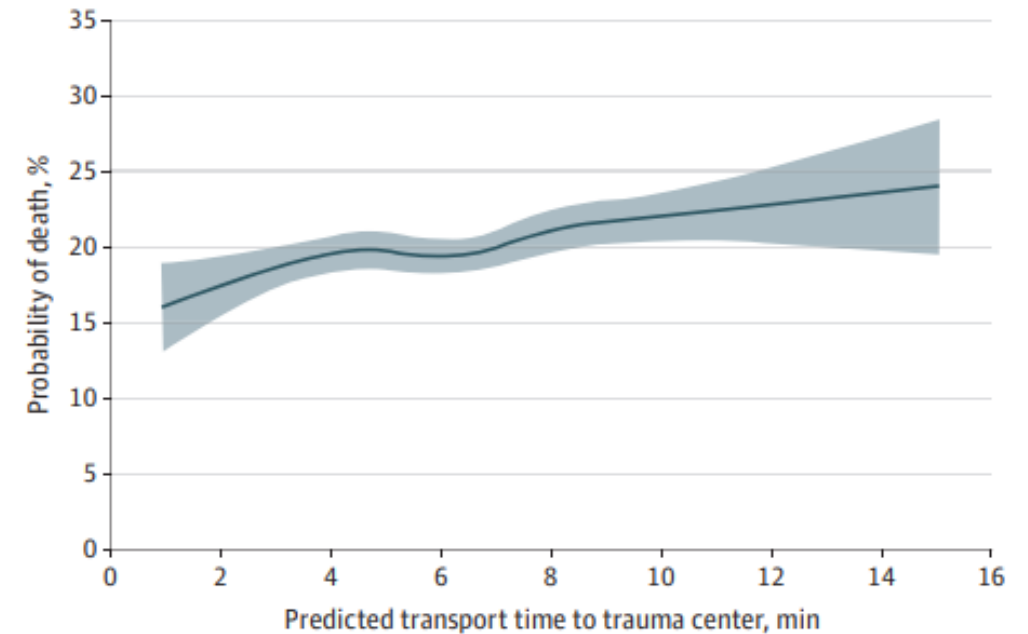


Figure 1. Unadjusted Association Between Increasing Predicted Transport Time to Nearest Trauma Center and Probability of Death for Individuals Shot



Shading indicates 95% CIs.

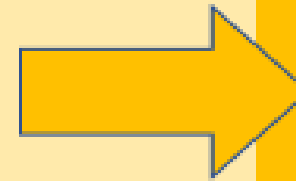
Association of Pre-hospital Time to In-hospital Trauma Mortality in a Physician Staffed Emergency Medicine System

**2 Trauma Systems
Physician Staffed**



n= 10216

Total Prehospital Time



per 10 minute elapsed

**All-cause In-hospital
Mortality**



↑ by 4-9%

 traumabase.eu



Gauss et al. *JAMA Surgery*. XX 2019

JAMA Surgery

First 70 minutes about by 1.56 (56% relative increase) every 10 minutes. After 70 minutes no increase of early death.

Early death

0.3
0.2
0.1
0.0

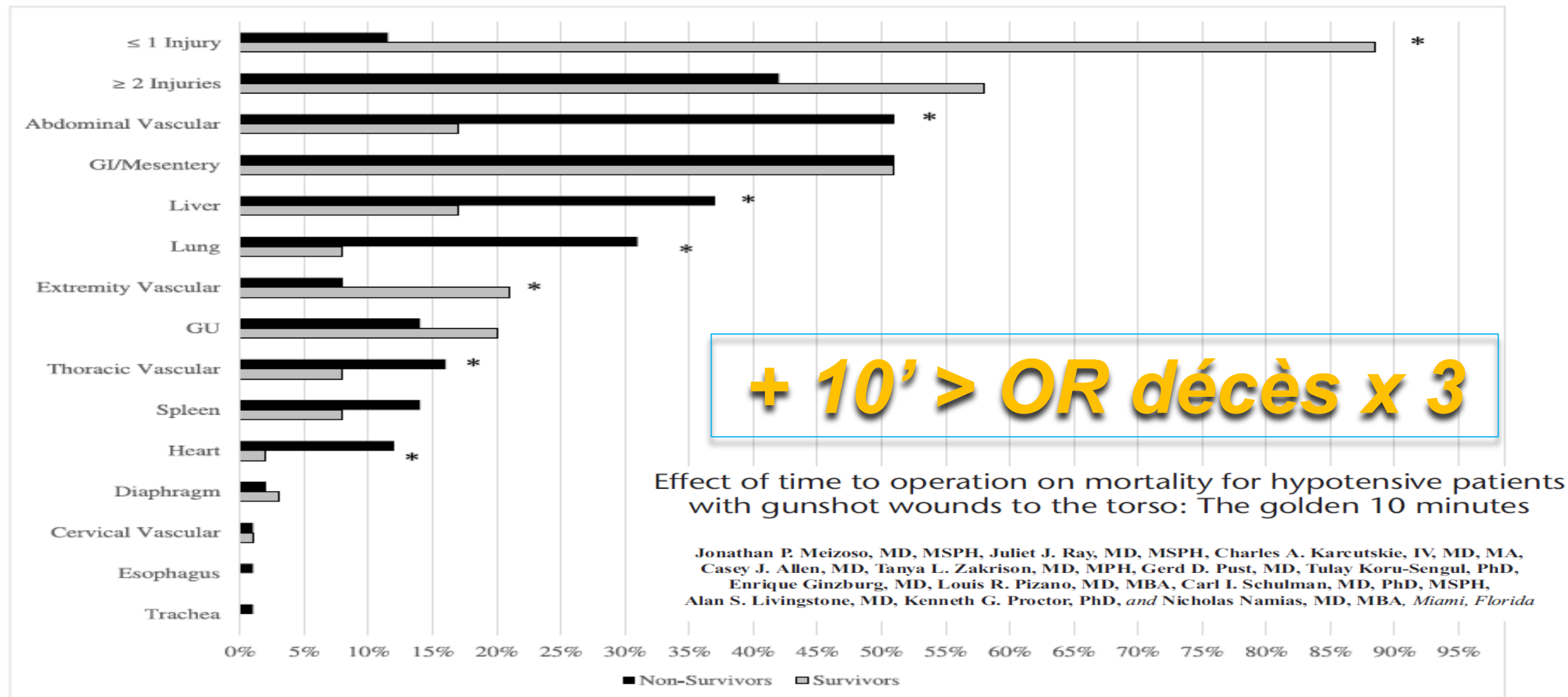
20

40

60

Time from ambulance arrival to hospital arrival





Time to Death by Cause of Death

	<1 hr	2 hr	3 hr	4 hr	4-8 hr	8-12 hr
Head Injury, n (%)	119/265 (45)	20/62 (32)	20/38 (53)	13/26 (50)	38/58 (66)	30/37 (8)
Hemorrhage, n (%)	131/265 (50)	38/62 (61)	19/38 (50)	14/26 (54)	24/58 (41)	7/37 (19)
ARDS + Sepsis, n (%)	0/265 (0)	0/62 (0)	0/38 (0)	0/26 (0)	0/58 (0)	0/37 (0)
Respiratory Fail, n (%)	4/265 (2)	0/62 (0)	0/38 (0)	0/26 (0)	1/58 (2)	0/37 (0)
Shock, n (%)	7/265 (3)	2/62 (3)	4/38 (11)	0/26 (0)	4/58 (7)	0/37 (0)
Comorbidities, n (%)	0/265 (0)	2/62 (3)	0/38 (0)	0/26 (0)	0/58 (0)	1/37 (3)
Other, n (%)	2/265 (1)	0/62 (0)	1/38 (3)	1/26 (4)	0/58 (0)	0/37 (0)
Unknown, n (%)	36/265 (14)	1/62 (2)	0/38 (0)	0/26 (0)	0/58 (0)	0/37 (0)
PE, n (%)	0/265 (0)	0/62 (0)	0/38 (0)	0/26 (0)	0/58 (0)	0/37 (0)

Cumulative percentage is greater than 100% due to patients with multiple causes of death

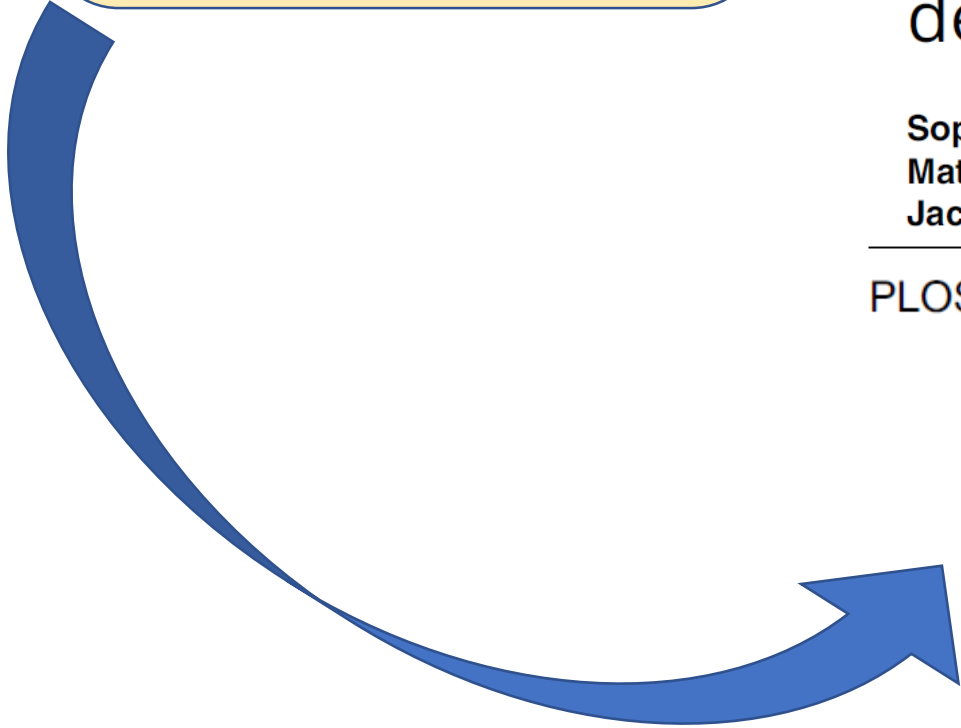
	<1h
TC grave	119/265 (45%)
Hémorragie/Choc	131/265 (50%)

Published online first in the *Journal of Trauma and Acute Care Surgery* in the form of a full-length article on January 1, 2016; 48(1): 5–12. doi:10.1016/j.injury.2016.10.037.

Trends in 1029 Trauma Deaths at a Level 1 Trauma Center

Blessing T. Oyeniya, BS¹, Erin E. Fox, PhD¹, Michelle Scerbo, M.D.¹, Jeffrey S. Tomasek, M.D.¹, Charles E. Wade, PhD¹, and John B. Holcomb, M.D.¹

696/4412
Accident Ile de
France Paris
Non admis Niv I



RESEARCH ARTICLE

Direct transport vs secondary transfer to level I trauma centers in a French exclusive trauma system: Impact on mortality and determinants of triage on road-traffic victims

Sophie Rym Hamada^{1,2*}, Nathalie Delhay³, Samuel Degoul⁴, Tobias Gauss⁵, Mathieu Raux⁶, Marie-Laure Devaud⁷, Johan Amani⁸, Fabrice Cook⁹, Camille Hego¹⁰, Jacques Duranteau¹¹, Alexandra Rouquette^{12,13}, the Traumabase Group¹¹

PLOS ONE | <https://doi.org/10.1371/journal.pone.0223809> November 21, 2019

569 (60%)
Décès sur place



POURQUOI?????

ORIGINAL RESEARCH

Open Access



Diagnostic accuracy of clinical examination to identify life- and limb-threatening injuries in trauma patients

Jared M. Wohlgemut^{1,2*}, Max E. R. Marsden^{1,2,3}, Rebecca S. Stoner^{1,2}, Erhan Pisirir⁴, Evangelia Kyrimi⁴, Gareth Grier⁵, Michael Christian⁵, Thomas Hurst⁵, William Marsh⁴, Nigel R. M. Tai^{1,2,3} and Zane B. Perkins^{1,2,5}

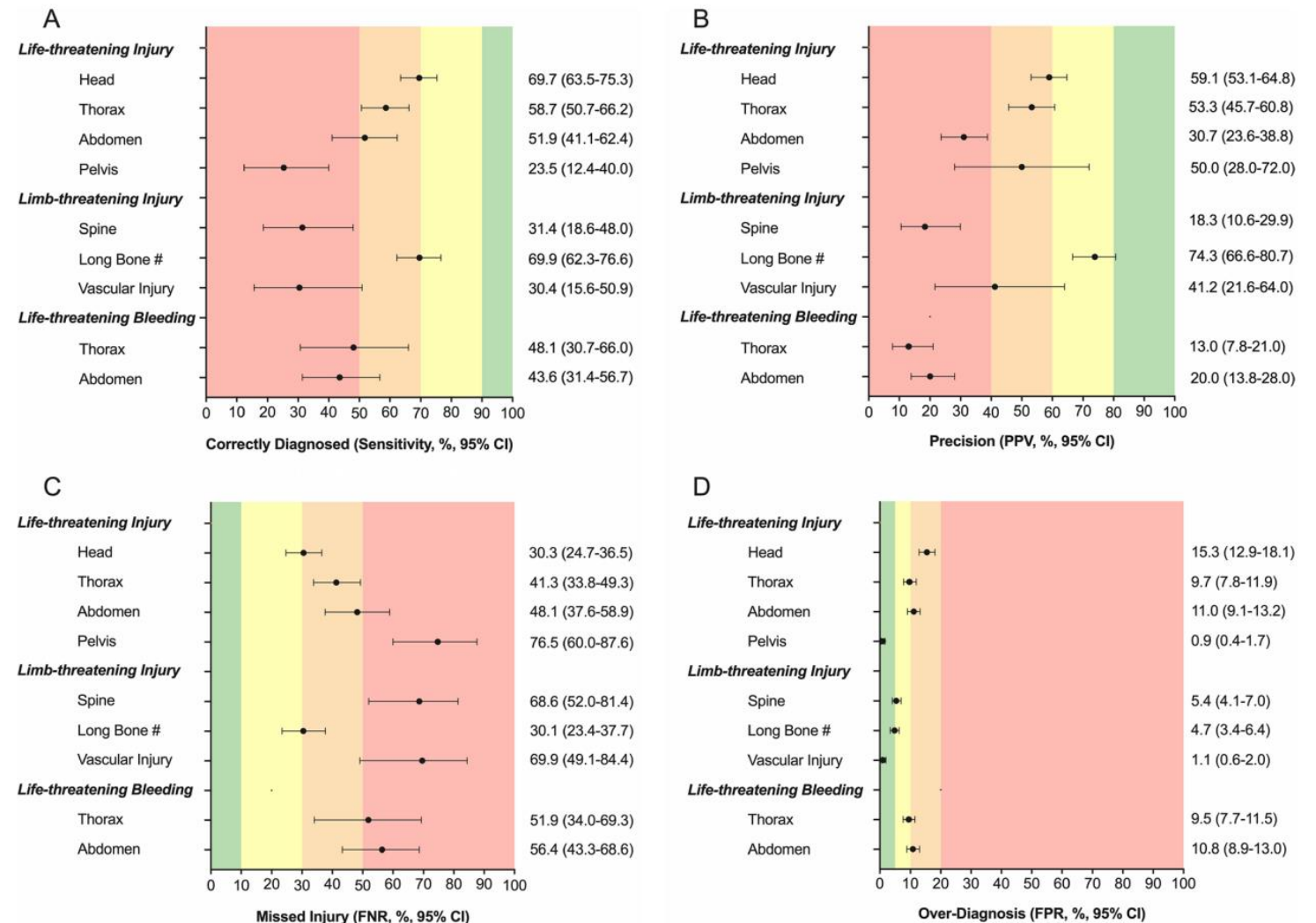
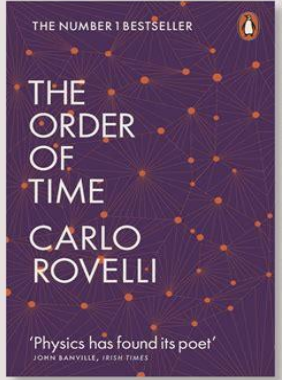


Fig. 1 Diagnostic accuracy of clinical examination to identify life- and limb-threatening injuries and bleeding. Measures include **A** sensitivity, **B** Positive Predictive Value (PPV), **C** False Negative Rate (FNR) and **D** False Positive Rate (FPR). Black dots represent the accuracy measure, and horizontal lines represent 95% confidence intervals. Shaded vertical areas represent acceptable standards of accuracy measures

□ Poor □ Moderate □ Good □ Excellent



La physique ne décrit pas comment les choses évoluent dans *le temps*, mais dans leur propre temps et dans leur rapport réciproque

Chaînes évènements

= +++ complexité

= +++ interactions

= +++ de temps

	Total	Oro-tracheal intubation N (%)	Resuscitation fluid >1000 ml N (%)	Vasopressor use N (%)	Osmotherapy N (%)
0-29 min	514	49 (10)	71 (14)	24 (5)	11 (2)
30-59 min	3,535	488 (14)	578 (16)	203 (6)	131 (4)
60-89 min	3,459	794 (23)	806 (23)	328 (10)	210 (6)
90-119 min	1,624	555 (34)	550 (34)	242 (15)	123 (8)
120-179min	870	391 (45)	365 (42)	153 (18)	76 (9)
180 + min	124	67 (54)	68 (54)	32 (26)	18 (14)
Total	10,126	2,321 (23)	2,438 (24)	982 (10)	569 (6)
		<0.001	<0.001	<0.001	<0.001

**A
C
T
I
O
N
S**

**T
E
M
P
S**

Not all prehospital time is equal: Influence of scene time on mortality

Joshua B. Brown, MD, MSc, Matthew R. Rosengart, MD, MPH, Raquel M. Forsythe, MD, Benjamin R. Reynolds, MPAS, PA-C, Mark L. Gestring, MD, William M. Hallinan, RN, MS, EMT-P, Andrew B. Peitzman, MD, Timothy R. Billiar, MD, and Jason L. Sperry, MD, MPH, Pittsburgh, Pennsylvania

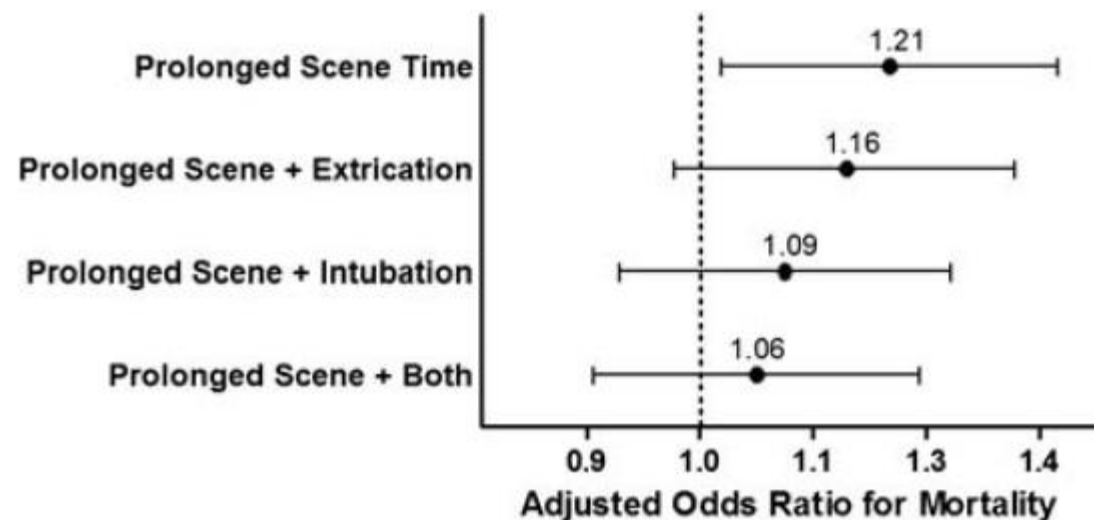


TABLE 2. Regression Results for Association Between Prolonged Scene Time and Mortality in PH Criteria Subgroups With a Significant Association

Criterion	AOR*	95% CI*	q value**
Risk adjustment model without extrication or PH intubation			
Hypotension (SBP < 90 mm Hg)	1.40	1.17–1.67	<0.01
PH GCS score ≤ 13	1.14	1.02–1.29	0.04
Penetrating injury	1.59	1.29–1.97	<0.01
Flail chest	1.34	1.15–1.56	<0.01
Pelvic fracture	1.23	1.03–1.54	0.04
Risk adjustment model adjusting for extrication and PH intubation			
Hypotension (SBP < 90 mm Hg)	1.25	1.04–1.50	0.04
Penetrating injury	1.38	1.13–1.69	0.01
Flail chest	1.21	1.04–1.40	0.03

*AOR and 95% CI, for association of mortality with prolonged scene time.

**False discovery rate-adjusted *p* values; can be interpreted similarly to standard *p* values with significance defined as *q* ≤ 0.05.

10 min



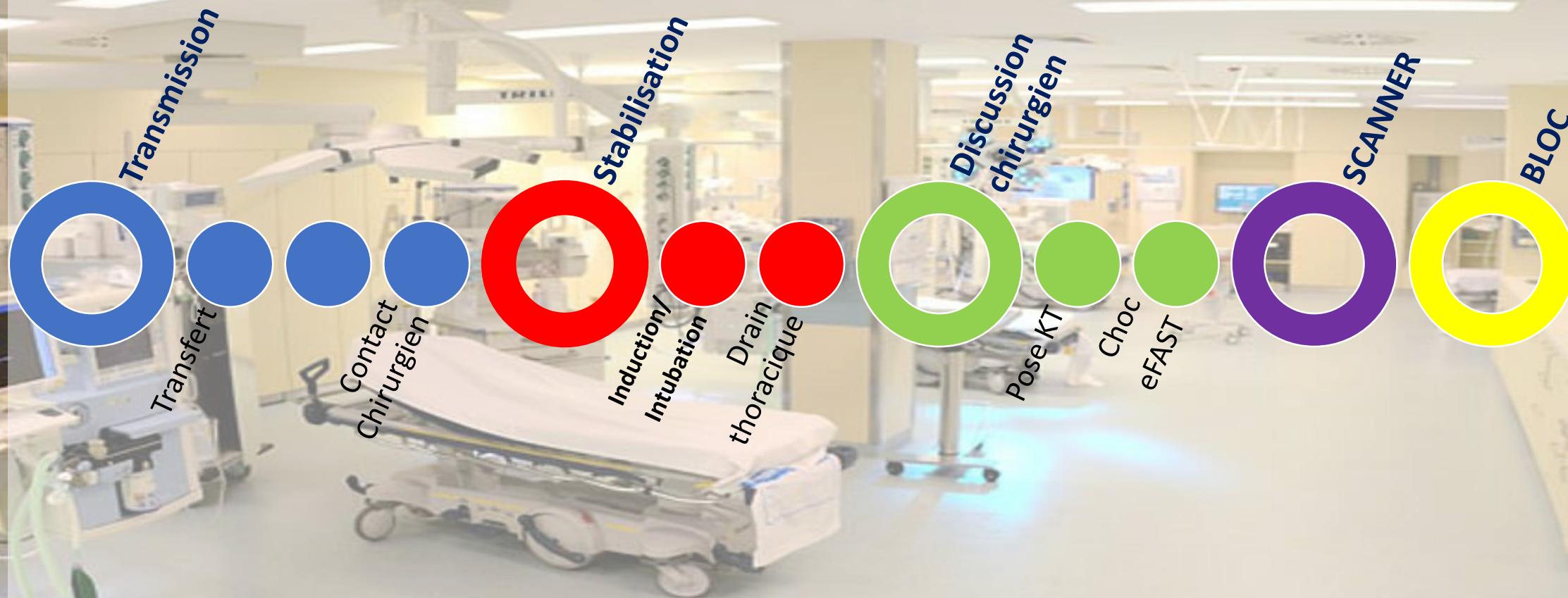
15 min



5 min



10 min



STOP THE BURNING PROCESS > TIME IS BLOOD AND TIME IS BRAIN

A

AIRWAY



OBSTRUCTION
HYPOXIE

B

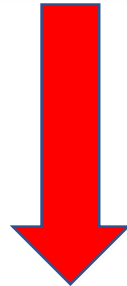
BREATHING



VENTILATION
HYPOXIE
PNEUMOTHORAX

C

CIRCULATION



HEMORRAGIE
CHOC
TAMPONNADE

D

DISABILITY



COMPRESSION
ISCHEMIE

E

EXPOSURE



ARTICULAIRE
INFECTION

STOP THE BURNING PROCESS > TIME IS BLOOD AND TIME IS BRAIN

A

AIRWAY

B

BREATHING

C

CIRCULATION

D

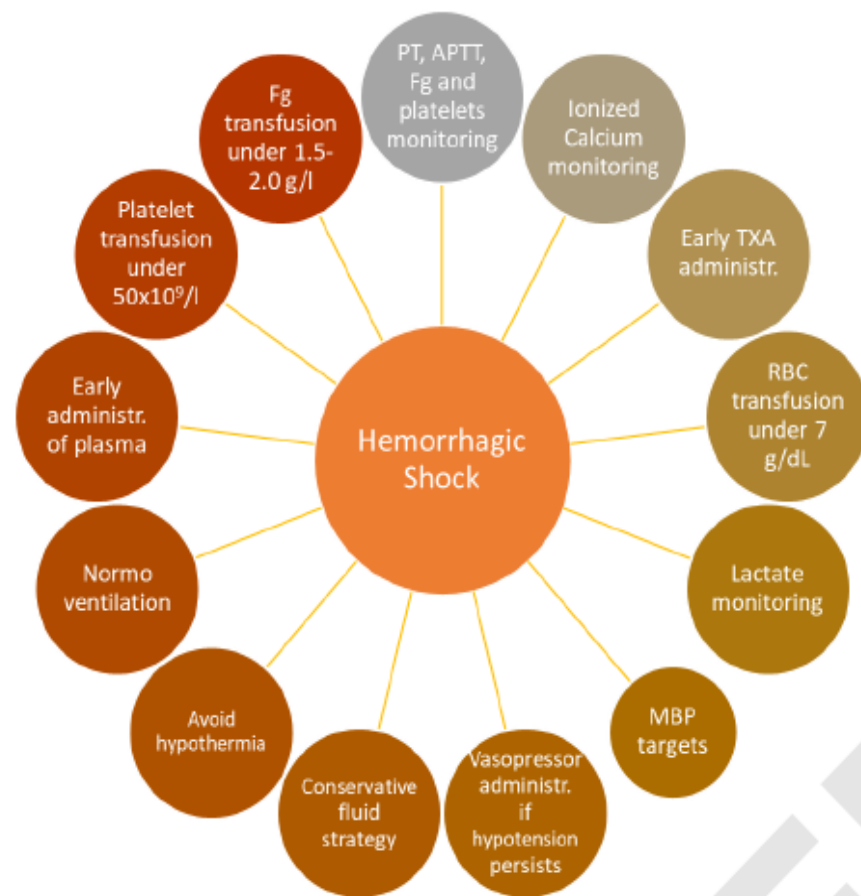
DISABILITY

E

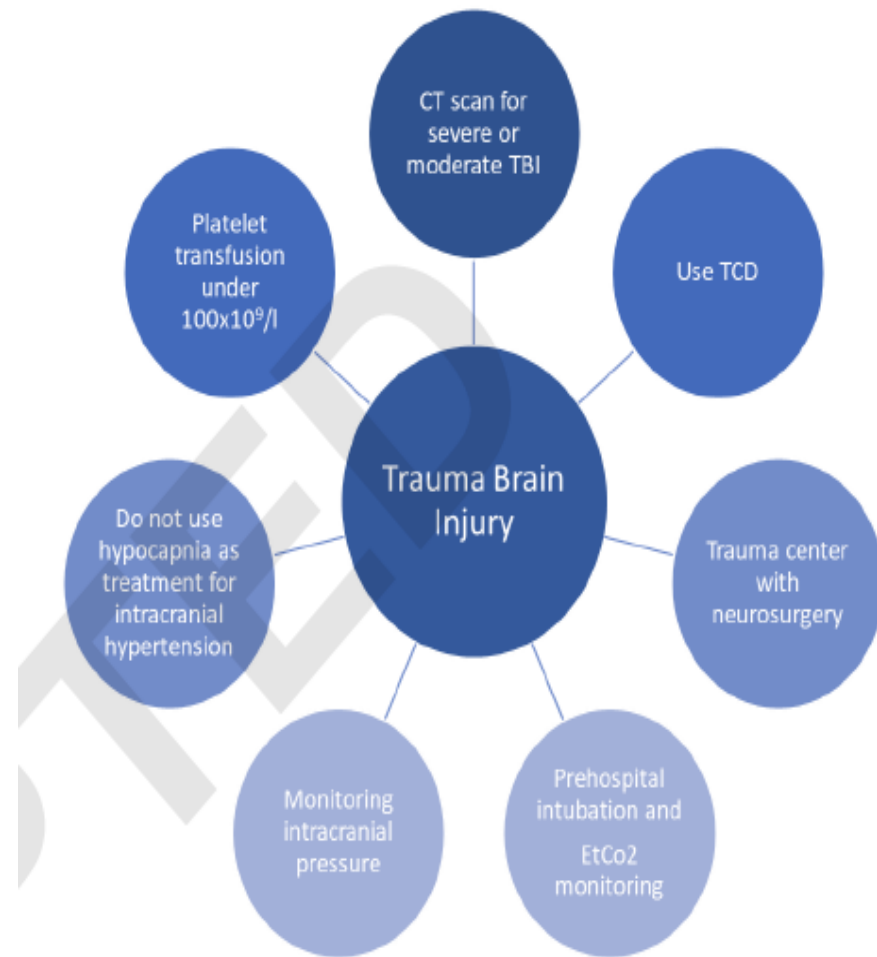
EXPOSURE

STABILISATION

DEFINITIV



A



B

**Clinical decision support for severe trauma patients : Machine Learning
based definition of a bundle of care for Hemorrhagic Shock and Traumatic
Brain Injury**

E. Lang, MD¹, A. Neuschwander, MD¹, G. Favé, MD¹, P.S. Abback, MD², P. Esnault, MD³,
T. Geeraerts, MD⁴, A. Harrois, MD⁵, J.L. Hanouz, MD, PhD⁶, E. Kipnis, MD, PhD⁷,
M. Leone, MD, PhD⁸, V. Legros, MD⁹, N. Mellati, MD¹⁰, J. Pottecher, MD, PhD¹¹,
S. Hamada, MD, PhD¹, R. Pirracchio, MD, PhD¹² for Traumabase group.

	Trauma brain injury : Training cohort				Trauma brain injury : Validation cohort			
	Univariate Analysis		Multivariate analysis		Univariate Analysis		Multivariate analysis	
7-day mortality	RR [95CI%]	p	RR [95CI%]	p	RR [95CI%]	p	RR [95CI%]	p
« Bundle » vs « less »	0.35 [0.27; 0.51]	<0.001	0.42 [0.19; 0.57]	<0.001	0.52 [0.41; 0.72]	<0.001	0.55 [0.34; 0.71]	0.02
« Bundle » vs « more »	1.81 [1.21; 2.01]	<0.001	1.26 [0.92; 1.34]	0.34	2.4 [1.71; 3.17]	<0.001	1.56 [0.89; 1.98]	0.45

Table 4. 7-day Mortality of traumatic brain injury for different bundles of care



PIEGE COMPLEXITE



**MIEUX ENNEMI
DU BIEN**

STABILISATION

DEFINITIV

A
Besoins
Immédiats

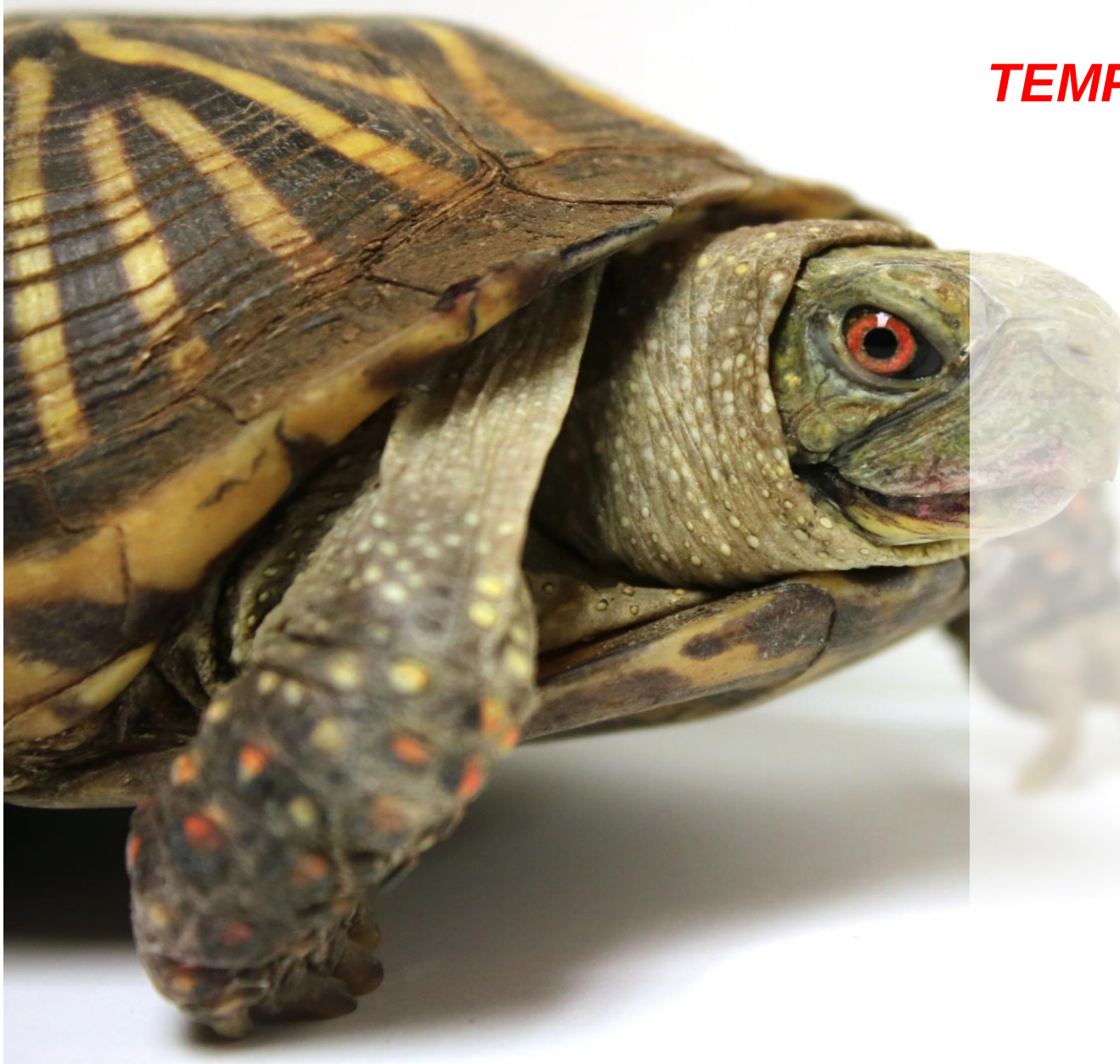
Interventions
Immédiates
EBM

B
Besoins
complexes

Peser
Bénéfice/Risque
Temps/Complexité

QUEL EST LE
PROCESSUS
PRIORITAIRE?

Quel traitement
DEFINITIF est
prioritaire?



TEMPS objectif thérapeutique individualisé

PRIORISER
entre **STABILISATION ET DEFINITIF**

MAINTENANT ou plus **TARD**

Attention **PIEGE COMPLEXITE**

Trouver réponse à **MORTALITE 1h**

Déterminer interventions précoces
INDISPENSABLES