SFAR
Société Française d'Anesthésie et de Réanimation
LE CONGRÈS
DU 19 AU 21 SEPT 2019
Palais des Congrès de Paris

Réduire le délai de l'hémostase chirurgicale et/ou radiologique

Pr Julien Bordes
Fédération Anesthésie-Réanimation-Brûlés
HIA Sainte-Anne, Toulon

SFAR 2019 Session CARUM le 19 septembre 2019

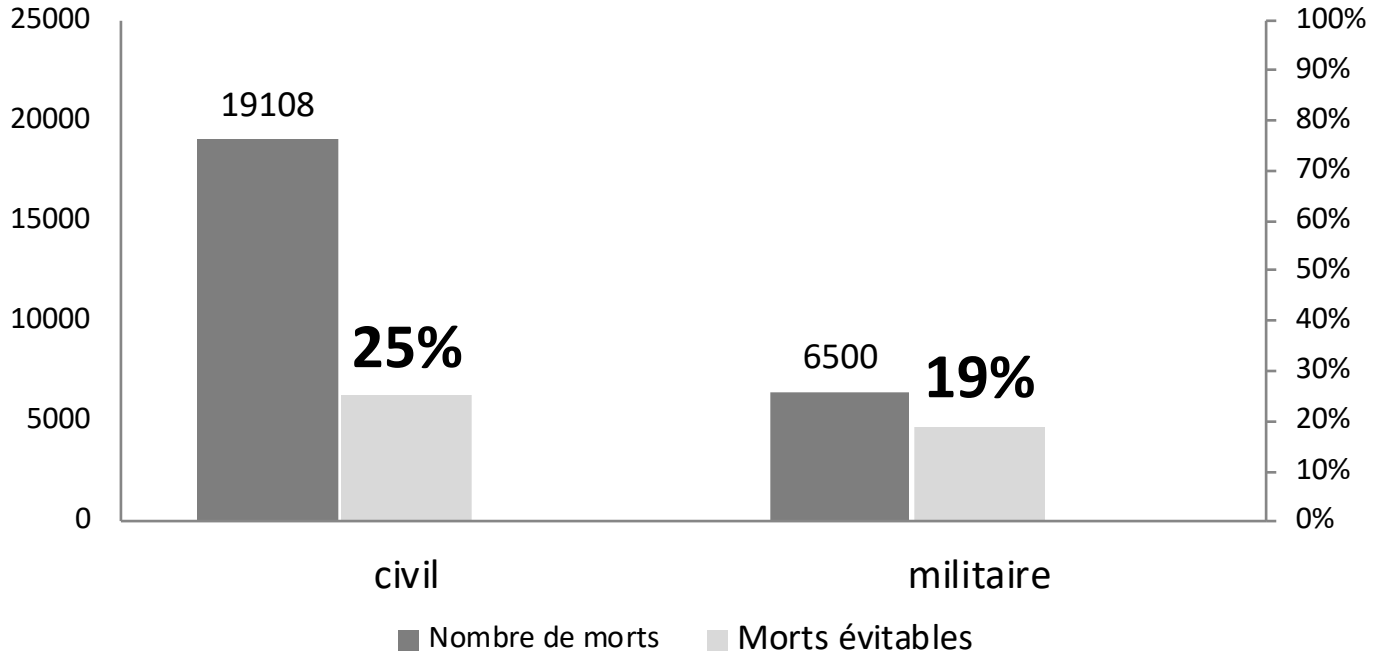
Service de santé des armées

Hôpital d'Instruction des Armées Sainte Anne

Hémorragie:
1ère cause de mortalité évitable

Le quart des morts sont évitables

Méta-analyse
42 études civiles
8 études militaires
1985 à 2011



Janak et al JAMA Surg 2018

Civil: 4000 patients/an en France

Les délais: cause de mortalité

Preventable Mortality at a Mature Trauma Center

Trauma center niveau 1
Los Angeles, Etats-Unis

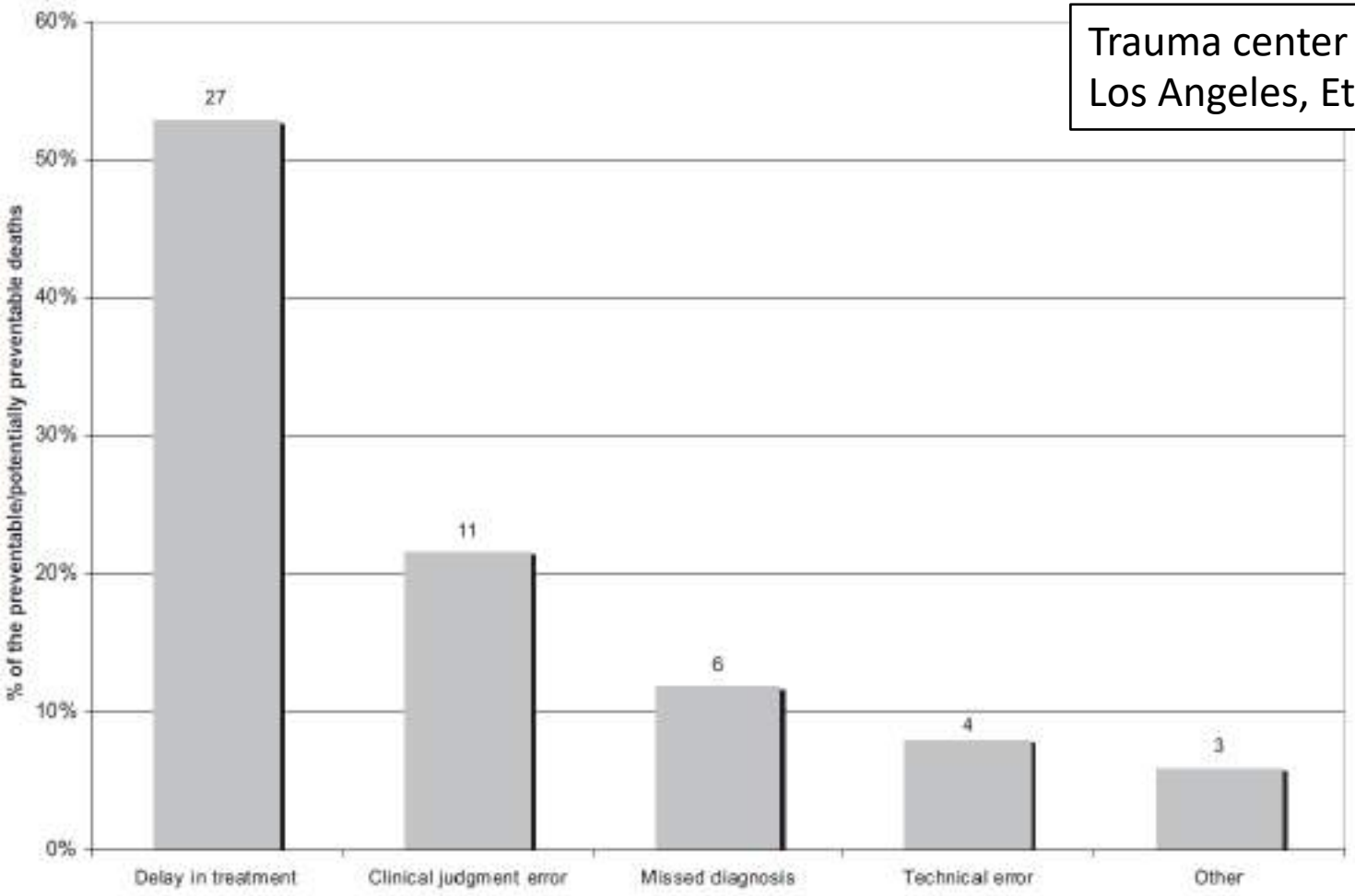
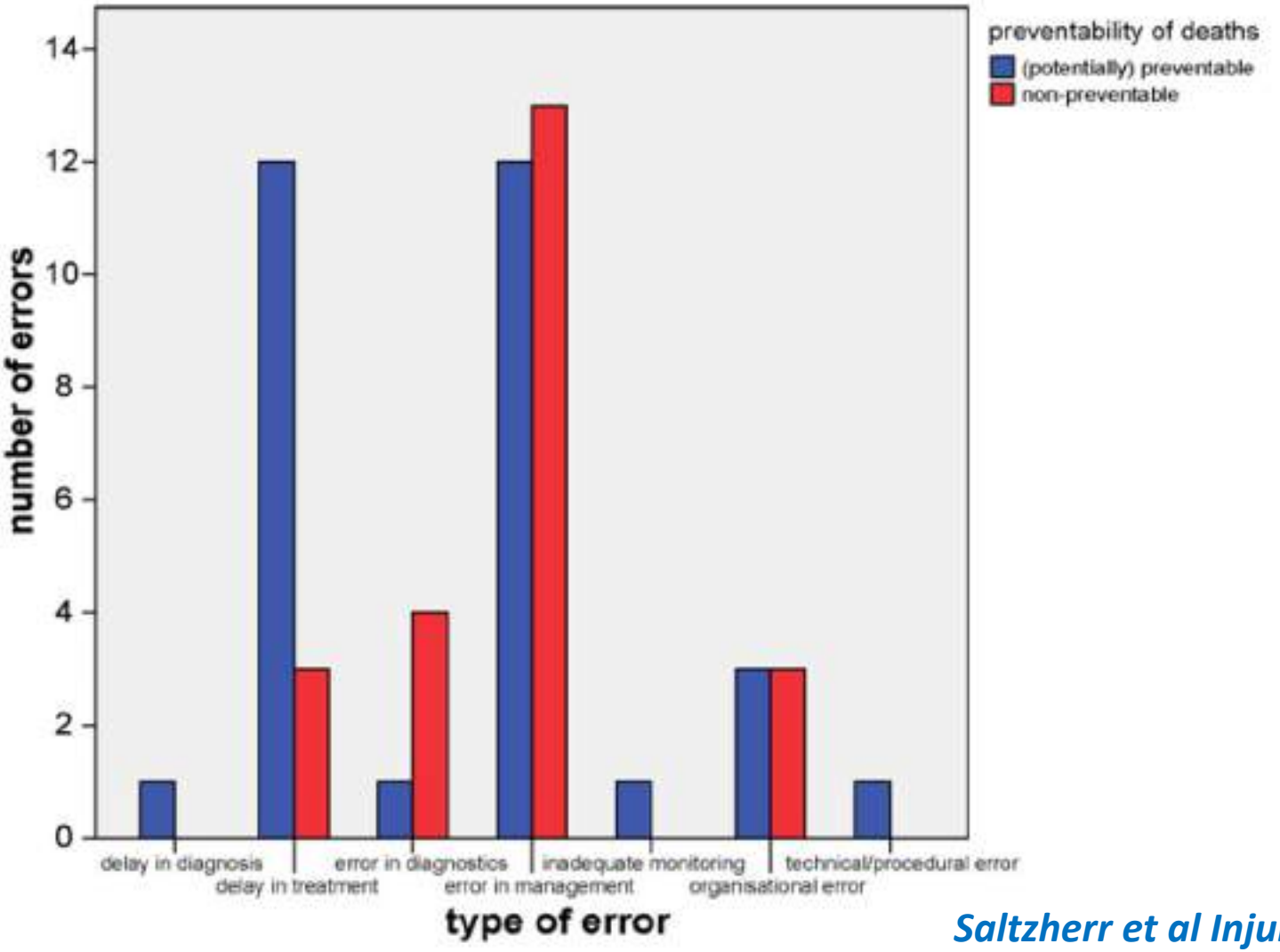


Fig. 4. *Errors contributing to deaths.*

Teixeira et al J of trauma 2007

Les délais: cause de mortalité

Trauma center niveau 1
Croningue, Pays-Bas



Saltzherr et al Injury 2011

Injury, Int. J. Care Injured 47 (2016) 669–673

Contents lists available at ScienceDirect

Injury

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

Preventable deaths and potentially preventable deaths. What are our errors?

Sandra Montmany [a,*], Anna Pallisera [b,1], Pere Rebasa [c,2], Andrea Campos [d,2], Carme Colilles [e,2], Alexis Luna [c,2], Salvador Navarro [c,2]

16 centres Espagne

Table 2
Errors recorded with our classification.

Errors (recorded with our classification)			
130 errors in all deaths		46 errors in preventable and potentially preventable deaths	
Correct procedure, but untimely	26 (20%)	Correct procedure, but untimely	10 (22%)
CT performed in hemodynamically unstable patients	21 (16%)	CT performed in hemodynamically unstable patients	7 (15%)
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Journal of Visceral Surgery (2019) 156, 10–16

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com/en

ORIGINAL ARTICLE

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

13 centres
1 trauma center niveau 1
7884 patients
Réseau TRENEAU France

Table 2 Analysis of errors by the adjudication committee.

	Preventable deaths *n* = 72 patients	Potentially preventable deaths *n* = 36 patients	Total *n* = 108 patients
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Equipment failure	0	1	1
Total	92	78	170

One preventable/potentially preventable death may be related to more than one error, so that sum totals of errors exceed the number of deaths.

Les traumatisés sévères meurent d'une hémostase trop tardive

Philip Charles Spinella
Washington University in St. Louis | WUSTL , Wash U · Department of Pediatrics
37.82

CURRENT OPINION

Zero preventable deaths after traumatic injury: An achievable goal

Philip Charles Spinella, MD, FCCM, *St Louis, Missouri*

0% mort évitable = réaliser une hémostase rapide

« Trauma system »

Guerre du Vietnam 1955-1975 1966

ACCIDENTAL DEATH AND DISABILITY: THE NEGLECTED DISEASE OF MODERN SOCIETY

Prepared by the
COMMITTEE ON TRAUMA AND COMMITTEE ON SHOCK
DIVISION OF MEDICAL SCIENCES
NATIONAL ACADEMY OF SCIENCES
NATIONAL RESEARCH COUNCIL

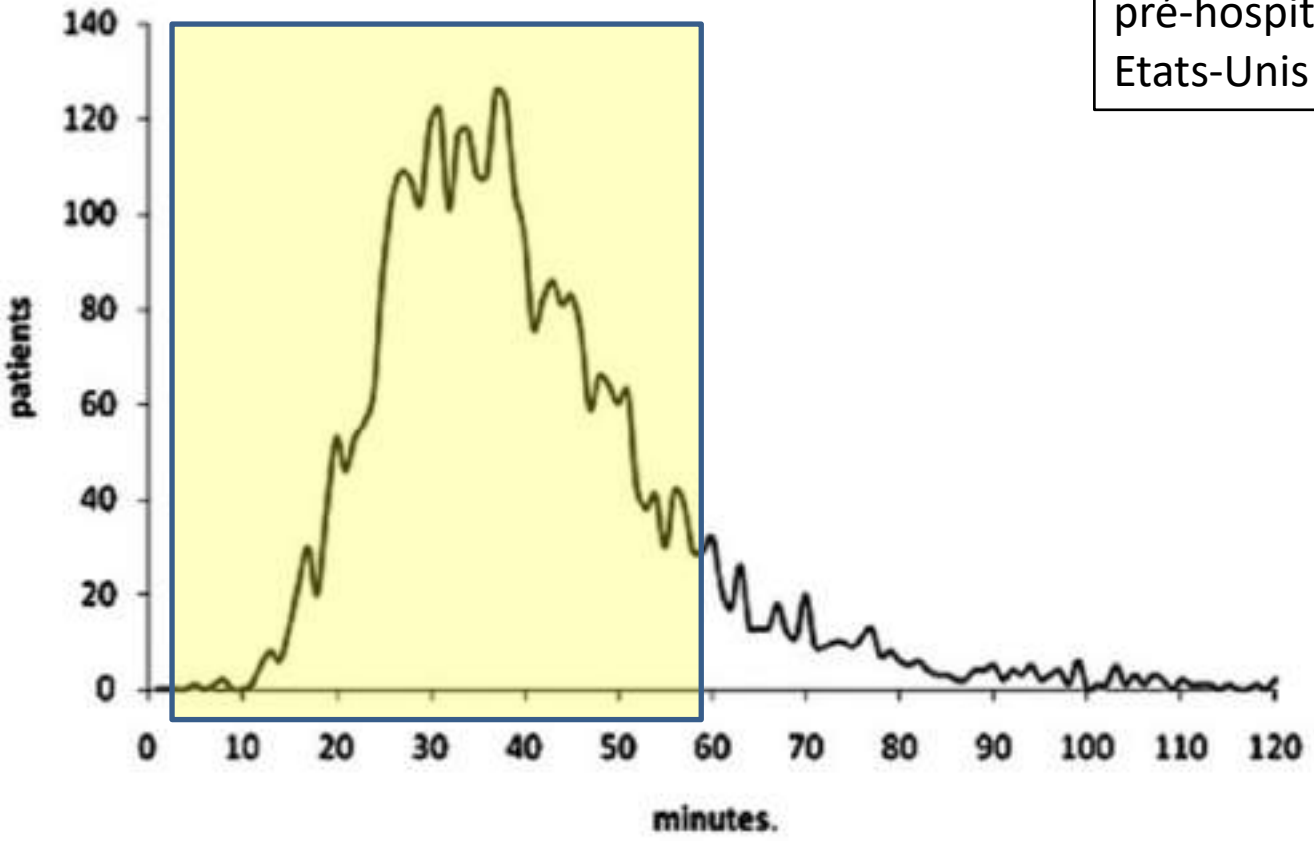
NATIONAL ACADEMY OF SCIENCES
NATIONAL RESEARCH COUNCIL
Washington, D. C., September, 1966

La « golden hour »

1959: 1st Shock Trauma center of the university of Maryland Hospiland

Golden hour:
Mythe ou réalité?

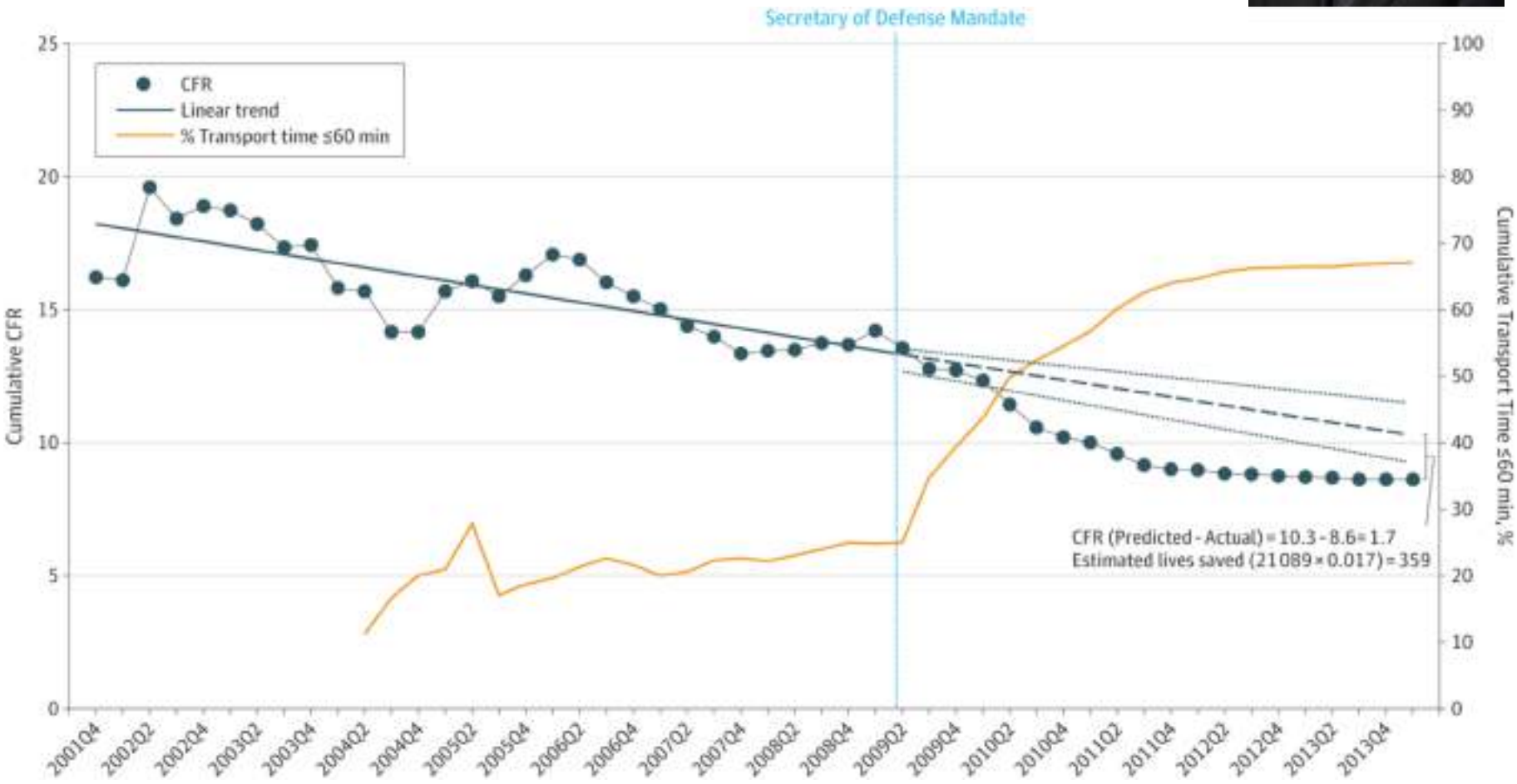
3656 traumatisés
146 services d'urgence pré-hospitalière
Etats-Unis



Craig Ann Emerg Med 2010

Réduire les délais = ↘mortalité

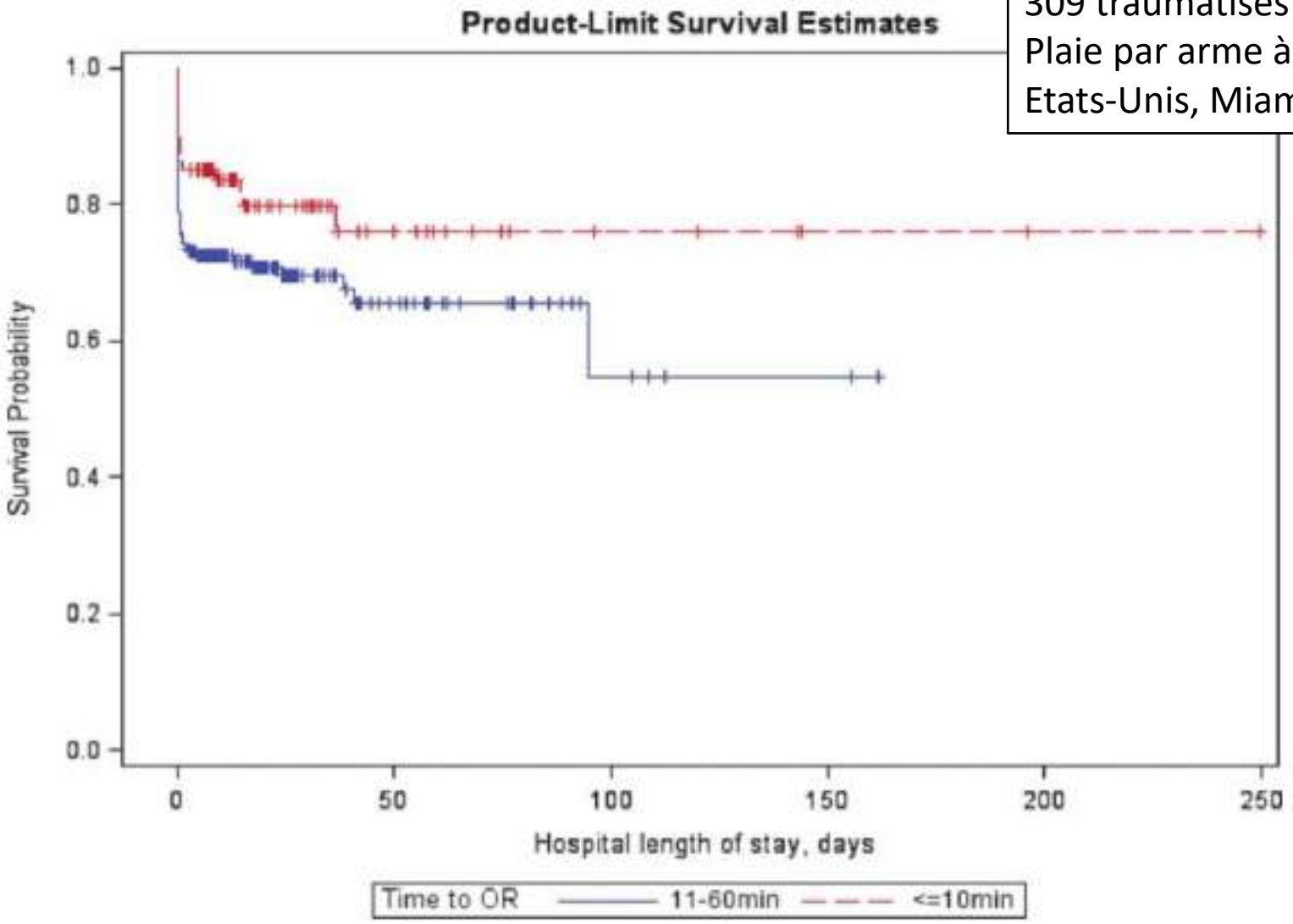
2009 « Golden hour mandate »



Kotwal et al JAMA Surg 2016

Réduire les délais = ↘mortalité

309 traumatisés
Plaie par arme à feu
Etats-Unis, Miami

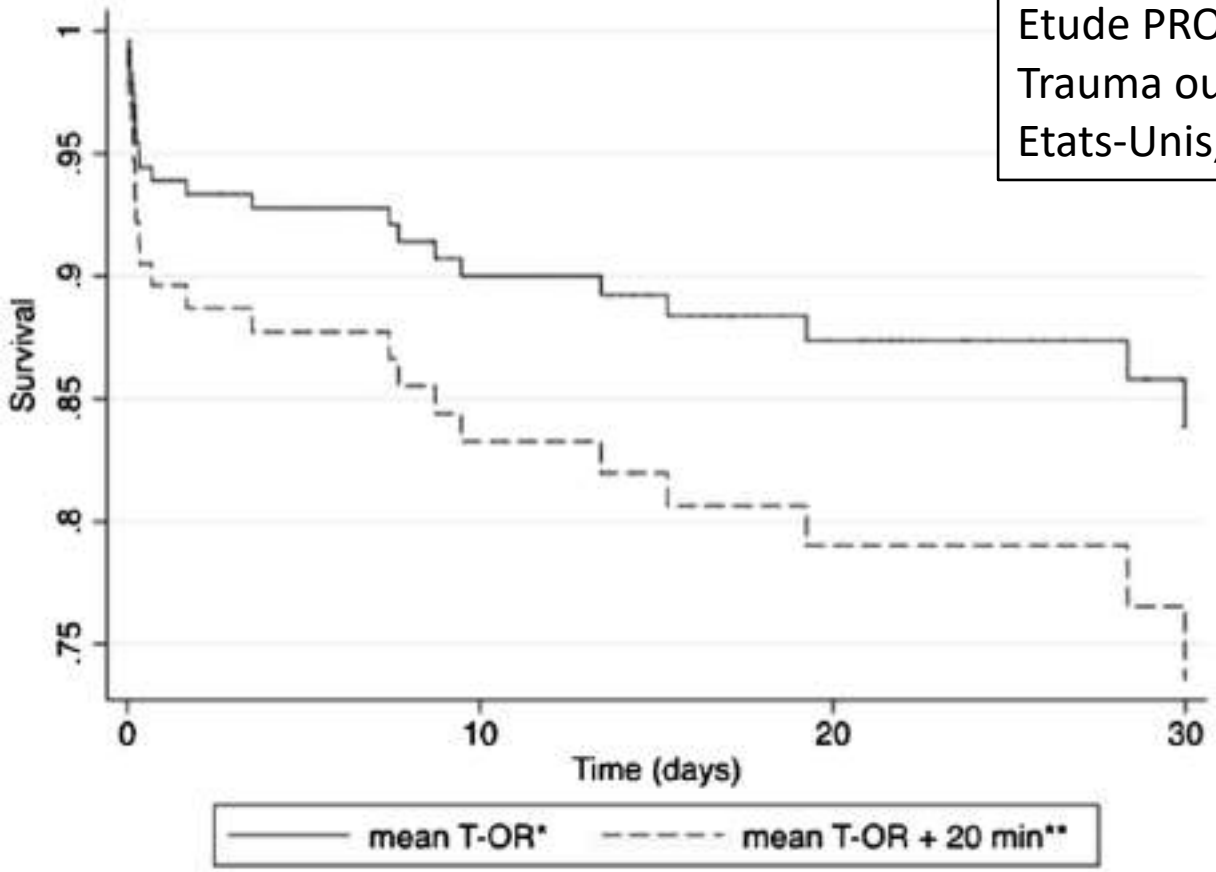


Meizoso J of trauma 2016

Réduire les délais = ↘mortalité

↗ mortalité x 1,5 / 10 minutes de délai supplémentaire

115 traumatisés
Etude PROMMTT
Trauma ouvert et fermé
Etats-Unis, Miami



Barbosa J of trauma 2013

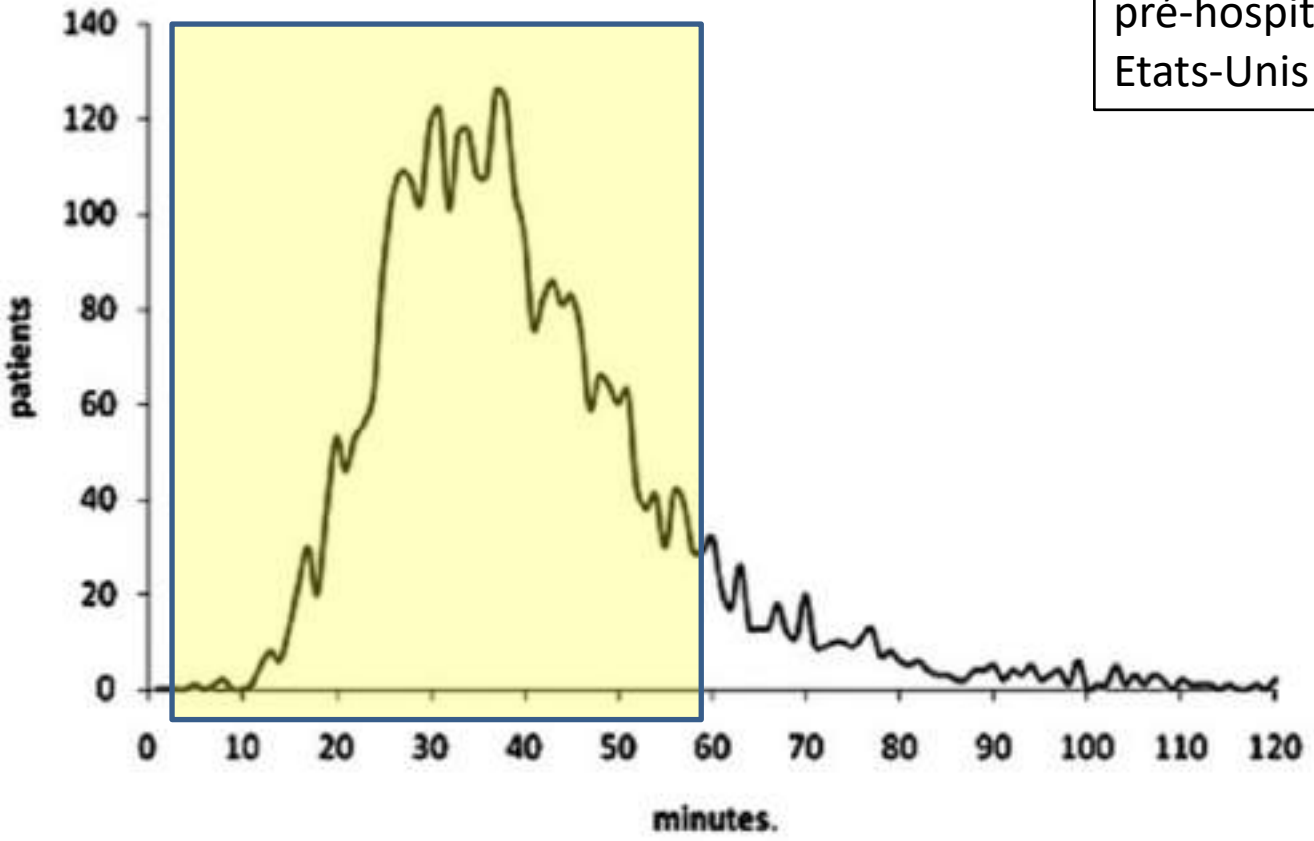
Organisation d’un trauma system

- Enjeux diagnostique et thérapeutique dans un temps limité
- Contrainte de temps
- Concerne la période pré-hospitalière et hospitalière

Délai pré-hospitalier: une réalité contrastée

Contexte civil

3656 traumatisés
146 services d'urgence pré-hospitalière
Etats-Unis



Craig Ann Emerg Med 2010

Contexte militaire: élongations +++

4000 militaires français
5 millions de km²

Opération Barkhane: élongations +++

Blessure

Rôle 1

Rôle 2

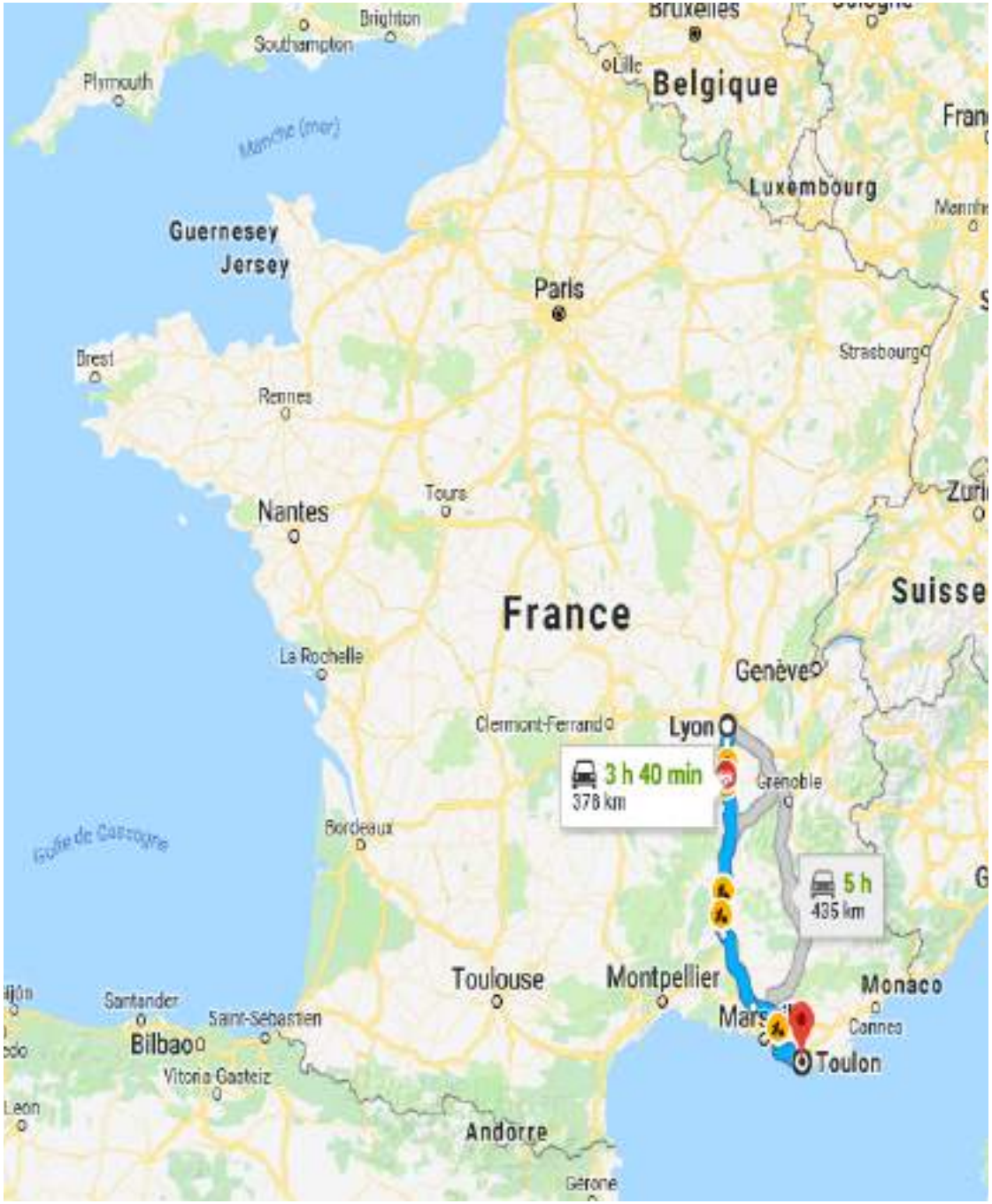
Médicalisation de l'avant

Evacuation tactique

17h55 (J0)

19h15 (J0)

22h10 (J0)


Brighton
Southampton
Plymouth
Bruxelles
Lille
Belgique
Luxembourg
Guernesey
Jersey
Paris
Strasbourg
Brest
Rennes
Nantes
Tours
France
Suisse
La Rochelle
Genève
Clermont-Ferrand
Lyon
3 h 40 min
378 km
Grenoble
Bordeaux
5 h
435 km
Toulouse
Montpellier
Monaco
Santander
Saint-Sébastien
Bilbao
Vitoria-Gasteiz
Cannes
Toulon
Andorre

Délais d'évacuation > 60min

Injury, Int. J. Care Injured 48 (2017) 58–63

Contents lists available at ScienceDirect

Injury

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

Original article

Forward medevac during Serval and Barkhane operations in Sahel: A registry study

Cyril Carfantan[a,*], Yvain Goudard, MD[b], Christophe Butin, MD[c], Sandrine Duron-Martinaud, MD, MPH[d], Jean-Philippe Even, MD[e], Anthony Anselme, MD[f], Erwan Dulaurent, MD[g], Mélanie Géhant, MD[a], Vicky Vitalis, MD[h], Christian Bay, MD[i], Jérôme Bancarel, MD[i], Julien Bordes, MD, MSC[a]

	Barkhane Area	Gao	Tessalit
All	n = 533	n = 348	n = 105
Duration	235 min [140–403]	245 min [145–377]	155 min [100–365]
Distance	290 km [100–455]	316 km [150–455]	83 km [55–120]
Alpha	n = 66	n = 47	n = 14
Duration	145 min [100–251]	145 min [100–252]	115 min* [93–153]
Distance	126 km [90–285]	172 km [100–320]	85 km* [83–97]

Carfantan Injury 2017

Amener le bloc opératoire au blessé

France: Module de Chirurgie Vitale (MCV)

US: Army's Expeditionary Resuscitation Surgical Team (ERST)

Intérêt en contexte civil?

Etude FIRST
14 Trauma centers
niveau 1
France

Table 1 Patients' characteristics and accident circumstances among patients with severe blunt trauma according to pre-hospital management

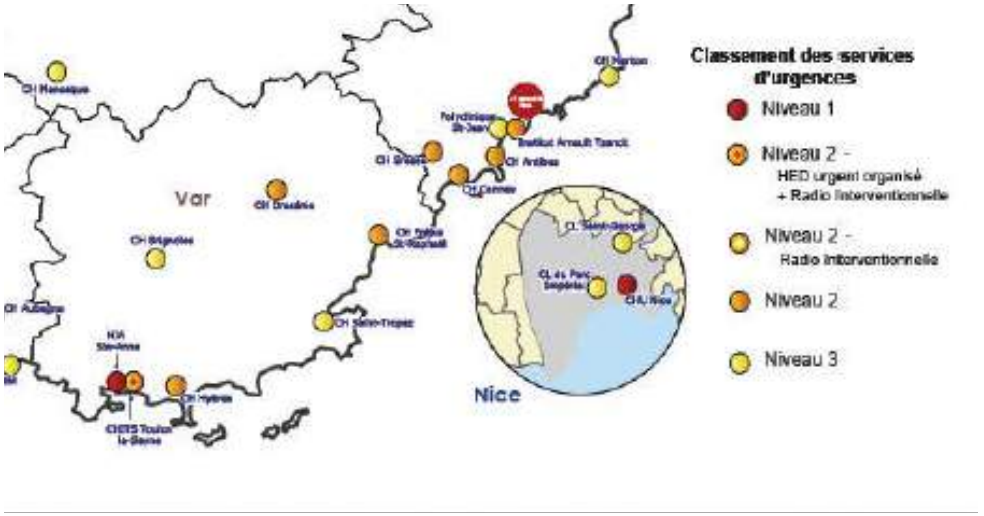
	Pre-hospital management		*P*-value
	Non-SMUR (*n* = 190); n (%)	SMUR (*n* = 2513); n (%)	
Sex			0.16
Male	153 (81%)	1,910 (76%)	
Female	37 (19%)	603 (24%)	
Age *			0.015
18 to 29 y	51 (27%)	915 (36%)	
30 to 54 y	82 (43%)	1,039 (41%)	
55 to 69 y	31 (16%)	338 (13%)	
≥70 y	26 (14%)	219 (9%)	
First hospital of admission			<0.001
General hospital	118 (62%)	533 (21%)	
University hospital	72 (38%)	1,980 (79%)	
Delay to hospital admission			<0.001
<1 h	88 (46%)	340 (14%)	
1 to 3 h	85 (45%)	1,845 (73%)	
≥3 h	17 (9%)	328 (13%)	

Yeguiayan Crit Care 2011

Réduire les délais d'hémostase

Projet Emocstase

Equipe **Mo**bile **C**hirurgicale **de** **S**tabilisation des **T**raumatisés sévères **A**vant **S**olution d'**E**vacuation



Trauma abdominal instable	Laparotomie écourtée, Packing, ReBOA
Trauma bassin instable	Packing pelvien, ReBoA
Plaie vasculaire non garrotable	Ligature temporaire, shunt
Trauma thorax hémorragique	Thoracotomie d'hémostase
Plaie du cœur	Cardiomyoraphie

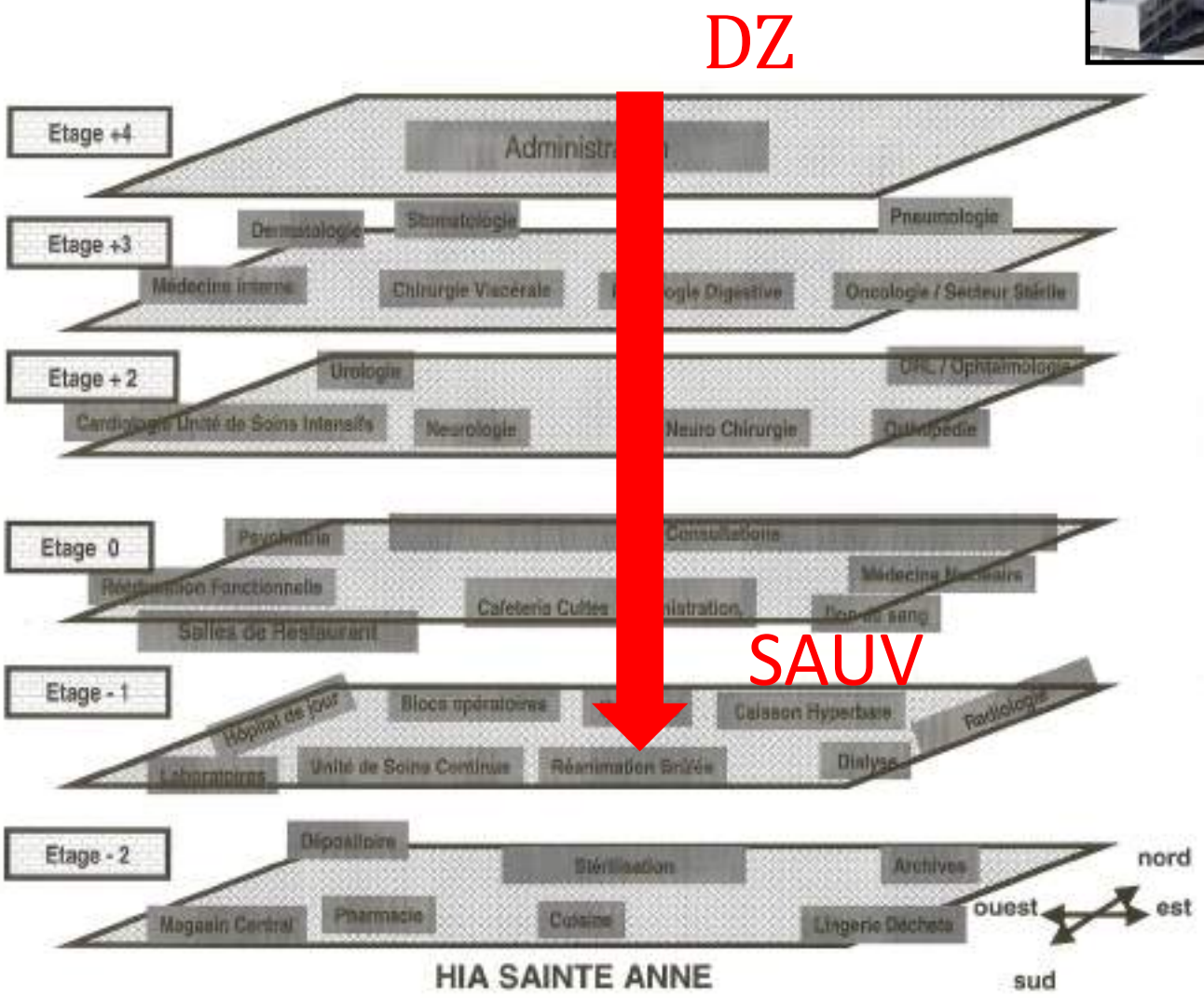
En trauma center: course contre la montre

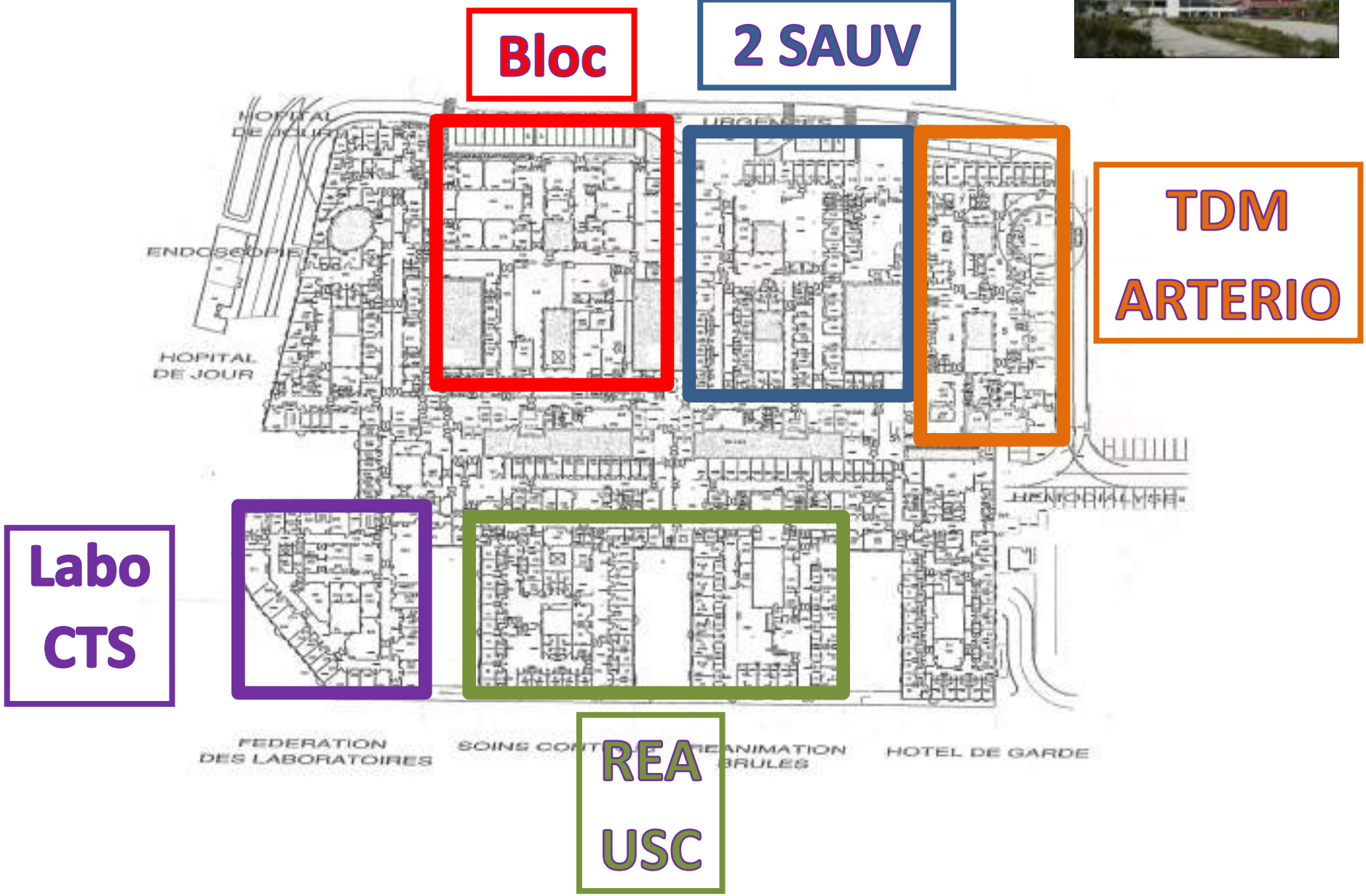
Hémostase trop tardive: ↗ mortalité

↗ mortalité x 1,5 / 10 minutes de délai supplémentaire
Barbosa J of trauma 2013

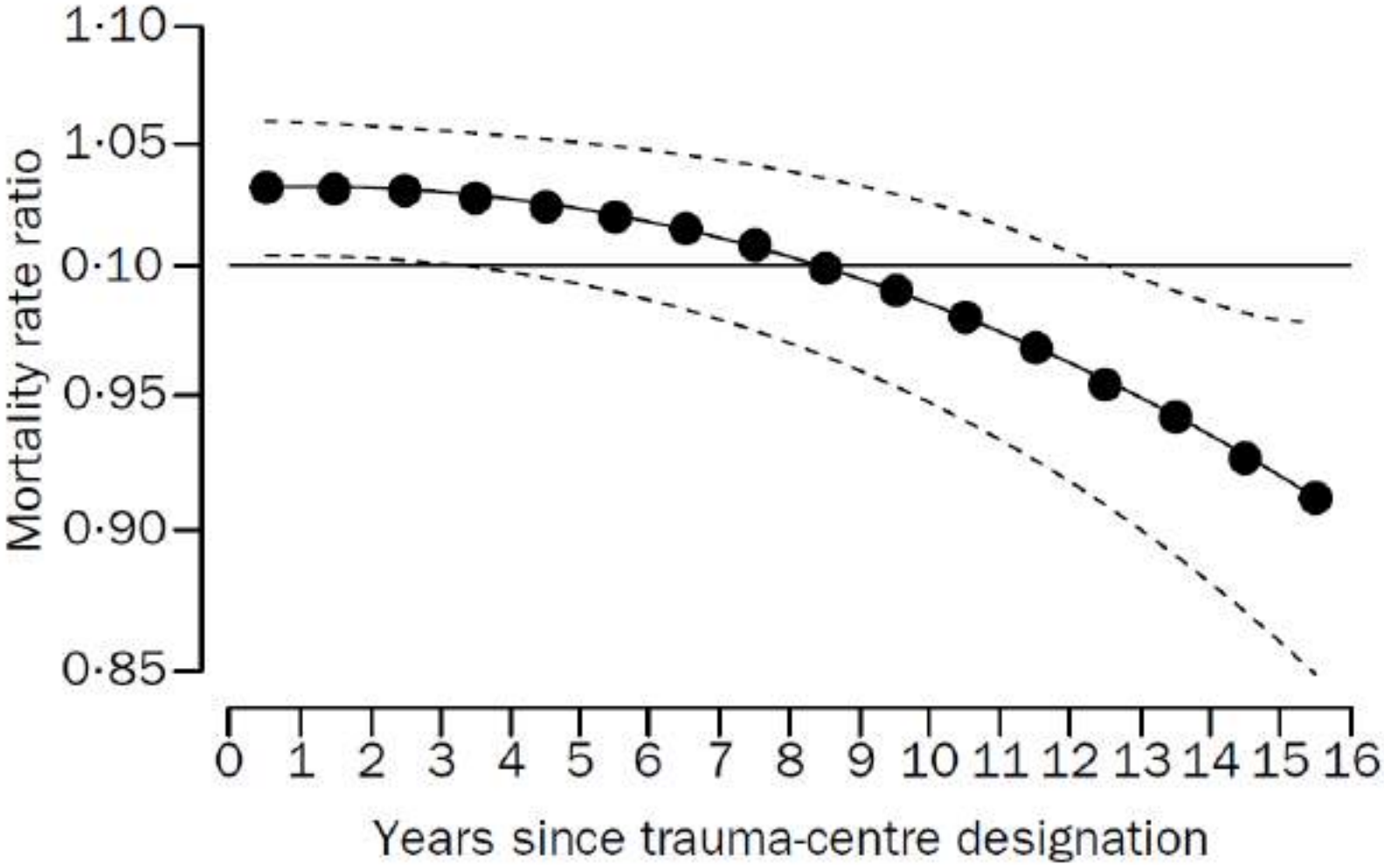
↗ mortalité x 1% / 3 minutes de délai supplémentaire
Clark J of trauma 2002

En trauma center: course contre la montre



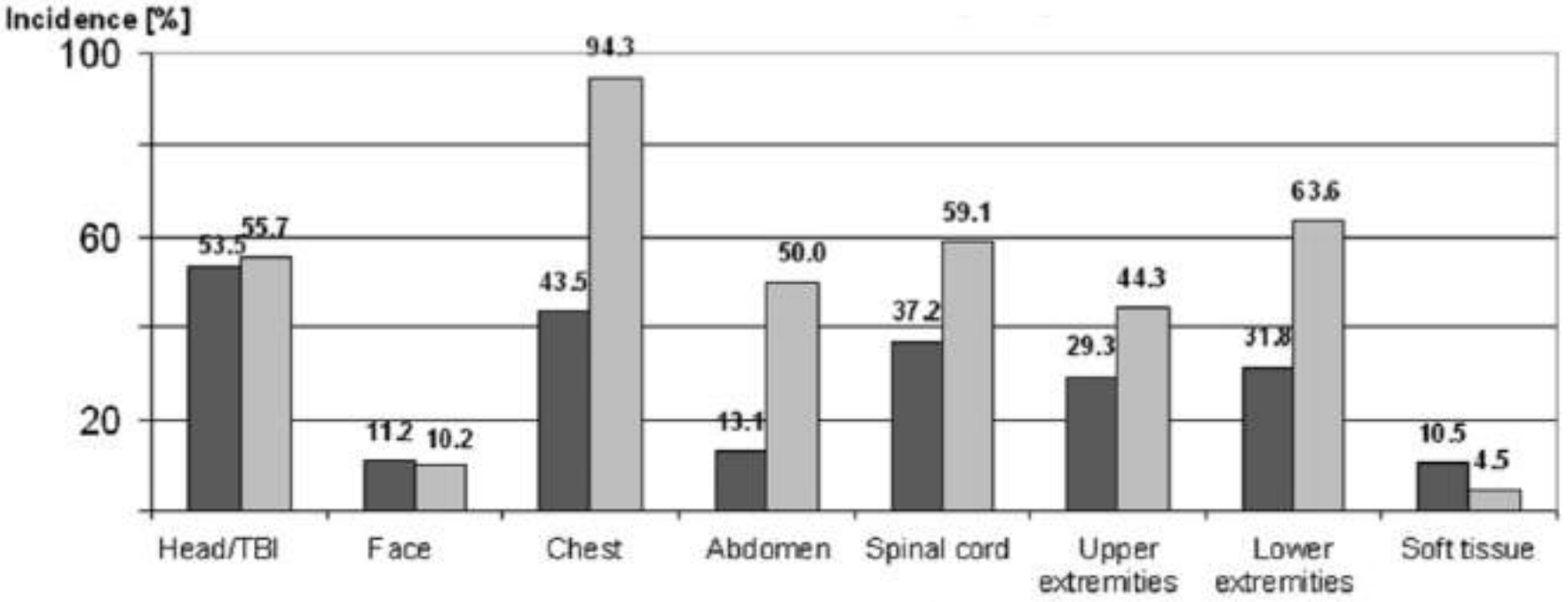

Bloc
2 SAUV
TDM
ARTERIO
Labo
CTS
REA
USC
HOPITAL
DE JOUR
ENDOSCOPIE
HOPITAL
DE JOUR
FEDERATION
DES LABORATOIRES
HOTEL DE GARDE

Organisation du trauma center et mortalité



Nathens Lancet 2004

Lésions multiples

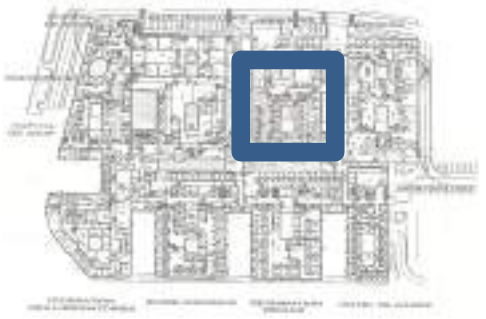


ISS < 50
Mortalité 13,3%
2,3 atteintes/patients

ISS > 50
Mortalité 36,4%
3,8 atteintes/patients

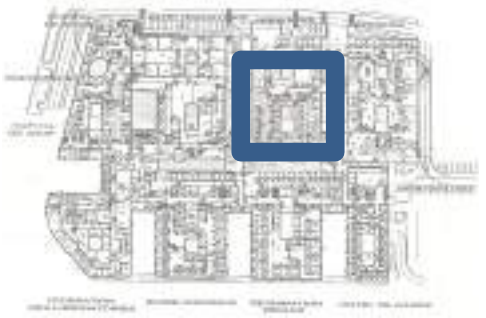
Von Ruden J of trauma 2013

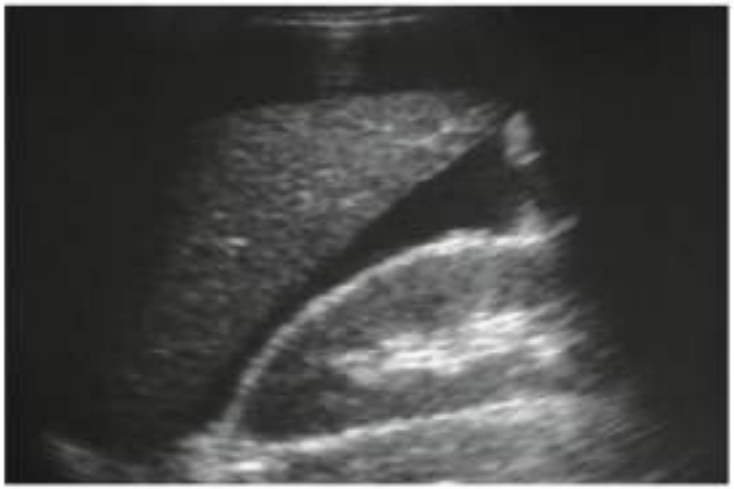
En pratique



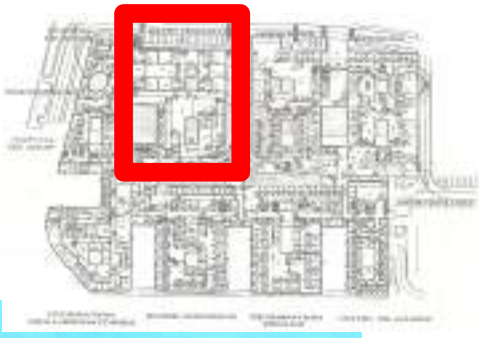
- Homme 22 ans
- AVP 2 roues
- A l'admission en SAUV
  - Fc = 130/min TA=70/20mmhg
  - Hb = 8g/dL
  - TP = 43%
  - Fibrinogène = 1,6g/dL
  - Lactates 5 mmol/L
  - Noradrénaline 3mg/h

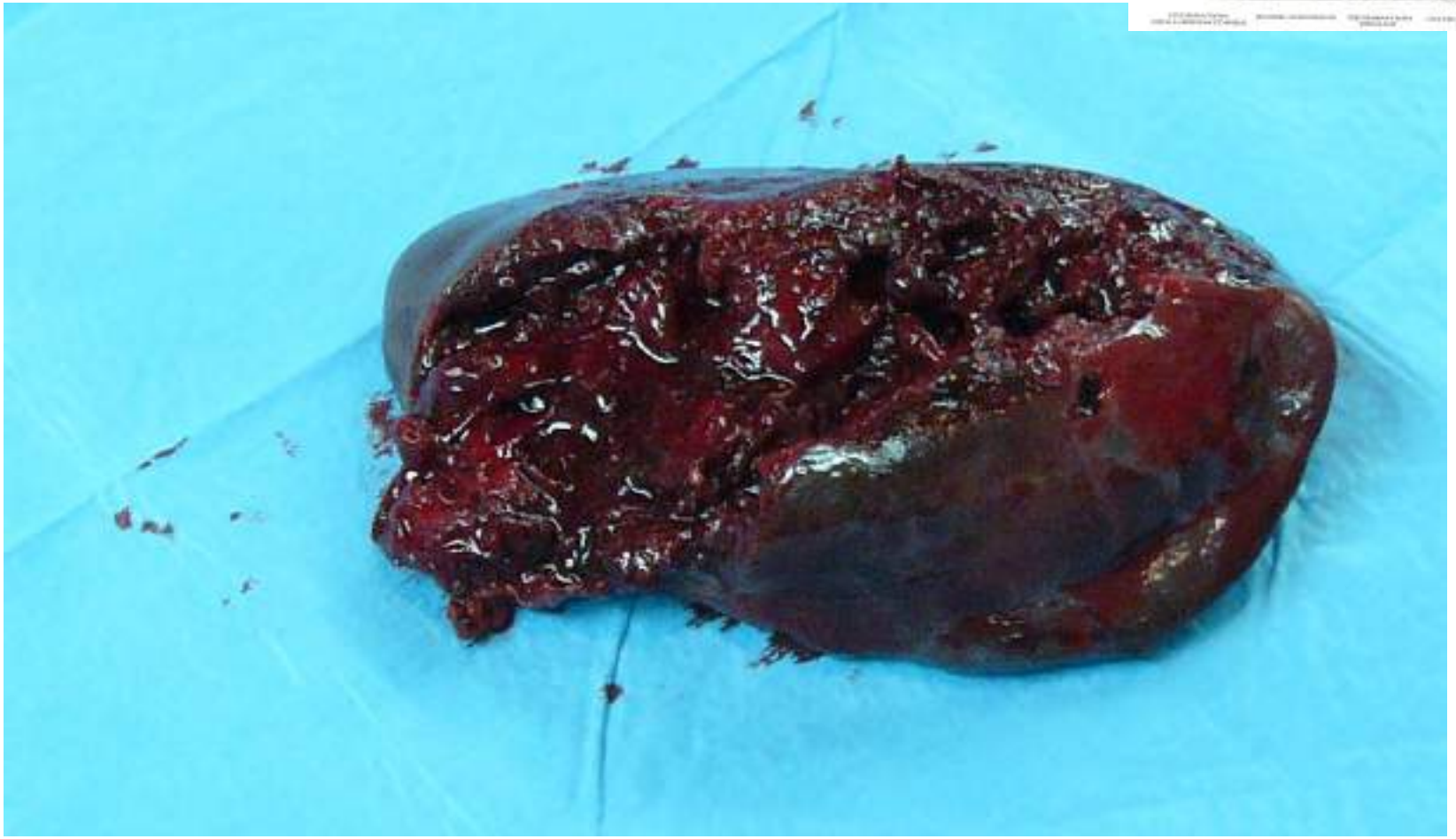
En SAUV



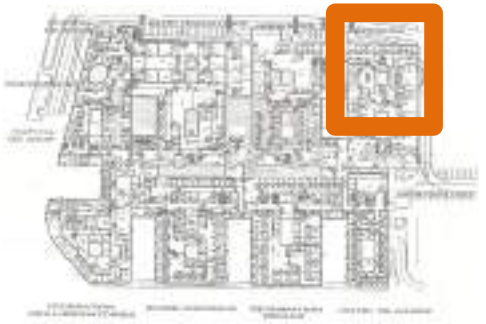


Hémostase chirurgicale

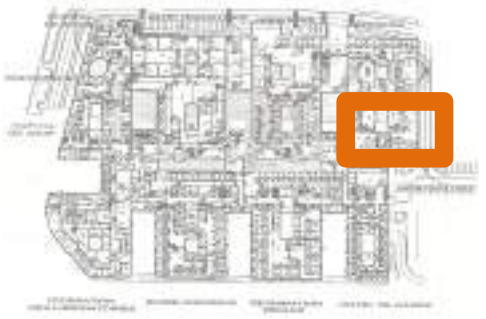


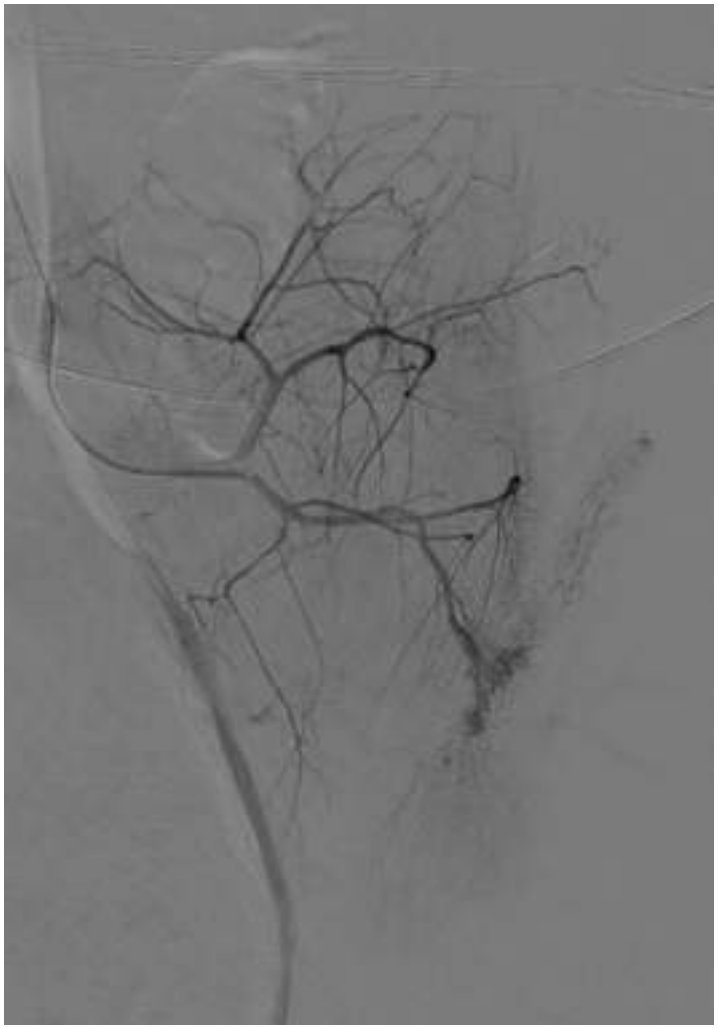


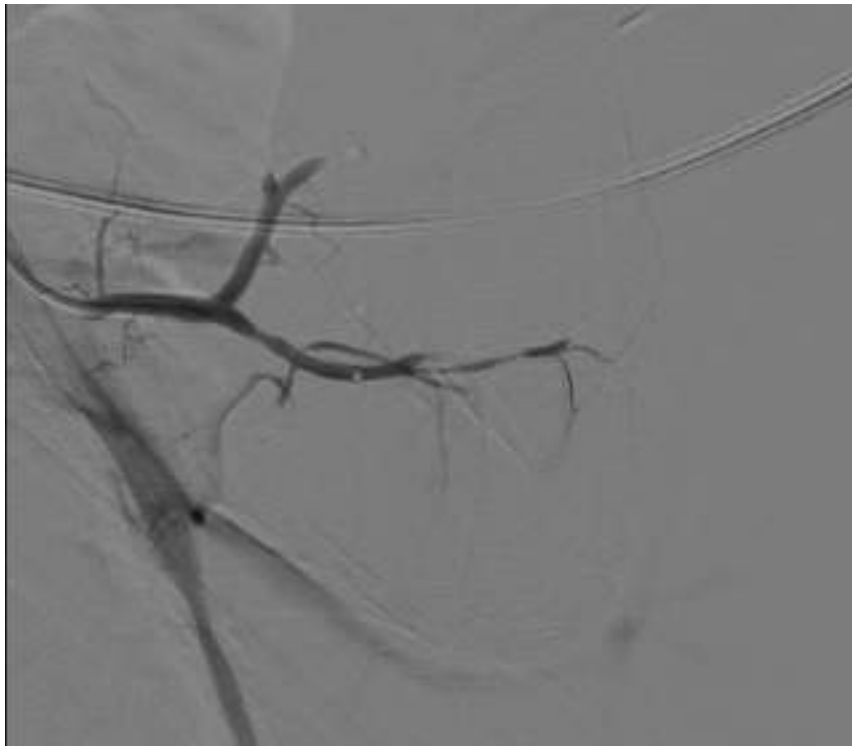
Body-TDM

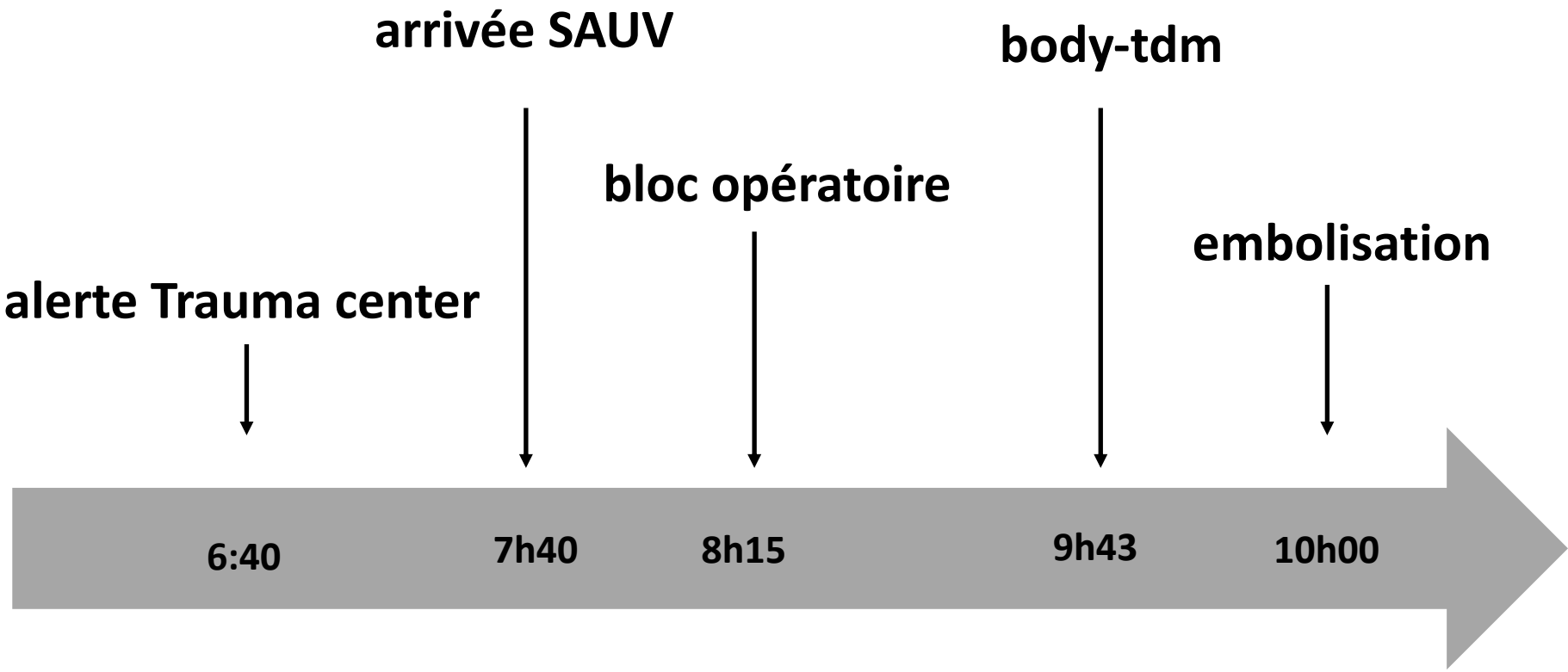


Hémostase radiologique








arrivée SAUV
body-tdm
bloc opératoire
embolisation
alerte Trauma center
6:40
7h40
8h15
9h43
10h00

Scanner initial chez le patient instable?

Injury, Int. J. Care Injured 47 (2016) 669–673

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7884 patients
Réseau TRENEAU France

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2 trauma center niveau 1
152 patients
Traumatismes fermés
ISS médian 35
Mortalité 26%
Japon

Wada et al. Critical Care 2013, 17:R178
http://ccforum.com/content/17/4/R178

CRITICAL CARE

RESEARCH ARTICLE Open Access

Impact on survival of whole-body computed tomography before emergency bleeding control in patients with severe blunt trauma

Daiki Wada[1,2*], Yasushi Nakamori[1,2], Kazuma Yamakawa[3], Yoshiaki Yoshikawa[1], Takeyuki Kiguchi[1], Osamu Tasaki[4], Hiroshi Ogura[3], Yasuyuki Kuwagata[2], Takeshi Shimazu[3], Toshimitsu Hamasaki[5] and Satoshi Fujimi[1]

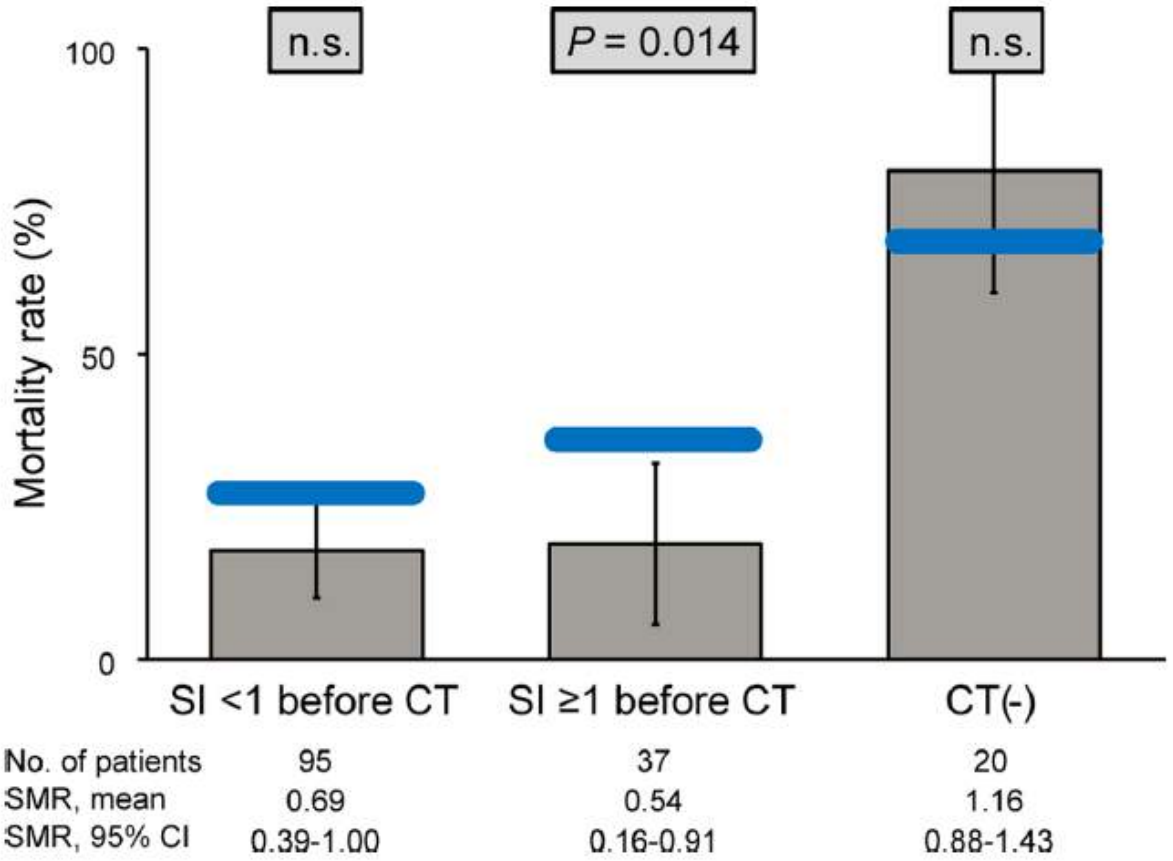


Figure 3 Outcome analysis for calculation of standardized mortality ratio (SMR) on the basis of shock index (SI) value. The patients who underwent CT scanning were divided into two groups on the basis of their SI value. The gray columns represent observed mortality rates, the blue bars represent predicted mortality rates, and the whisker bars represent the 95% confidence range.

216 trauma center
16719 patients
Traumatismes fermés
TraumaRegister
Allemagne, Suisse, Autriche

OPEN ACCESS Freely available online

PLOS ONE

Whole-Body CT in Haemodynamically Unstable Severely Injured Patients – A Retrospective, Multicentre Study

Stefan Huber-Wagner[1]*, Peter Biberthaler[1], Sandra Häberle[1], Matthias Wierer[3], Martin Dobritz[4], Ernst Rummeny[4], Martijn van Griensven[1], Karl-Georg Kanz[1], Rolf Lefering[2], the TraumaRegister DGU[5]

1 Department of Trauma Surgery, Klinikum rechts der Isar, Technical University Munich, Munich, Germany, **2** IFOM – Institute for Research in Operative Medicine, University Witten/Herdecke, Faculty of Health, Cologne, Germany, **3** Department of Trauma Surgery – Campus Innenstadt, Munich University Hospital, Munich, Germany, **4** Institute of Radiology, Klinikum rechts der Isar, Technical University Munich, Munich, Germany, **5** Committee on Emergency Medicine, Intensive Care and Trauma Management of the German Trauma Society, Berlin, Germany

Plos one 2013

Computed tomography in hemodynamically unstable severely injured blunt and penetrating trauma patients

Carlos A. Ordoñez, MD, Juan P. Herrera-Escobar, MD, Michael W. Parra, MD, Paola A. Rodriguez-Ossa, MD, David A. Mejia, MD, Alvaro I. Sanchez, MD, MSc, Marisol Badiel, MD, MSc, Monica Morales, Johanna C. Rojas-Mirquez, MD, Maria P. Garcia-Garcia, MD, Luis F. Pino, MD, *and* Juan C. Puyana, MD, *Cali, Colombia*

Variables	OA Group (n = 91)	CT Group (n = 80)	*p*
Age, median (IQR)	26 (22–35.5)	31.5 (23–42)	0.13*
Male, n (%)	82 (90)	71 (89)	0.81**
Mechanism of injury, n (%)			
Penetrating	86 (95)	37 (46)	<0.01**
Blunt	5 (5)	43 (54)	
ISS, median (IQR)	20 (16.5–29)	25 (19–33)	0.02*
SI, median (IQR)	1.3 (1–1.6)	1.2 (0.9–1.4)	0.09*
HR, median (IQR)	115 (103–125)	110 (100–122)	0.35*
SBP, median (IQR)	86 (70–100)	91.5 (79–100)	0.06*
SBP < 100, n (%)	70 (77)	63 (79)	0.85**
GCS score, median (IQR)	15 (13–15)	14 (6–15)	<0.01*
Patients with PRBC in the ED, n (%)	42 (46)	19 (24)	<0.01**
Transfused units, median (IQR)	4 (3.5–6)	4 (2–5)	0.20*
Time,† median (IQR), min	34 (20–62)	60 (50–75)	<0.01*
Head injuries, AIS score ≥ 3, n (%)	13 (14)	45 (56)	<0.01**
Thorax injuries, AIS score ≥ 3, n (%)	44 (48)	42 (53)	0.65**
Abdomen injuries, AIS score ≥ 3, n (%)	57 (63)	22 (28)	<0.01**
Extremity injuries, AIS score ≥ 3, n (%)	25 (27)	28 (35)	0.32**
FAST, n (%)			
Positive	15 (16)	14 (18)	1.00**
Negative or not performed	76 (84)	66 (82)	
Mortality, n (%)	16 (17.6)	10 (12.5)	0.23**
<24 h	10 (63)	2 (20)	
>24 h	6 (37)	8 (80)	

1 trauma center niveau 1
171 patients
Traumatismes pénétrants
Cali, Colombie

J of trauma 2015

Etude REACT-2
5 trauma centers niveau 1
Pays-Bas, Suisse
Traumatismes fermés

World J Surg (2019) 43:490–496
https://doi.org/10.1007/s00268-018-4818-0

World Journal of Surgery

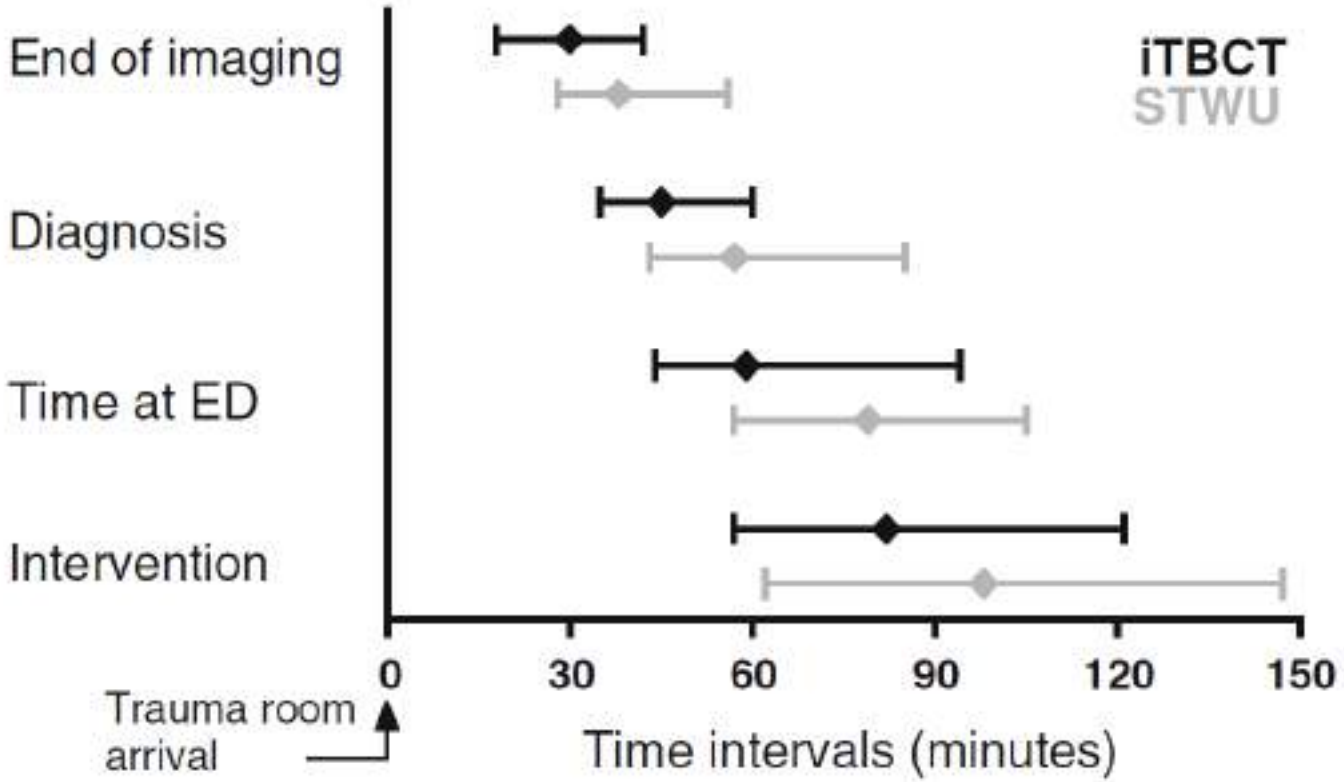
CrossMark

ORIGINAL SCIENTIFIC REPORT (INCLUDING PAPERS PRESENTED AT SURGICAL CONFERENCES)

Emergency Bleeding Control Interventions After Immediate Total-Body CT Scans in Trauma Patients

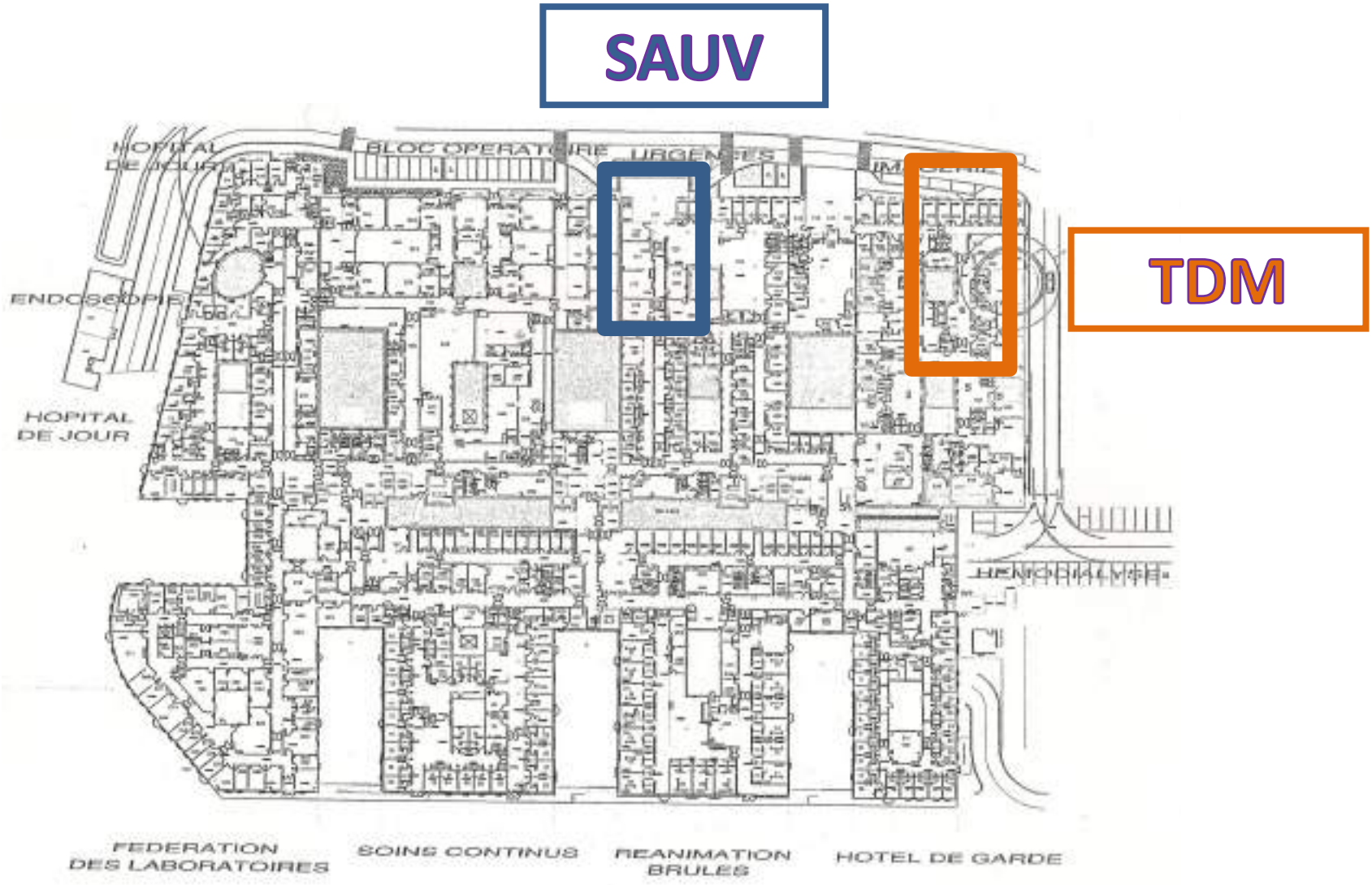
Kaij Treskes[1] · Teun P. Saltzherr[2] · Michael J. R. Edwards[3] · Benn J. A. Beuker[4] · D. Den Hartog[5] · Joachim Hohmann[6] · Jan S. Luitse[1] · Ludo F. M. Beenen[7] · Markus W. Hollmann[8] · Marcel G. W. Dijkgraaf[9] · J. Carel Goslings[1,10] on behalf of the REACT-2 study group

Le scanner diminue le délai de diagnostic lésionnel



Treskes World J Surg 2019

Où est le scanner?



Où est le scanner?

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

Table 8
Logistic regression model including RISC and CT distance (per metre).

Variable	Regression coefficient β	p	Odds ratio (e^{β})	CI 95%
RISC[a]	0.88	<0.001	2.41	2.30–2.52
CT distance to TR per metre	0.004	0.005	1.004	1.001–1.006
Constant	−0.65	<0.001	–	–

RISC revised injury severity classification score, CT computed tomography, TR trauma room, CI 95% confidence interval.
[a] Inverse logistic transformation of the predicted outcome probability of RISC (mortality); target variable = mortality; For example: distance from TR to CT = 100 m: OR $1.004^{100} = 1.50$; distance from TR to CT = 175 m: OR $1.004^{175} = 2.00$ (doubled chance to die).

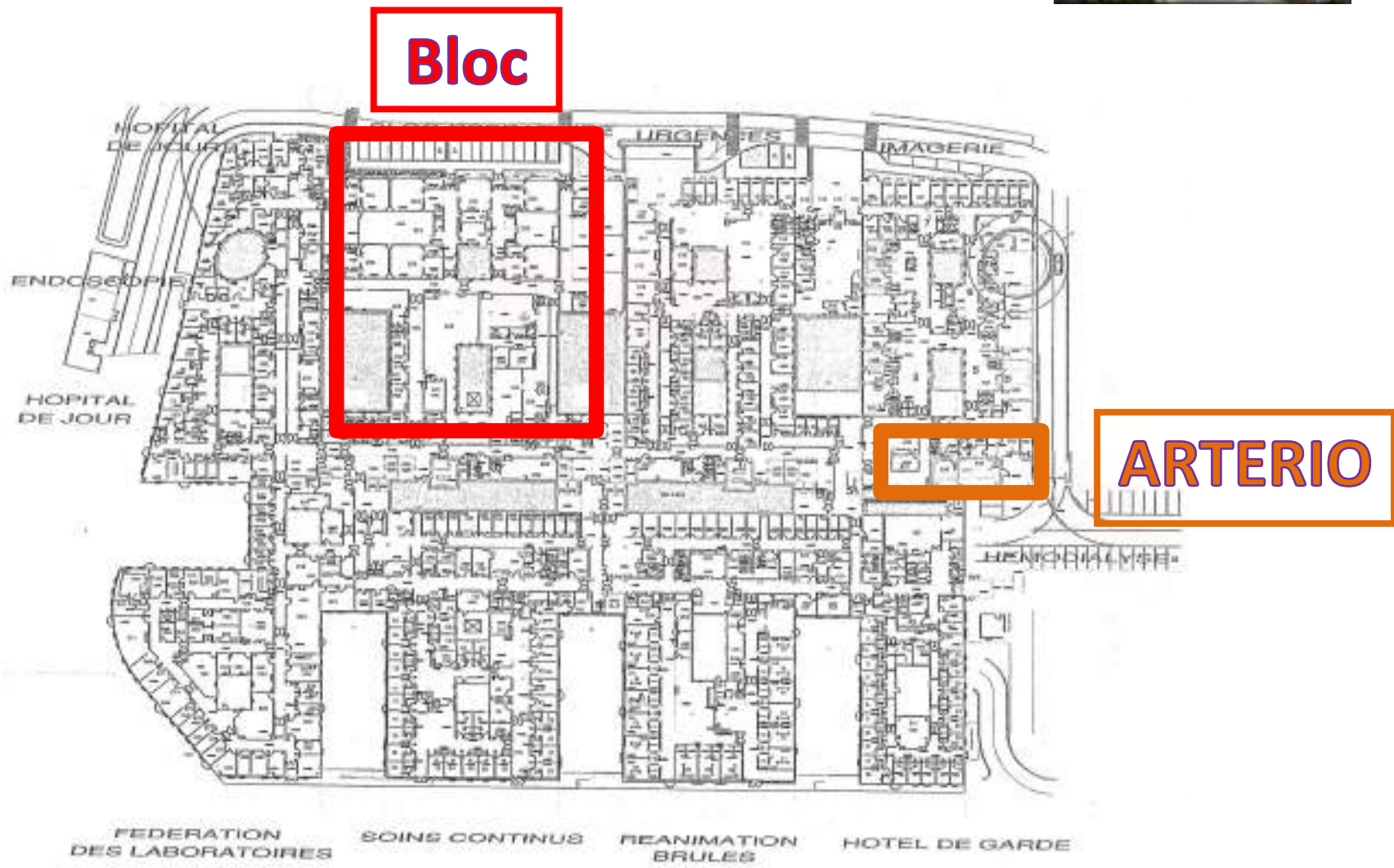
Scanner à 100m -> ↗mortalité de 50%

Scanner en SAUV

Scanner en SAUV

Hubert Wagner Injury 2014

Où faire l'hémostase?



Place de la radiologie interventionnelle

- Indication privilégiée: patient stable

- Indication discutée: patient instable

Quel est le délai optimal pour effectuer le geste d'hémostase d'une hémorragie secondaire à un traumatisme pelvien grave ?

R2.8 – Il est recommandé de réaliser un geste d'hémostase le plus rapidement possible en cas d'hémorragie active en lien avec un traumatisme pelvien grave. Dans le contexte d'un traumatisme pelvien grave, le geste d'hémostase peut être une artériographie avec embolisation ou un tamponnement chirurgical pelvien pré-péritonéal de sauvetage réalisé par une équipe entraînée.
(GRADE 1+) Accord FORT
R2.9 – Il est recommandé que le délai entre l'admission hospitalière et le geste d'hémostase ne dépasse pas 60 minutes quelle que soit la technique utilisée.
(GRADE 1+) Accord FORT

RFE SFAR 2018

- **« Damage control » endovasculaire**

Limites de la radiologie interventionnelle

Jarvis et al. Patient Safety in Surgery (2019) 13:23
https://doi.org/10.1186/s13037-019-0201-9

Patient Safety in Surgery

SHORT REPORT Open Access

Variability in the timeliness of interventional radiology availability for angioembolization of hemodynamically unstable pelvic fractures: a prospective survey among U.S. level I trauma centers

Stephanie Jarvis[1], Alessandro Orlando[1], Benoit Blondeau[2,3], Kaysie Banton[4], Cassandra Reynolds[4], Gino M. Berg[5], Nimesh Patel[6], Michael Kelly[7], Matthew Carrick[8] and David Bar-Or[1,4*]

Table 2 Interventional Radiology Coverage at Level I Trauma Centers

Questions and Responses	% (n)	n
Does the interventional radiology department have on-site coverage 24-h a day?		
Yes	54% (20)	37
No	46% (17)	
How many hours per day is there an interventional radiologist available by call only?		
8	13% (2)	16
10	19% (3)	
12	31% (5)	
13	6% (1)	
14	13% (2)	
15	6% (1)	
24	13% (2)	
Approximately how long does it take for an interventional radiologist to arrive when working off-site?		
0–10 min	0	17
11–20 min	6% (1)	
21–30 min	71% (12)	
≥ 31 min	24% (4)	
Approximately how long does it take for IR to set-up for angioembolization once an interventional radiologist is on-site?		
0–30 min	54% (20)	37
31–60 min	35% (13)	
61–120 min	11% (4)	
120–180 min	0	
> 180 min	0	

Délais en radiologie interventionnelle

- Procédures réalisées par des « acute care specialists »

1 trauma center niveau 2
Tokyo, Japon

TABLE 1. Clinical Characteristics of the Patients

Characteristics			
Age, median (IQR), years	64 (56–76)	Procedures of AVIRT, n (%)	
Male, n (%)	55	Embolization	59 (77)
Patient's location, n (%)		Trauma	29 (38)
In-hospital	3 (4)	Nontrauma	30 (51)
Transfer from another hospital	1 (2)	Mechanical retrieval and revascularization	15 (19)
Time of procedures, n (%)		Others	
Daytime	41 (53)	Angioplasty	2 (3)
Out of hours	36 (47)	Drug infusion	1 (2)
Hemorrhagic shock, n (%)	46 (60)	Mortality, n (%)	
Type of acute care, n (%)		Exsanguination	2 (3)
Trauma	29 (38)	Pneumonia	2 (3)
Nontrauma	33 (43)	Sepsis	1 (2)
Stroke	15 (19)	Brain death	1 (2)

IQR, interquartile range; n, number of patients.

Tsurukiri J of trauma 2016

Hémostase « hybride »

Contents lists available at ScienceDirect

Injury

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

Hybrid treatment combining emergency surgery and intraoperative interventional radiology for severe trauma

Yuichi Kataoka [a,*], Hiroaki Minehara [a], Fumie Kashimi [a], Tasuku Hanajima [a], Tatsuhiro Yamaya [a], Hiroshi Nishimaki [b], Yasushi Asari [a]

[a] Department of Emergency and Critical Care Medicine, Kitasato University School of Medicine, Japan
[b] Department of Cardiovascular Surgery, St. Marianna University School of Medicine, Japan

Kataoka Injury 2016

Hémostase « hybride »

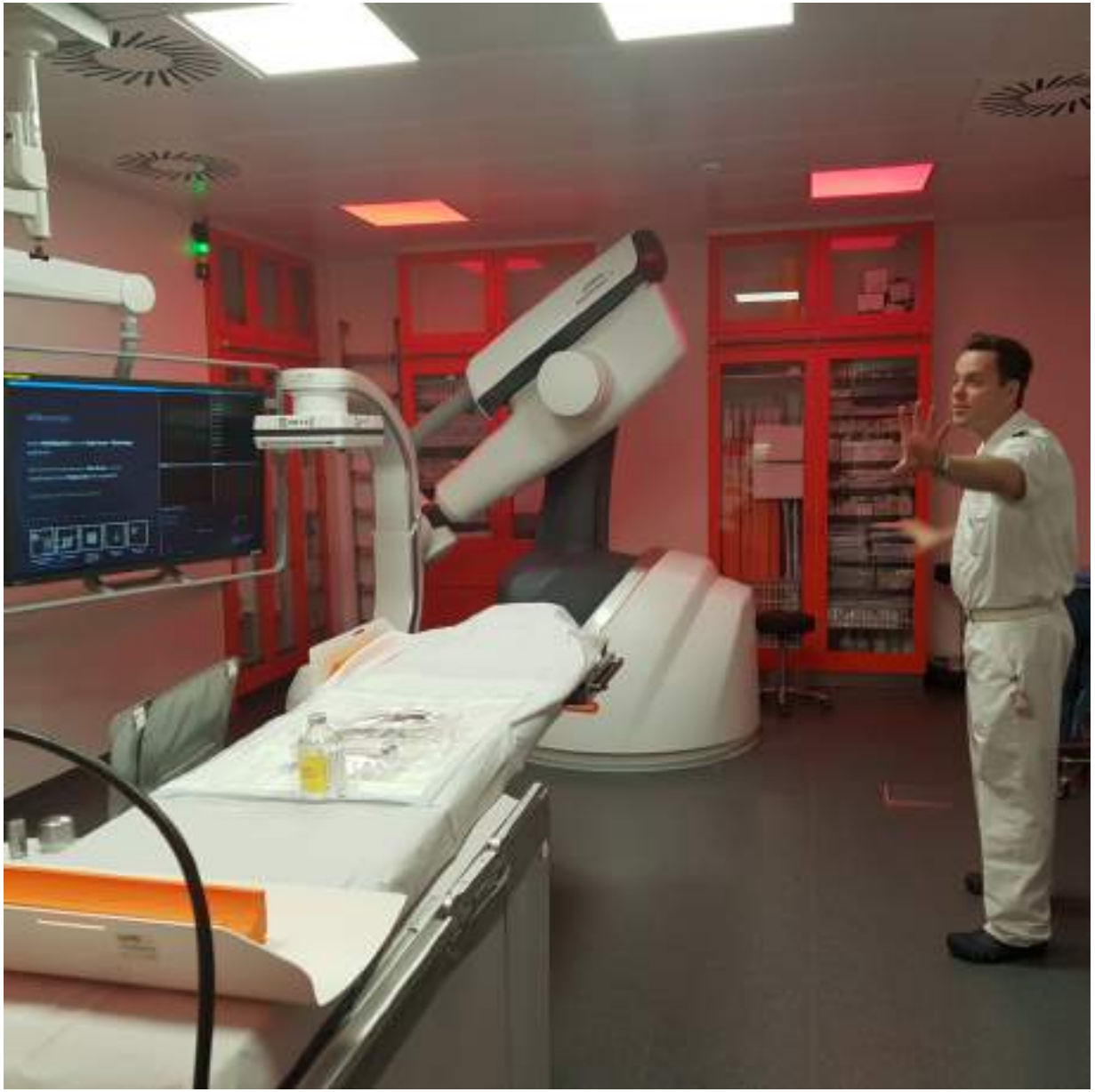
Table 3
Comparison of the clinical characteristics and outcomes between the groups.

	Intraoperative IVR group (n = 13) Mean (SD); median (IQR)	Control group (n = 45) Mean (SD); median (IQR)	p-Value
Age	38.1 (20.1); 33 (21, 55)	43.6 (19.4); 40 (27, 55)	0.29
ISS	40.0 (15.2); 34 (29, 50)	42.4 (14.9); 43 (33, 50)	0.41
RTS	6.21 (1.48); 6.38 (5.64, 7.55)	5.83 (1.88); 6.08 (4.94, 7.84)	0.74
Ps	0.62 (0.37); 0.82 (0.23, 0.88)	0.51 (0.37); 0.55 (0.17, 0.92)	0.53
pH	7.31 (0.10); 7.31 (7.26, 7.34)	7.33 (0.09); 7.34 (7.28, 7.40)	0.29
Base excess (mmol/L)	−6.43 (4.01); −7.2 (−8, −3.8)	−6.08 (5.12); −5.0 (−9.5, −2.3)	0.61
Total time during emergency surgery and IVR (minute)	229 (72); 235 (180, 295)	355 (169); 370 (230, 440)	0.007
Transfusion volume during emergency surgery and IVR (mL)	4,174 (2,645); 3500 (2240, 6040)	5,832 (4,383); 5620 (3020, 8120)	0.24
In-hospital mortality, n (%)	2 (15%)	16 (36%)	0.31

SD, standard deviation; IQR, inter-quartile range (25%, 75%).
Categorical data were analysed with a two-tailed Fisher's exact test and continuous data were analysed with a Mann–Whitney test.

Kataoka Injury 2016

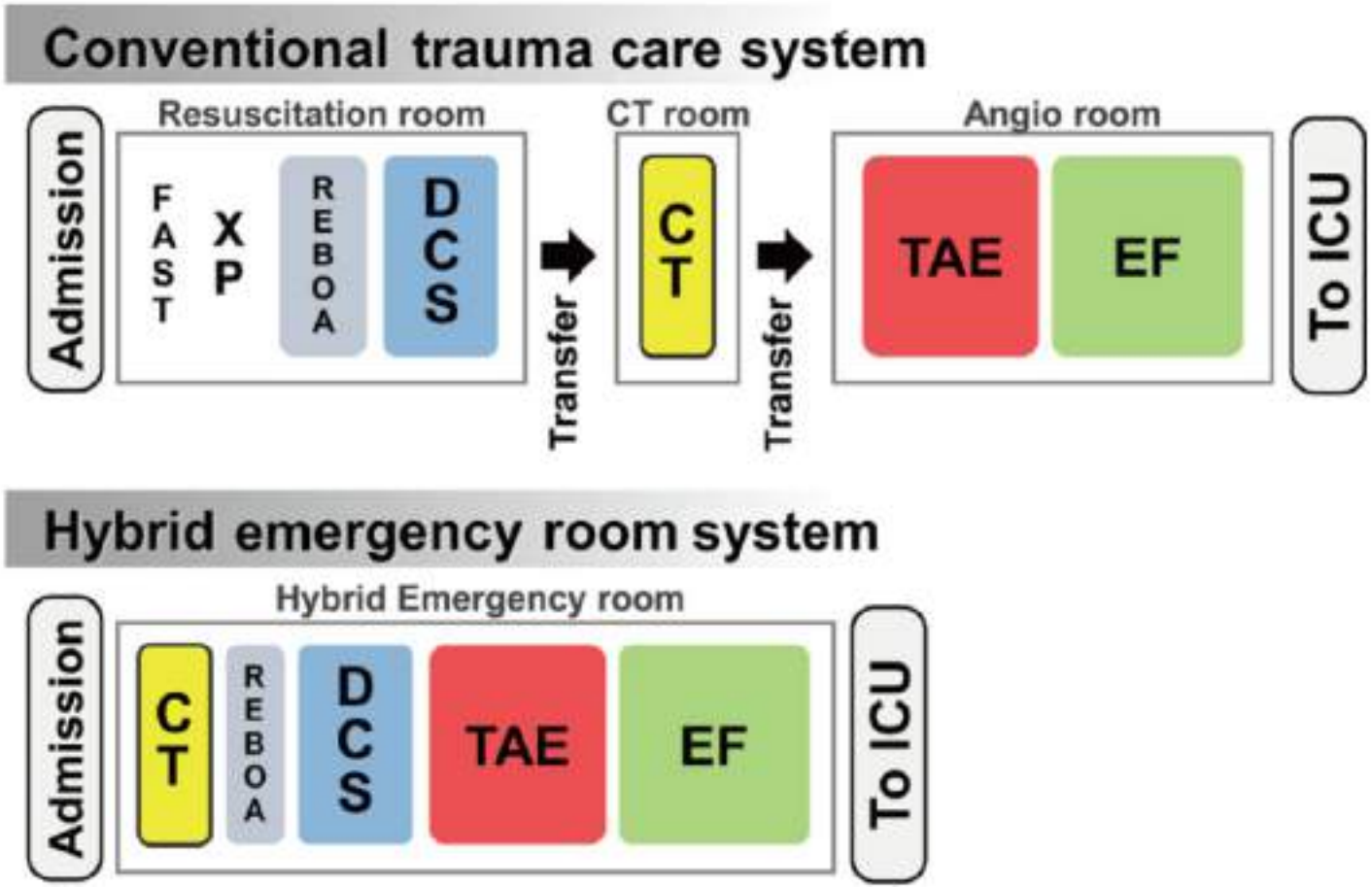
Salle « hybride »



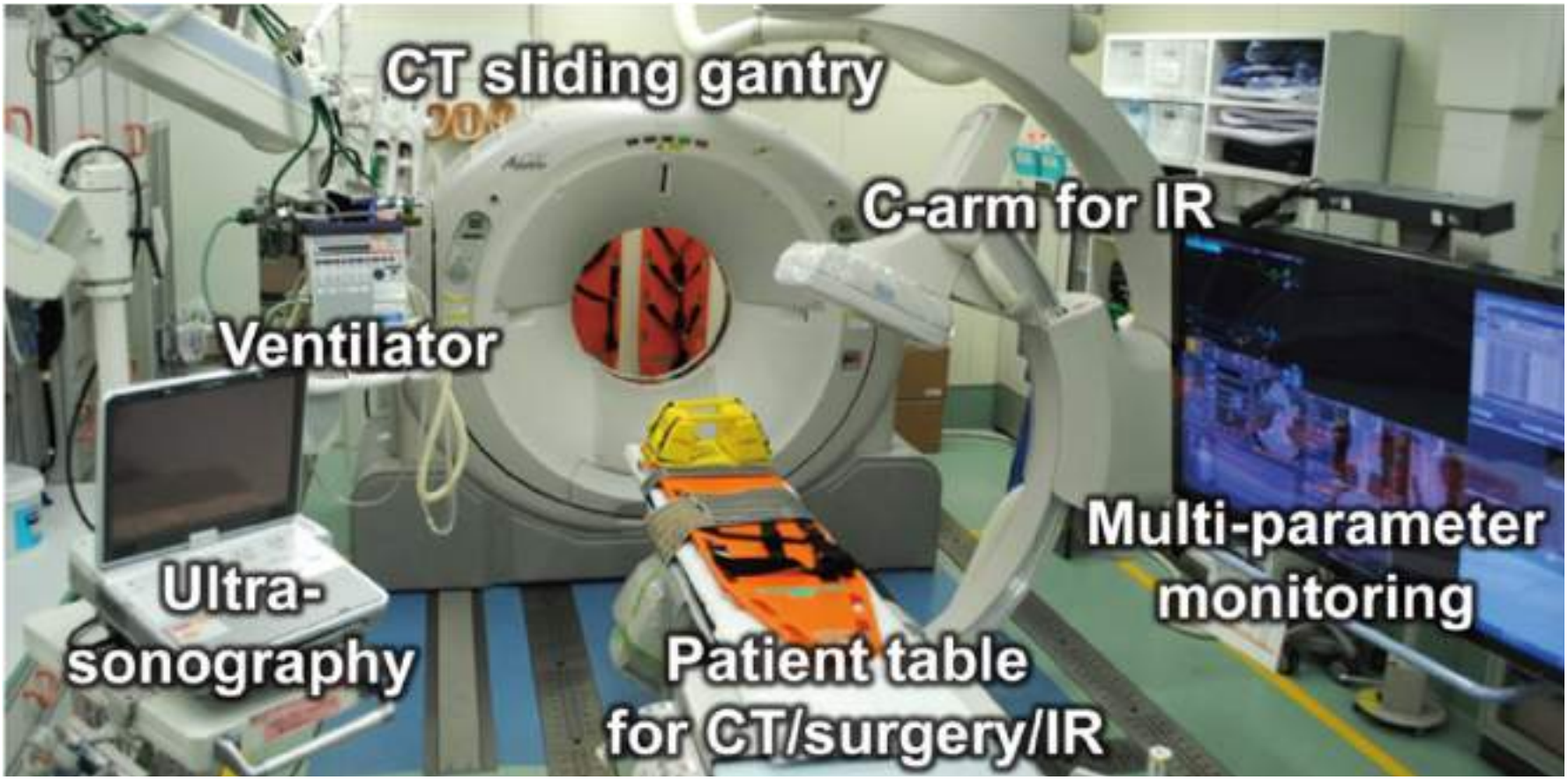
Après-demain

« Hybrid emergency room system »

« Solution tout-en-un »

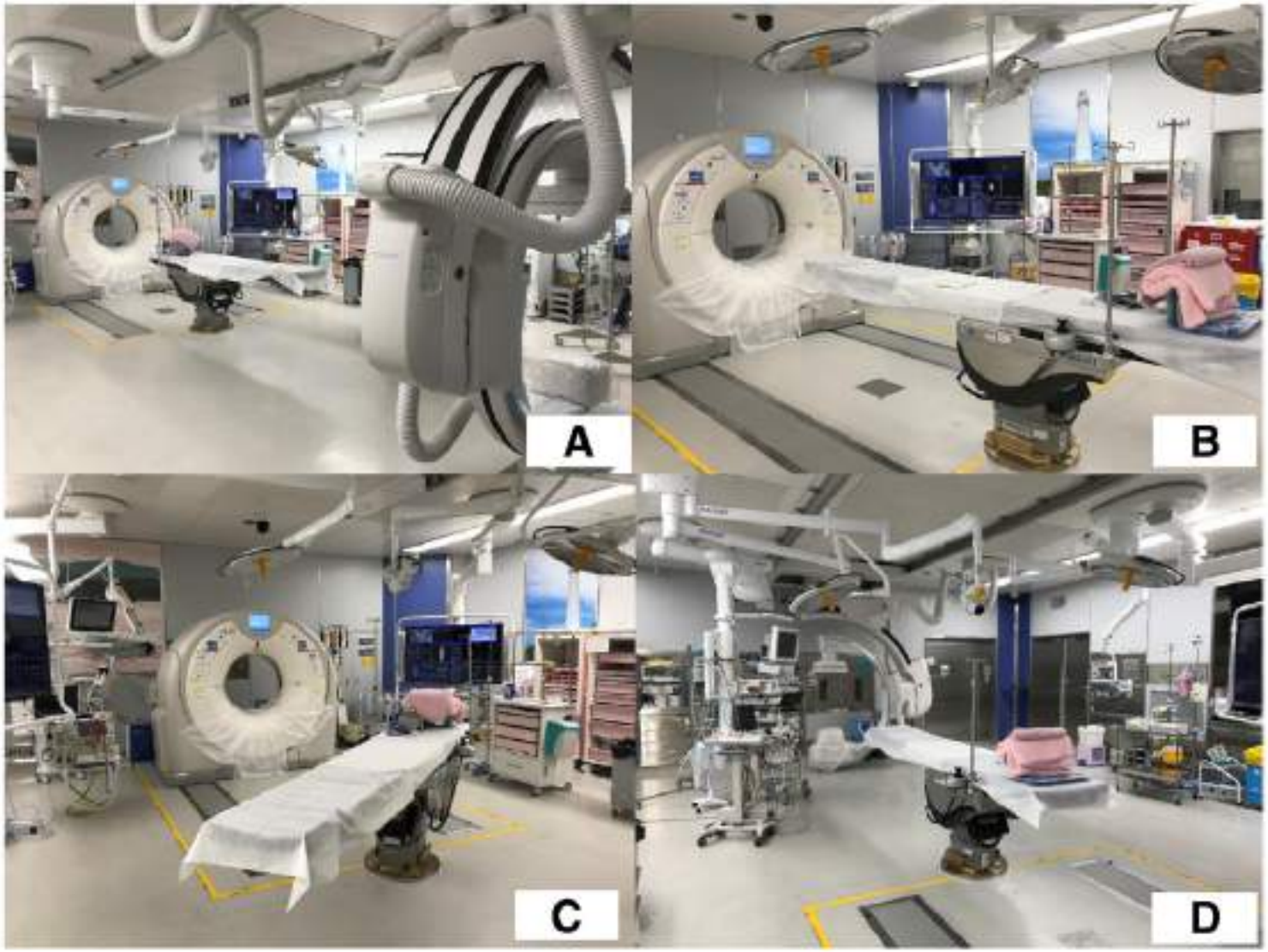


Après-demain: expérience japonaise



Kyoto, Japon, depuis 2018

Après-demain: expérience japonaise



Shimane, Japon, depuis 2011

Hybrid emergency room system

1 trauma center niveau 1
696 patients
Traumatismes fermés
Osaka, Japon

ORIGINAL ARTICLE

OPEN

The Survival Benefit of a Novel Trauma Workflow that Includes Immediate Whole-body Computed Tomography, Surgery, and Interventional Radiology, All in One Trauma Resuscitation Room

A Retrospective Historical Control Study

Takahiro Kinoshita, MD, Kazuma Yamakawa, MD, PhD,* Hiroki Matsuda, MD,* Yoshiaki Yoshikawa, MD,* Daiki Wada, MD, PhD,† Toshimitsu Hamasaki, PhD,‡ Kota Ono, MPH,§ Yasushi Nakamori, MD, PhD,† and Satoshi Fujimi, MD, PhD**

Kinoshita Annals of surgery 2019

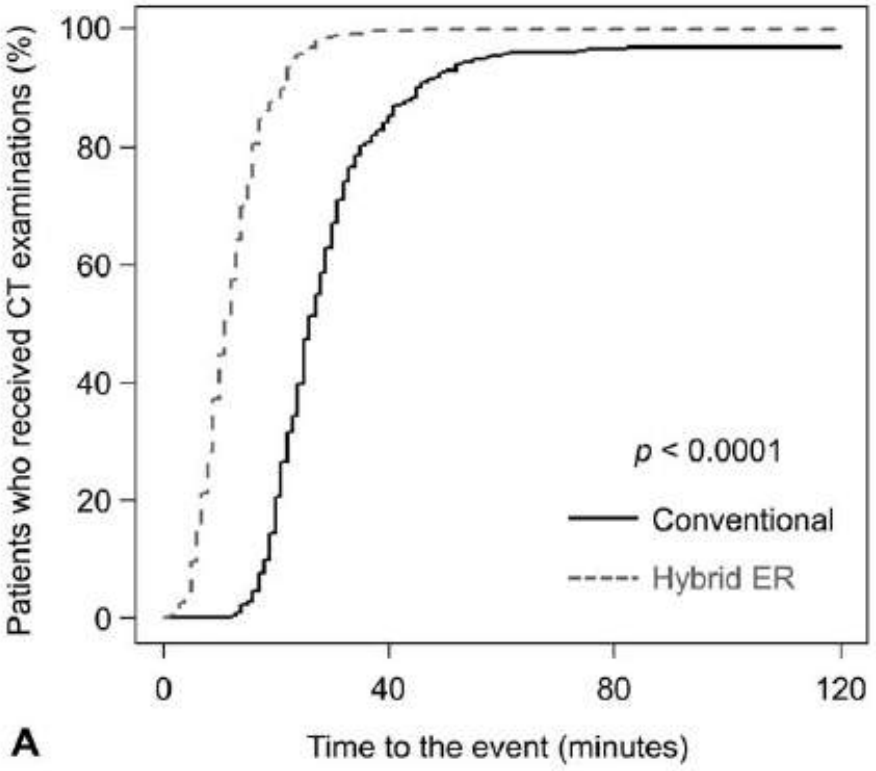
Hybrid emergency room system

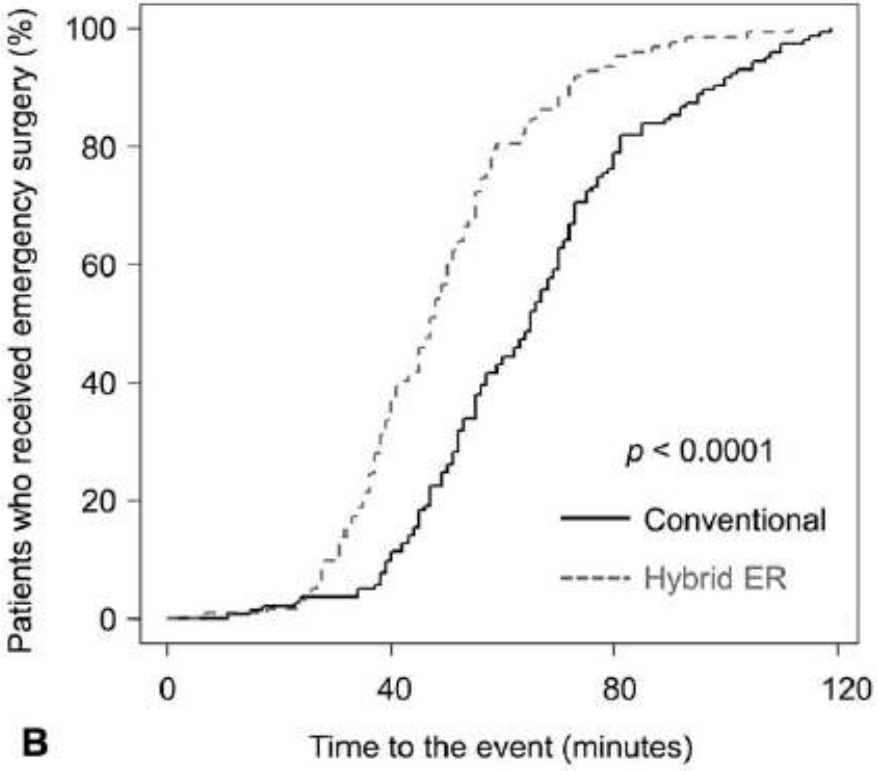
TABLE 1. Baseline Characteristics on Arrival of the Patients Included

Parameter	Conventional (n = 360)	Hybrid ER (n = 336)	P
Age, y	49 (33–64)	53 (36–66)	0.11
Sex			0.97
Male	248 (69%)	231 (69%)	
Female	112 (31%)	105 (31%)	
Mechanism of injury			0.013
Motor vehicle accident	218 (61%)	164 (49%)	
Fall from a height	77 (21%)	90 (27%)	
Fall down steps	20 (6%)	33 (10%)	
Ground level fall	19 (5%)	17 (5%)	
Crushed between objects	11 (3%)	7 (2%)	
Others	15 (4%)	25 (7%)	
GCS total score	13 (7–14)	13 (8–15)	0.11
HR, beats per min	92 (78–109)	91 (76–108)	0.44
Systolic BP, mm Hg	130 (103–154)	133 (114–154)	0.19
Shock index ≥1	86 (24%)	68 (20%)	0.25
RR, per min	22 (19–28)	21 (18–30)	0.48
BT, Celsius	36.5 (35.8–36.8)	36.5 (36.1–36.8)	0.081
RTS	6.90 (5.97–7.84)	7.33 (5.97–7.84)	0.29
Hb, g/dL	13 (12–14)	13 (12–14)	0.47
pH	7.39 (7.33–7.42)	7.40 (7.34–7.43)	0.28
Base excess, mmol/L	-1.5 (-4.3 to 0.6)	-1.7 (-4.5 to 0.3)	0.25
Lactate, mmol/L	2.5 (1.7–3.8)	2.4 (1.5–3.7)	0.26
PT-INR	1.10 (1.00–1.20)	1.10 (1.00–1.23)	<0.0001
APTT, s	30 (27–35)	30 (27–38)	0.92
AIS Head ≥3	254 (71%)	232 (69%)	0.67
AIS Face ≥3	4 (1%)	7 (2%)	0.30
AIS Chest ≥3	193 (54%)	175 (52%)	0.69
AIS Abdomen ≥3	70 (19%)	65 (19%)	0.97
AIS Extremities ≥3	115 (32%)	126 (38%)	0.12
Injury Severity Score	26 (21–35)	26 (21–38)	0.35
Probability of survival	0.91 (0.68–0.97)	0.91 (0.68–0.97)	0.54

Hybrid emergency room system

↘délai diagnostic ↘délai hémostase





Hybrid emergency room system

↘mortalité

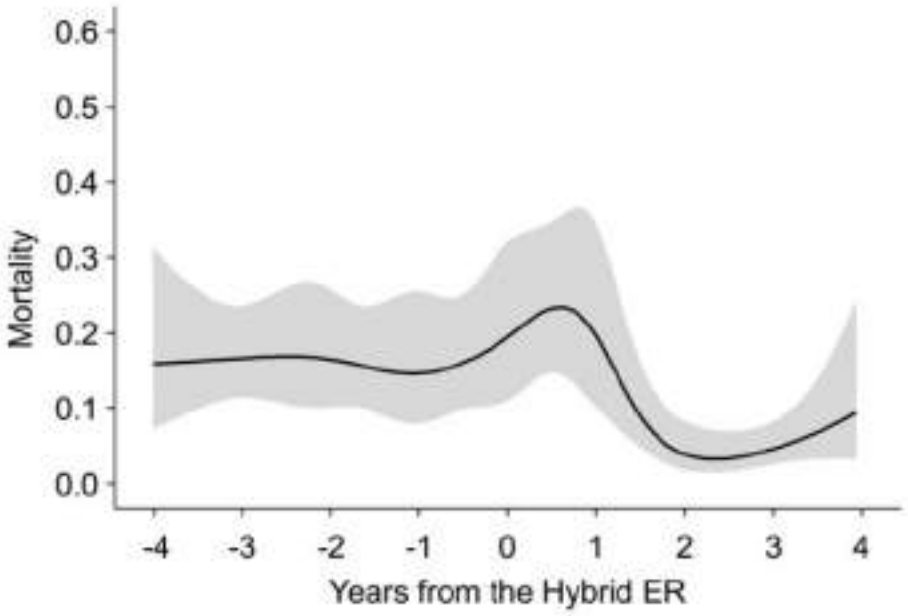


TABLE 2. Overall Mortality and Adjudicated Cause of Death by the Period From Admission

	Conventional (n = 360)	Hybrid ER (n = 336)	*P*
24-h mortality	49 (14%)	31 (9%)	0.070
Exsanguination	29 (8%)	11 (3%)	0.007
TBI	20 (6%)	18 (5%)	0.91
MODS	0 (0%)	0 (0%)	
Sepsis	0 (0%)	0 (0%)	
Respiratory	0 (0%)	2 (1%)	0.23
Others	0 (0%)	0 (0%)	
28-day mortality	78 (22%)	51 (15%)	0.028
Exsanguination	29 (8%)	11 (3%)	0.007
TBI	45 (13%)	32 (10%)	0.21
MODS	4 (1%)	1 (0%)	0.37
Sepsis	0 (0%)	2 (1%)	0.23
Respiratory	0 (0%)	2 (1%)	0.23
Others	0 (0%)	3 (1%)	0.11

Data are expressed as numbers (%).

ER indicates emergency room; MODS, multiple organ dysfunction syndrome; TBI, traumatic brain injury.

Conclusion

- L’innovation organisationnelle pour sauver les vies sauvables
- Intégrer l’hémostase endovasculaire dans nos algorithmes de prise en charge
- Inventer le « hybrid damage control »
- Penser le soutien médical en opération extérieure en intégrant ces innovations

Merci de votre attention!

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