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Transfusion précoce du blessé de guerre

Médecin en chef Julien Bordes

Professeur agrégé du Val-de-Grâce

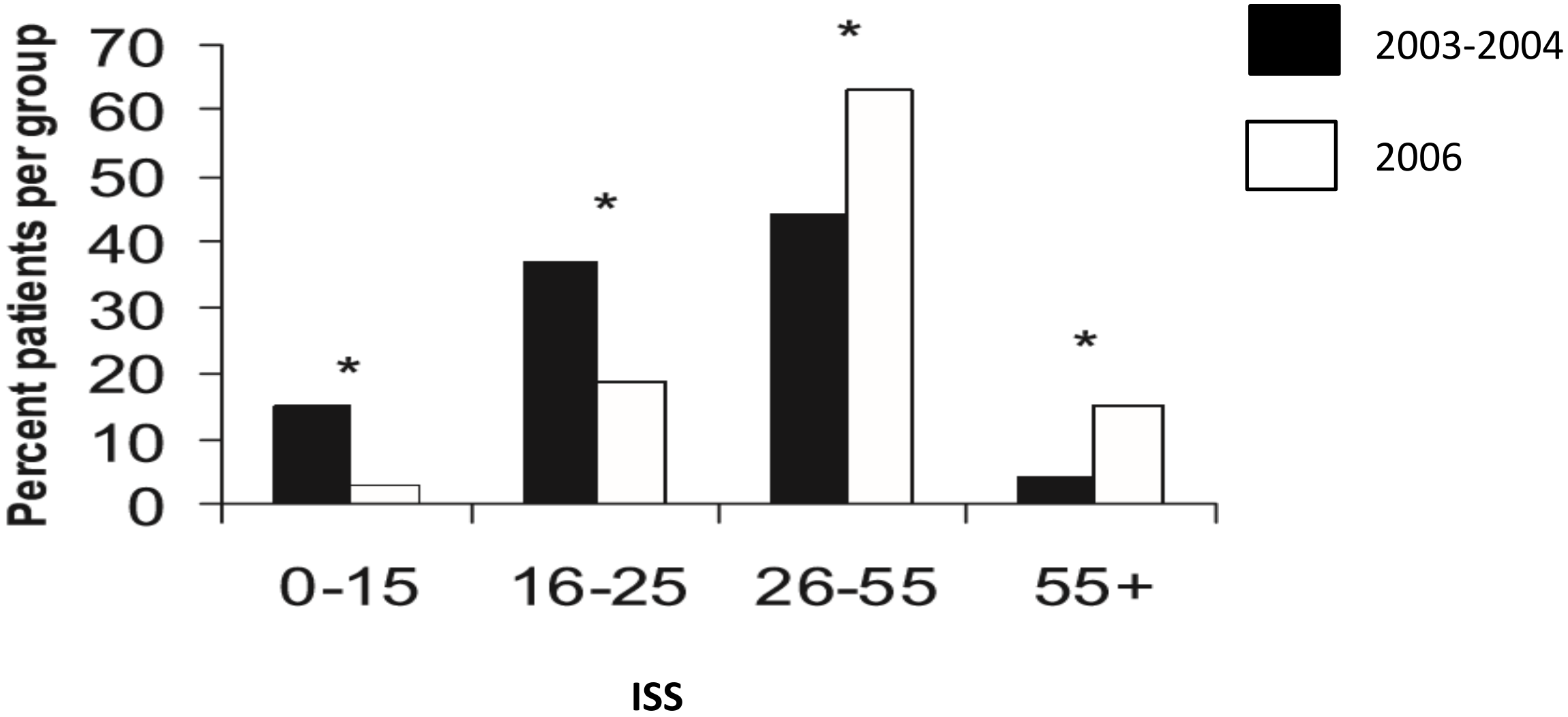
HIA Sainte Anne

Congrès de la SFAR 2018 Session CARUM le 27 septembre 2018

Service de santé des armées

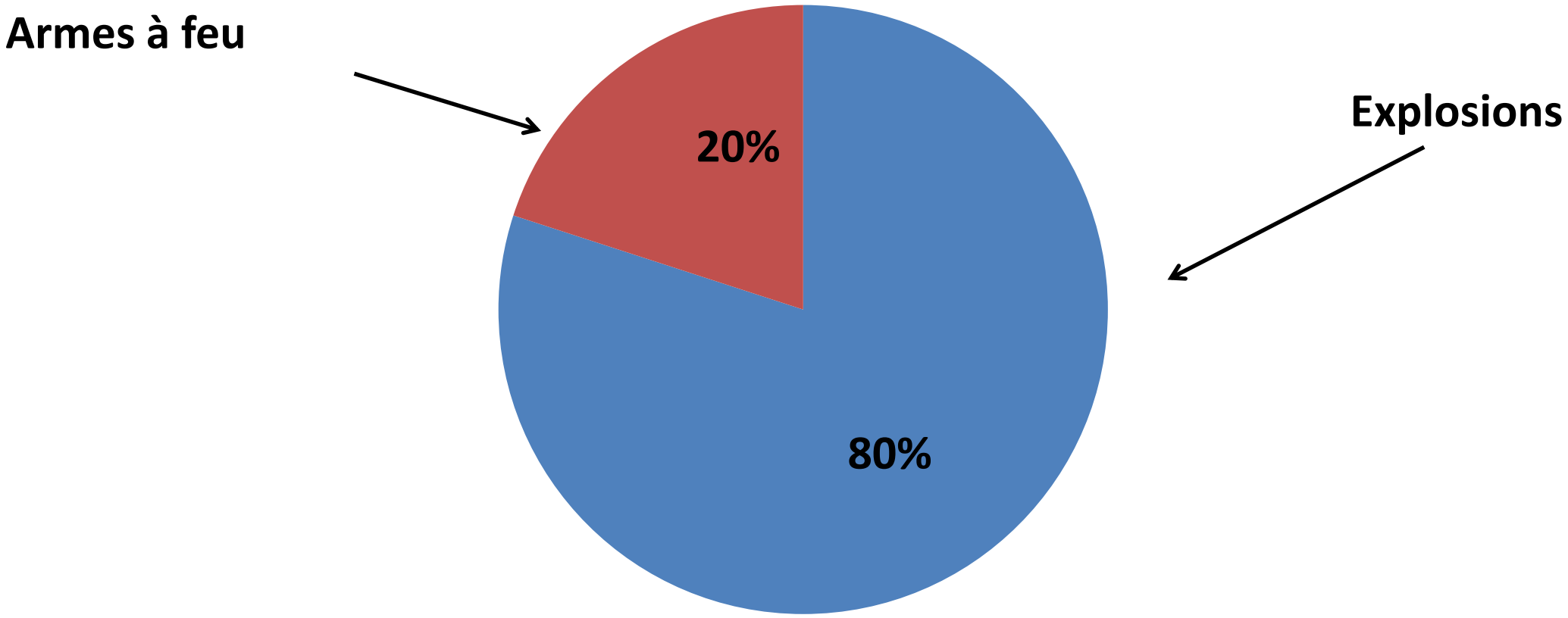
Hôpital d'Instruction des Armées Sainte Anne

Blessé de guerre = blessé grave



Kelly JF et al. J Trauma 2007

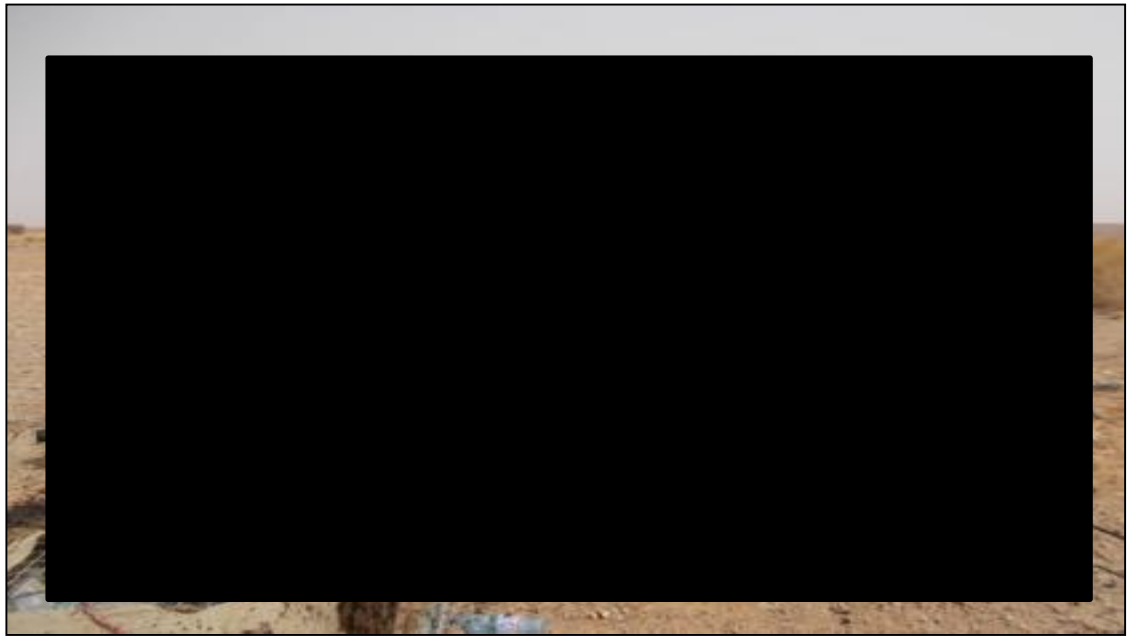
Mécanismes lésionnels



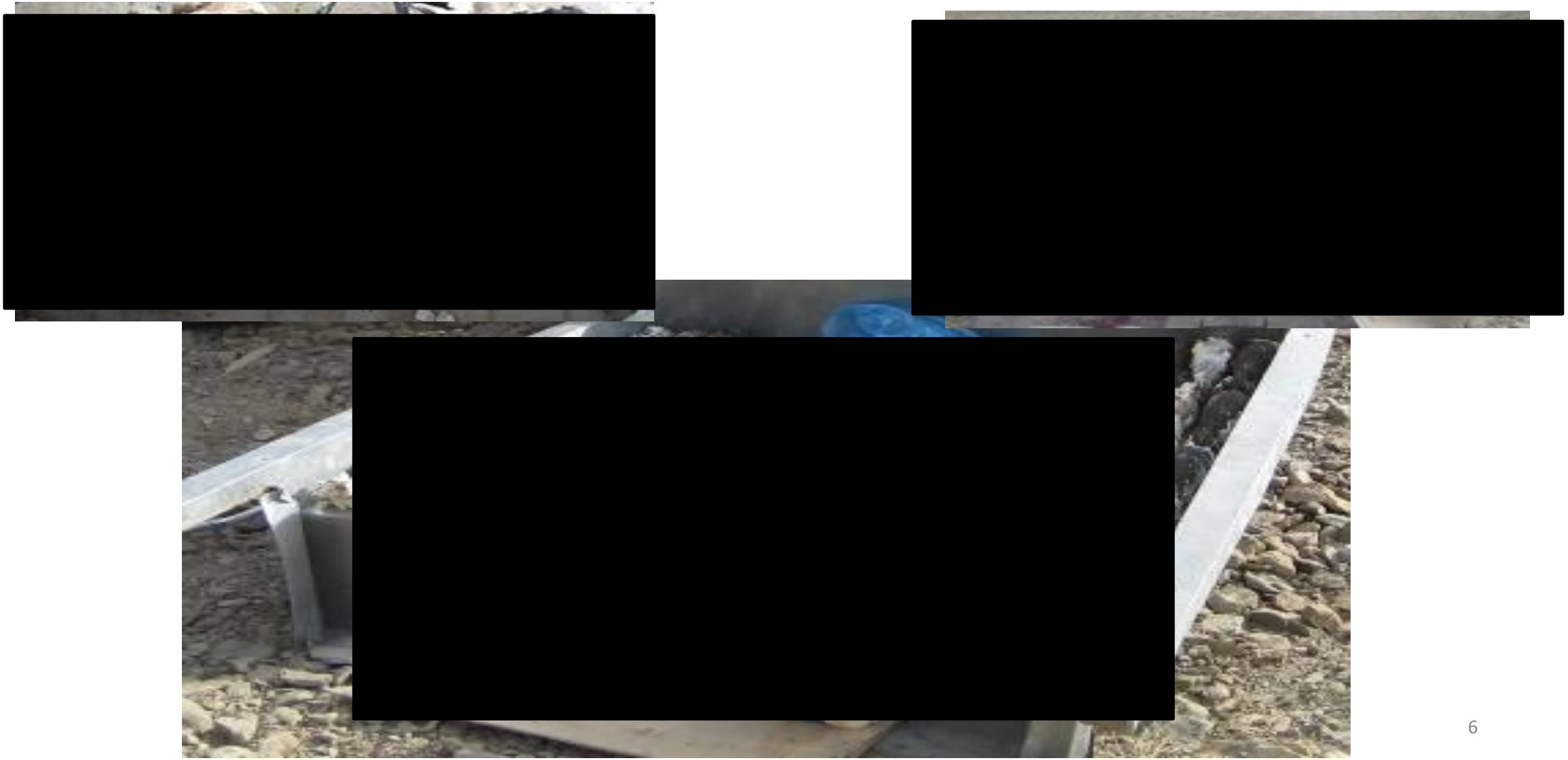
Kotwal et al J of Trauma 2018

IED

mines antichar

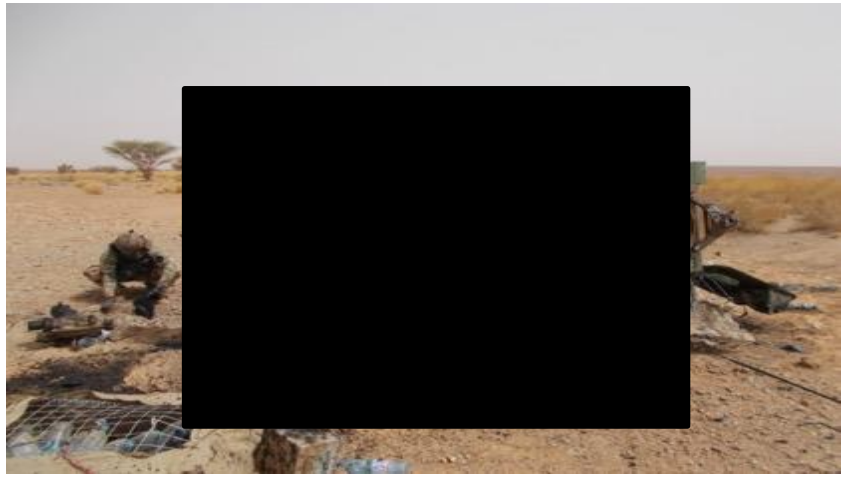


Nouveaux modes d’action



Blessé de guerre = blessé hémorragique

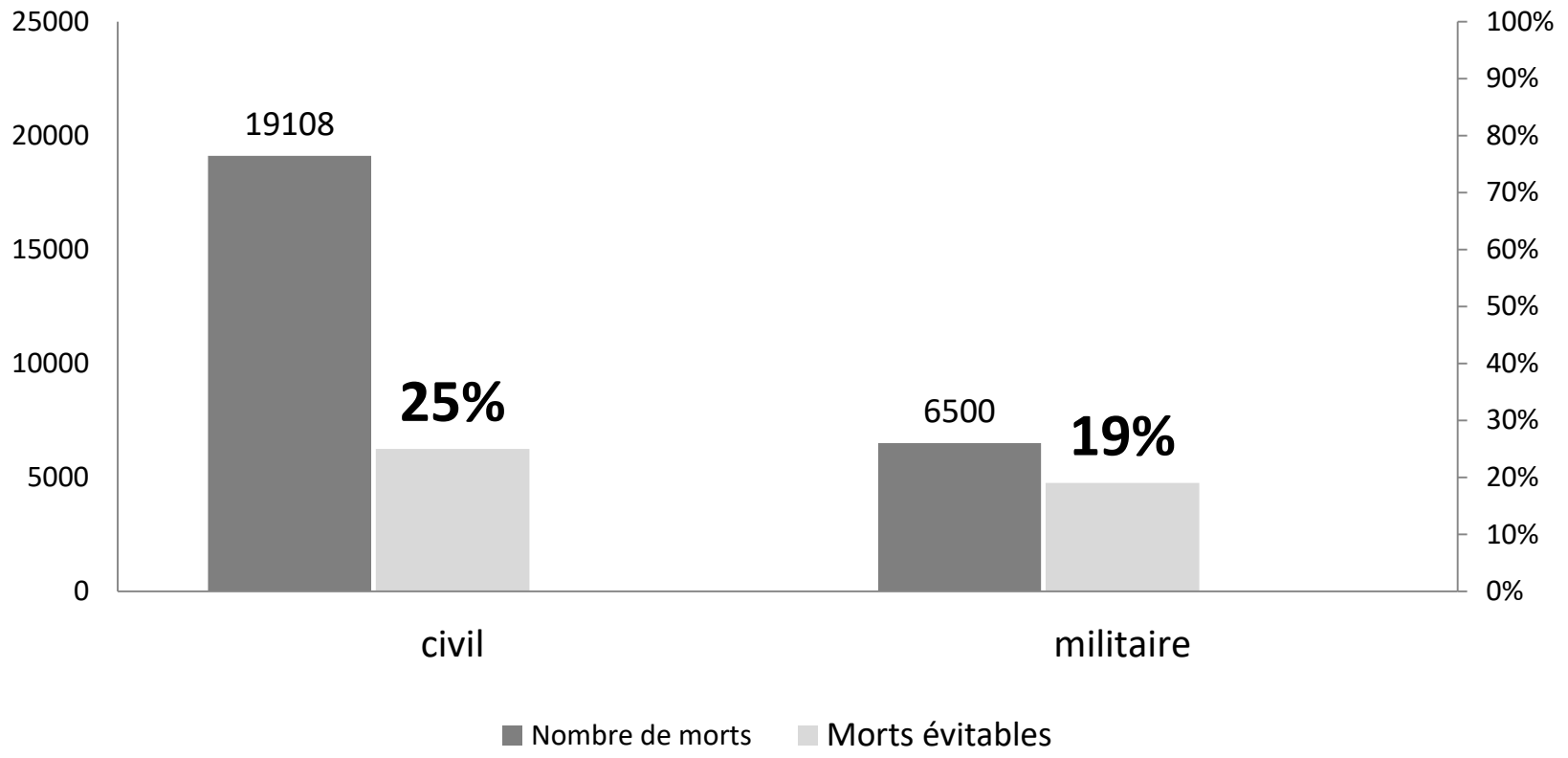
- Blasté
- Brûlé
- Choc hémorragique
- 30% des blessés transfusés
- 50% en transfusion massive



Cap et al J of trauma 2015

Hémorragie: 1ère cause de mortalité évitable

20-25% de morts évitables



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

Janak et al JAMA Surg 2018

Priorité de prise en charge: hémostase chirurgicale

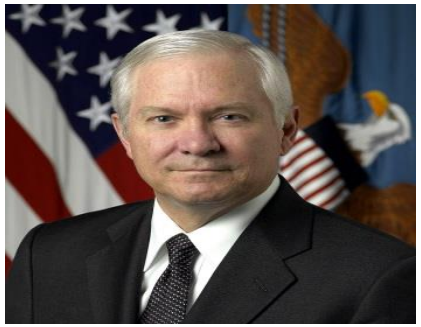
Rôle 2

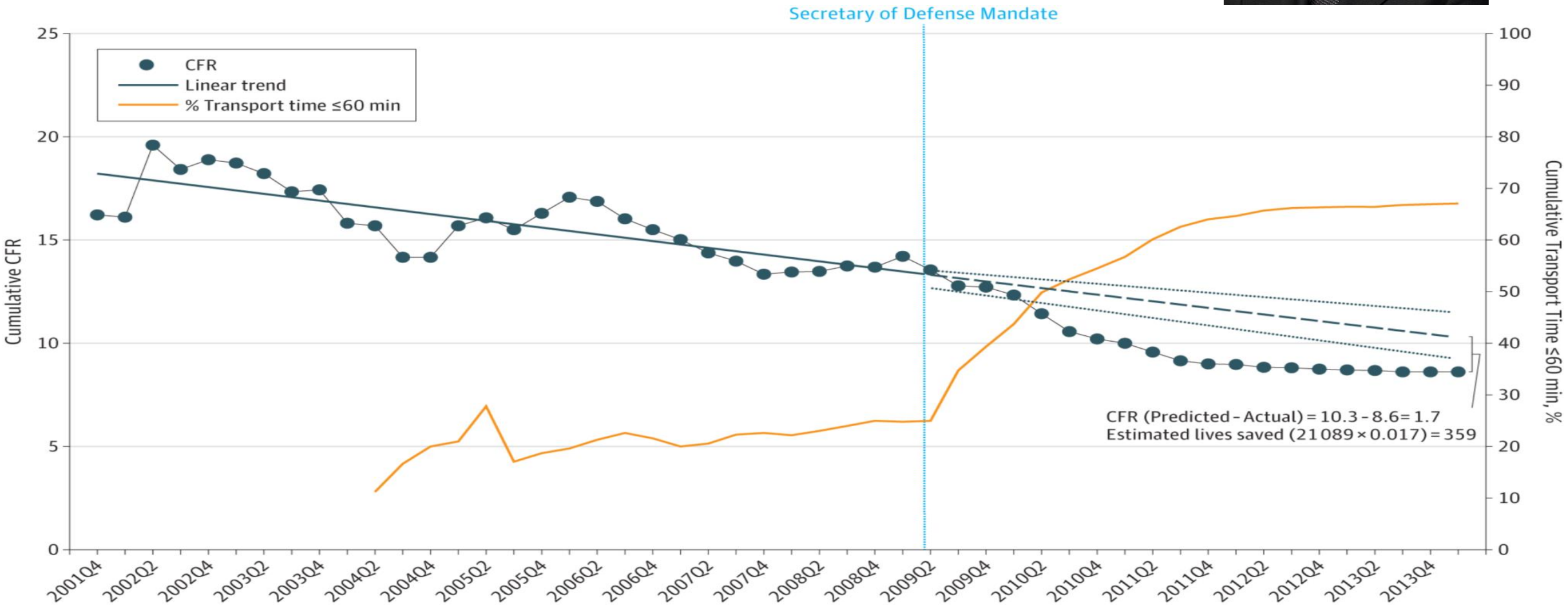
capacité chirurgicale

capacité transfusionnelle

Réduire les délais = ↘mortalité

« Golden hour mandate »





Kotwal et al JAMA Surg 2016

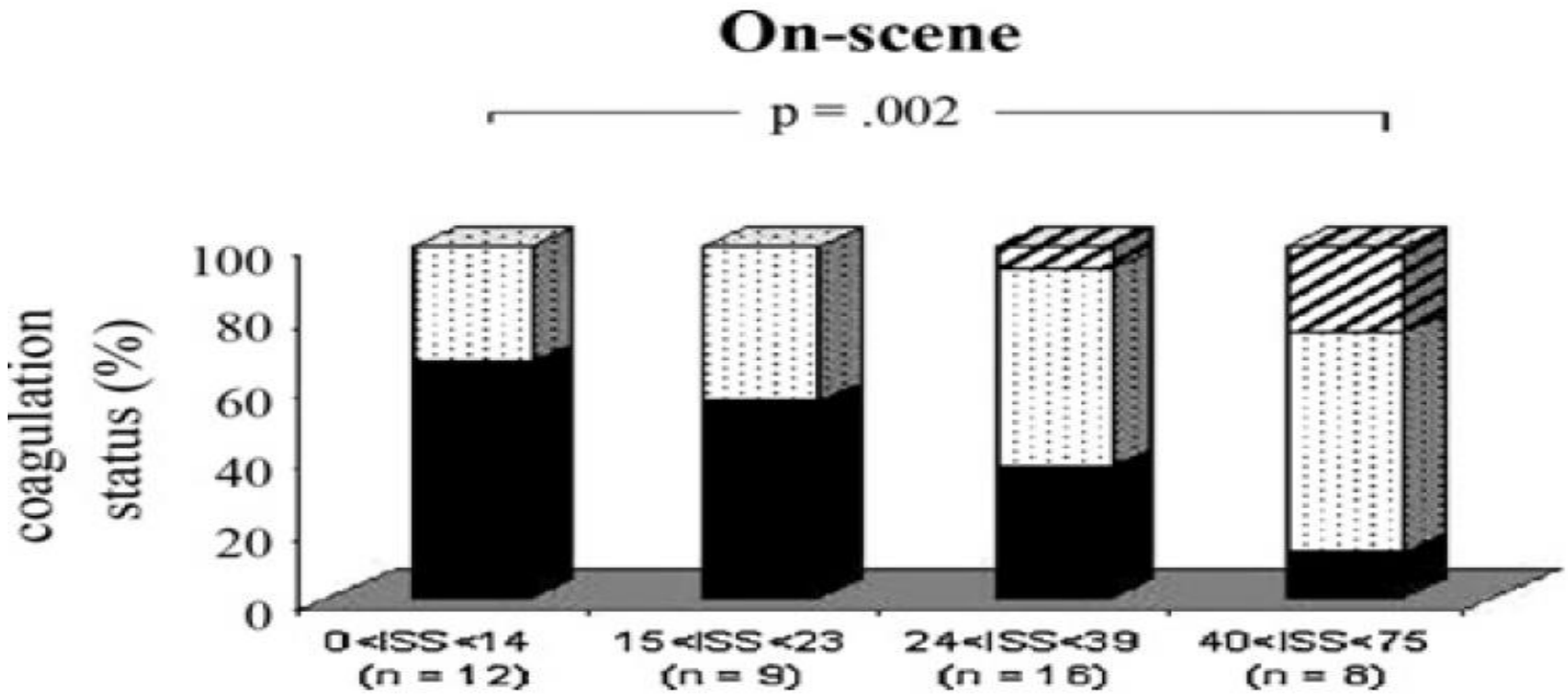
Mortalité évitable en préhospitalier

- **90% des décès en préhospitalier**
- **25% évitables**
- **90% des morts évitables: hémorragie**

Eastridge et al. J Trauma 2012

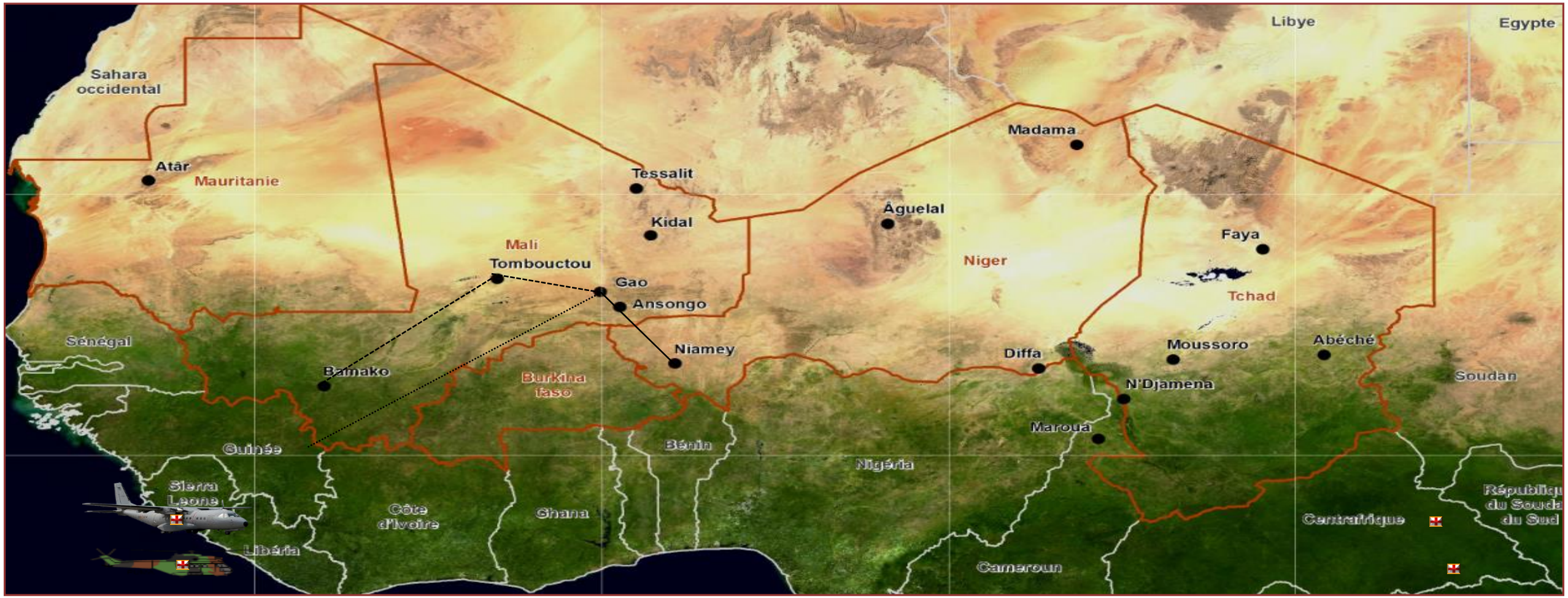
- <u>Optimiser</u> le temps préhospitalier
- <u>Démarrer</u> la transfusion

Coagulopathie traumatique dès les 1ères minutes



25min
Coagulopathie
56% des patients

Opération Barkhane: élongations +++



4000 militaires français
5 millions de km²

Délais d'évacuation opération Barkhane

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

Contents lists available at ScienceDirect

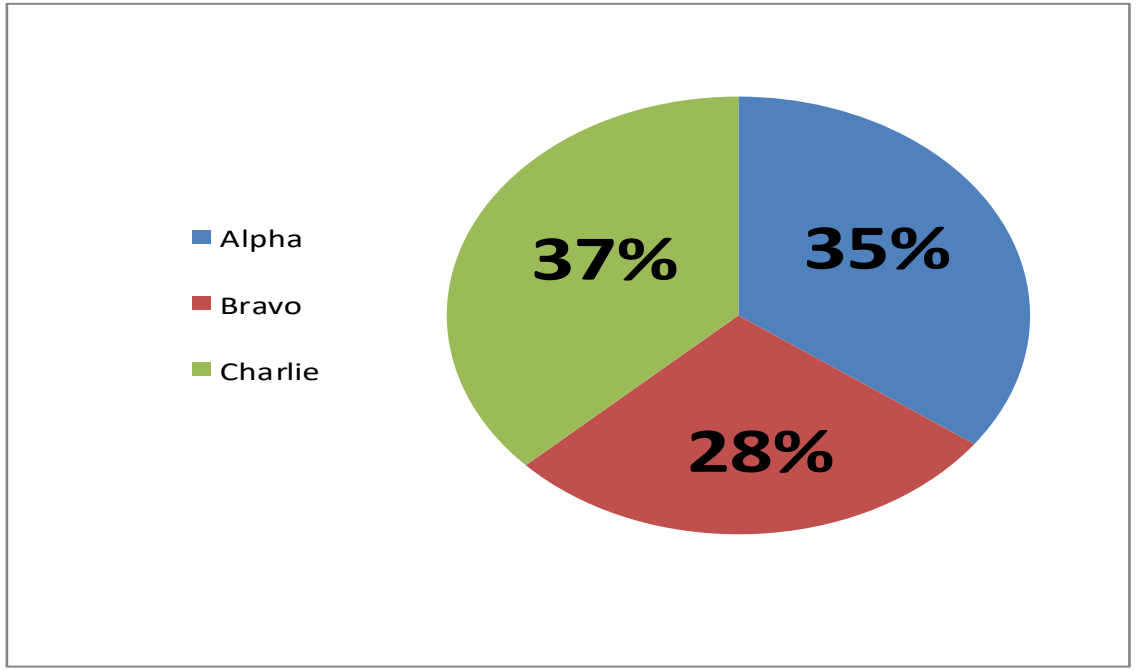
Injury

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[j], Julien Bordes, MD, MSC[k]



	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]

« Necessity is the mother of invention »

2016: déploiement du PLYO dans les UMO niveau 1 du SSA

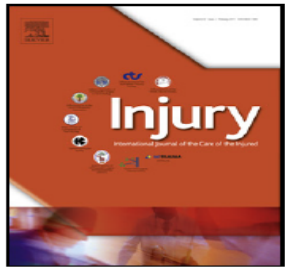
Transfusion précoce opération Barkhane

Injury, Int. J. Care Injured 49 (2018) 903–910

Contents lists available at ScienceDirect

Injury

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



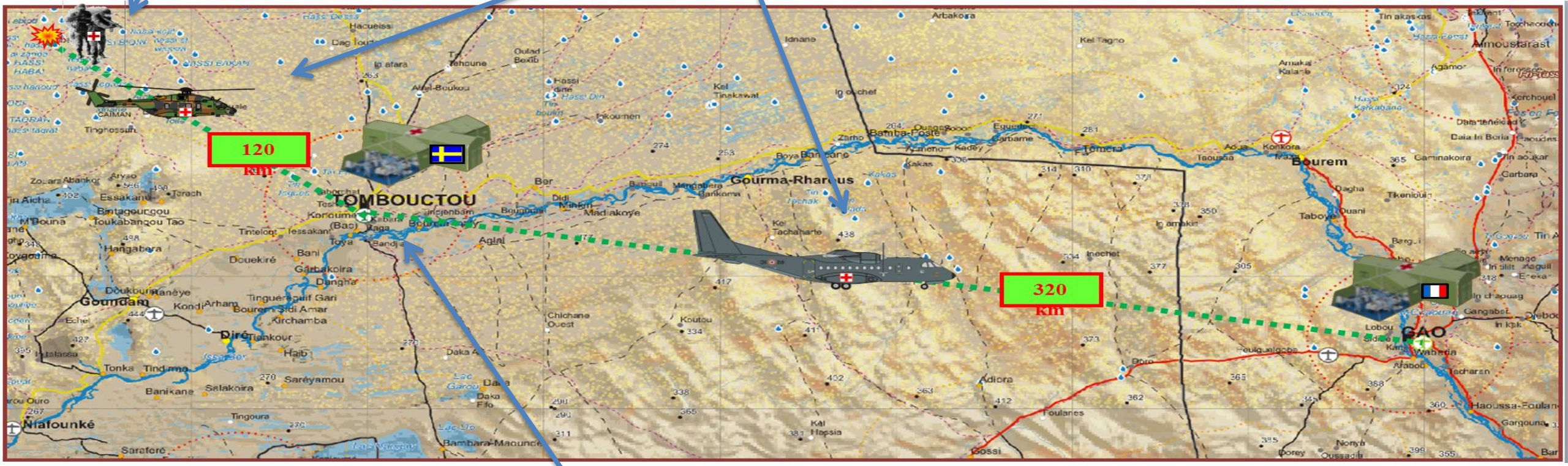
Early transfusion on battlefield before admission to role 2: A preliminary observational study during "Barkhane" operation in Sahel

V. Vitalis[a], C. Carfantan[b], A. Montcriol[c], S. Peyrefitte[d], A. Luft[b], T Pouget[e], A. Sailliol[e], S. Ausset[f], E. Meaudre[c], J. Bordes[c,g,*]

Transfusion précoce = avant l'arrivée en rôle 2

Sur le terrain

Evacuation tactique
« Medevac »



Rôle 1

Caractéristiques des blessés

n = 28	
Age, years	28 (23–29)
Gender, n (%)	
male	27 (96)
female	1 (4)
Nationality, n (%)	
french	12 (43)
other	16 (57)
Penetrating injuries, n (%)	27 (96)
Mechanisms of injury, n (%)	
Explosion	16 (57)
Gunshot	11 (39)
Other	1 (4)
Number of wounded regions/casualty, n	2 (1–3)
Wounds distribution by region, n (%)	
pelvis/extremities	21 (75)
abdomen	11 (39)
thorax	11 (39)
head and neck	9 (32)
face	3 (11)
soft tissus	11 (39)
Injury severity score	25 (21–38)
Patients requiring surgery at role 2, n (%)	15 (54)
Mortality at day 1, n (%)	5 (18)

Transfusion précoce: 25% des blessés graves

n = 28	
Glasgow coma scale	15 (13–15)
Heart rate,/min	105 (87–120)
Systolic blood pressure, mmHg	93 (84–114)
Diastolic blood pressure, mmHg	56 (51–69)
Active external haemorrhage	12 (43)
Hemorrhage control	
Tourniquet, n (%)	7 (25)
Pressure or hemostatic dressing, n (%)	16 (57)
Tranexamic acid, n (%)	16 (57)
Fibrinogen concentrate, n (%)	2 (7)
Airway and breathing	
Orotracheal intubation, n (%)	5 (18)
Pneumothorax exsufflation, n (%)	3 (11)
Thoracic drainage, n (%)	2 (7)
Vasopressive amines, n (%)	4 (14)
Transfusion, n (%)	7 (25)
Died before role 2 admission, n (%)	2 (7)
Medevac team intervention delay, min	99 (85–147)
Role 2 evacuation duration, min	145 (118–205)
French role 2 evacuation duration, min	180 (145–249)
Coalition role 2 admission, n (%)	5 (18)

Transfusion pendant les MEDEVAC

Table 5
Battlefield transfusions characteristics.

	n = 22
Battlefield transfusion place	
Role 1, n (%)	7 (32)
Medevac RW evacuation, n (%)	6 (27)
Medevac FX evacuation, n (%)	9 (41)
Transfused blood products	
Red blood cell, n (%)	7 (32)
Plasma, n (%)	15 (68)
Whole blood, n (%)	0 (0)
Complications related to transfusion, n(%)	0 (0)
Technical failure, n (%)	
Red blood cell	0 (0)
Plasma	2 (10)

RW: rotary wing; FX: fixed wing.

Transfusion opération Barkhane

Résultats: ↘délais transfusionnels

Table 3
field transfused patients' characteristics.

	Age	Mechanisms of injury	Number of wounded regions	Role 1 intervention delay, min	Medevac intervention delay, min	Transfused blood products on field			Blood product transfusion delay, min	Role 2 admission delay, min	Survival at H24	Transfused blood products at role 2		
						RBC	Plasma	WB				RBC	Plasma	WB
Patient 1	31	IED	5	0	99	3	3	0	177	358	No	0	2	9
Patient 2	20	IED	6	0	99	1	2	0	192	358	No	0	0	4
Patient 3	28	Gunshot	2	5	46	1	1	0	190	85	Yes	1	1	0
Patient 4	23	Mortar	3	40	–	0	1	0	80	115	Yes	7	4	0
Patient 5	28	IED	2	65	130	0	1	O	151	180	Yes	8	5	11
Patient 6	21	IED	1	16	85	2	4	O	82	142	Yes	4	1	2
Patient 7	44	Gunshot	3	25	89	0	3	O	75	115	Yes	0	4	0

Transfusion précoce
Expérience US

- Irak 2003-2010: exceptionnel
  - 3/1692 blessés
  - ***Kotwal J et al of trauma 2018***

- Afghanistan 2001- :
  - A partir de 2010
  - 55/502 blessés
  - ***Shackelford et al JAMA 2017***

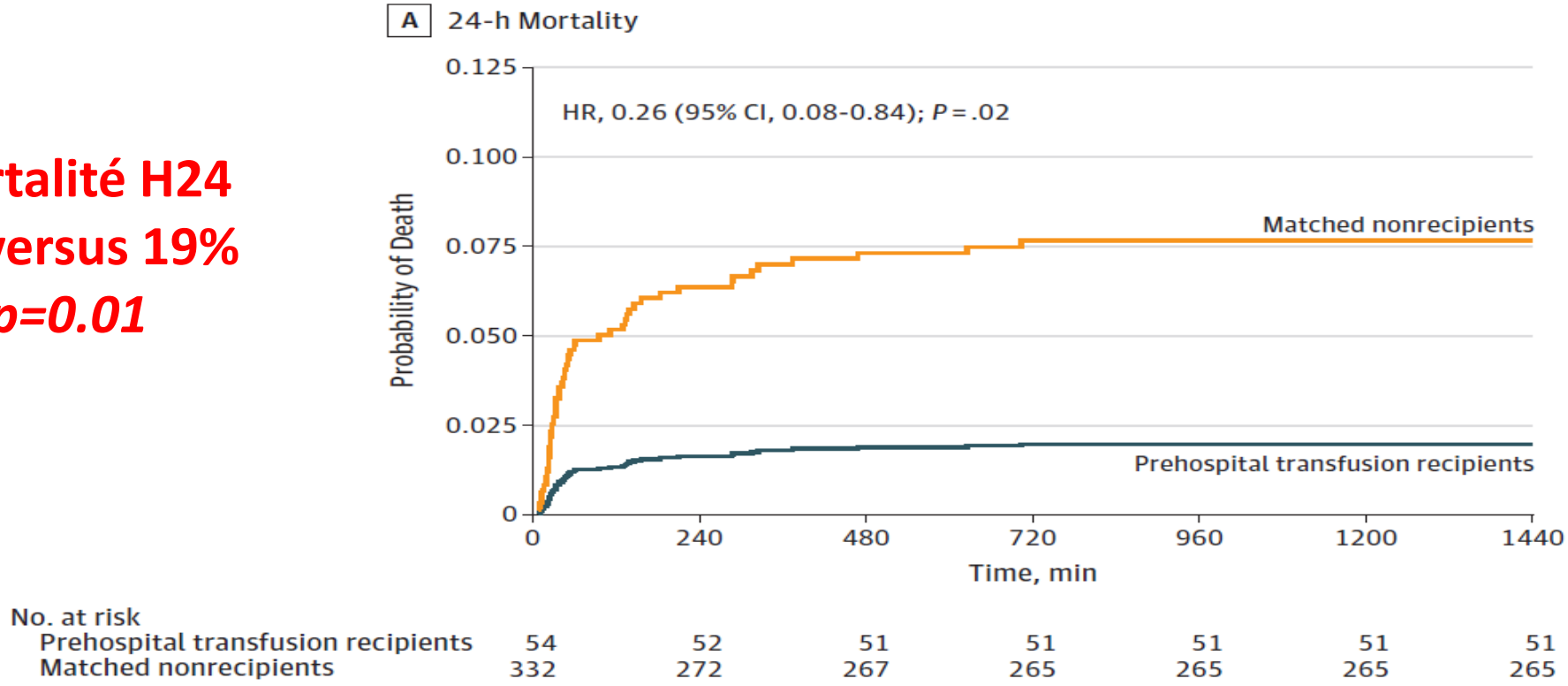
Transfusion précoce: ↘mortalité

JAMA | Original Investigation

Association of Prehospital Blood Product Transfusion During Medical Evacuation of Combat Casualties in Afghanistan With Acute and 30-Day Survival

Stacy A. Shackelford, MD; Deborah J. del Junco, PhD; Nicole Powell-Dunford, MD; Edward L. Mazuchowski, MD, PhD; Jeffrey T. Howard, PhD; Russ S. Kotwal, MD, MPH; Jennifer Gurney, MD; Frank K. Butler Jr, MD; Kirby Gross, MD; Zsolt T. Stockinger, MD

Mortalité H24
5% versus 19%
p=0.01



Shackelford et al JAMA 2017

Transfusion précoce: indications?
Expérience US

JAMA | Original Investigation

Association of Prehospital Blood Product Transfusion During Medical Evacuation of Combat Casualties in Afghanistan With Acute and 30-Day Survival

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- Amputation traumatique bras ou cuisse
- Ou
- Etat de choc
  - PAS < 90mmHg
  - Fc > 120/min
  - ***Shackelford et al JAMA 2017***

Transfusion précoce: indications? Expérience française

- PAS < 90mmHg
- Fc > 120/min
- Traumatisme pénétrant

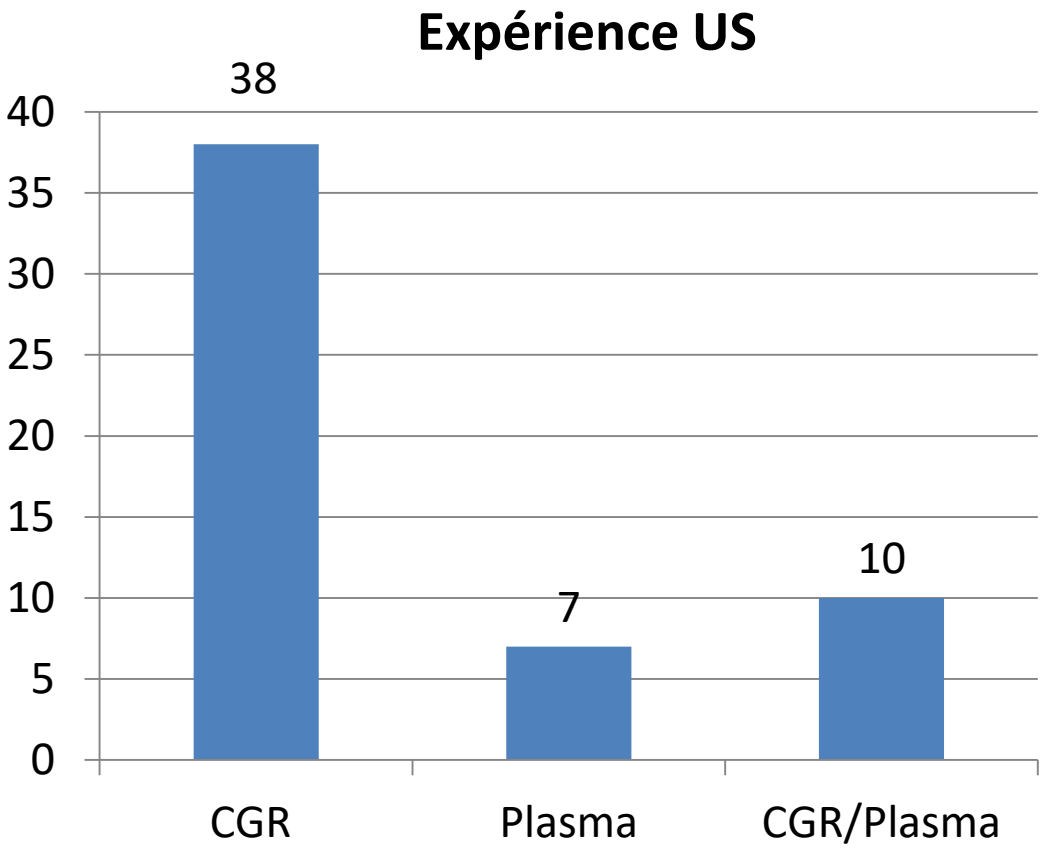
Table 6
comparison of battlefield transfused and non-battlefield transfused patients' characteristics.

	Battlefield transfused patients n = 7	Battlefield non transfused patients n = 21	*p*
Age, year	28 (22–29)	27 (24–29)	*1*[a]
Heart rate,/min	90 (86–105)	120 (90–130)	*0.31*[a]
Systolic arterial pressure,mmHg	91 (86–99)	95 (80–134)	*0.9*[a]
Glasgow coma scale	15 (7–15)	15 (13–15)	*0.4*[a]
Penetrating trauma, n (%)	7 (100)	20 (95)	*1*[b]
Active external haemorrhage, n (%)	4 (57)	8 (38)	0.8[b]
Number of regions wounded per casualty, n	3 (2–4)	2 (1,2)	*0.04*[a]
Injury severity score	45 (33–52)	25 (16–22)	*0.01*
Tactical tourniquet, n (%)	4 (57)	3 (14)	*0.07*[b]
Tranexamic acid, n (%)	7 (100)	9 (43)	*0.002*[b]
Medevac team arrival on scene, min	94 (86–99)	107 (86–177)	*0.5*
Role 2 admission delay, min	142 (115–269)	147 (128–200)	*1*[a]
Transfused patients at role 2, n (%)	7 (100)	5 (24)	*0.002*[b]
Total number of RBC transfused at role 2, n	1 (0.25–5.5)	0 (0–2)	*0.05*[a]
Total number of plasma transfused at role 2, n	2 (1–4)	0 (0–1.5)	*0.003*[a]
Total number of WB transfused at role 2, n	2 (0.5–6.5)	0 (0–0)	*0.002*[a]

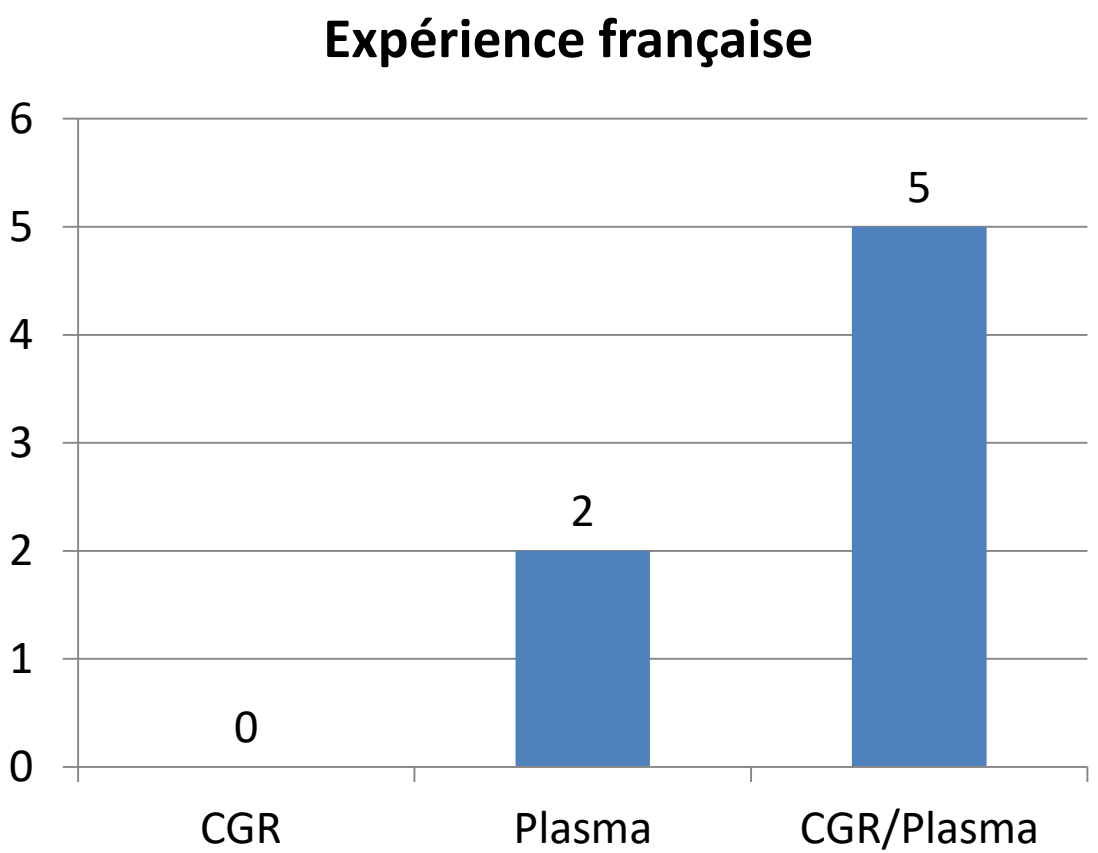
Data are expressed in median (interquartile range), or number (percentage).
[a] *Mann and Whitney test.*
[b] *Chi-squared test with Yates' correction.*

Vitalis et al Injury 2017

Transfusion précoce: quels produits?



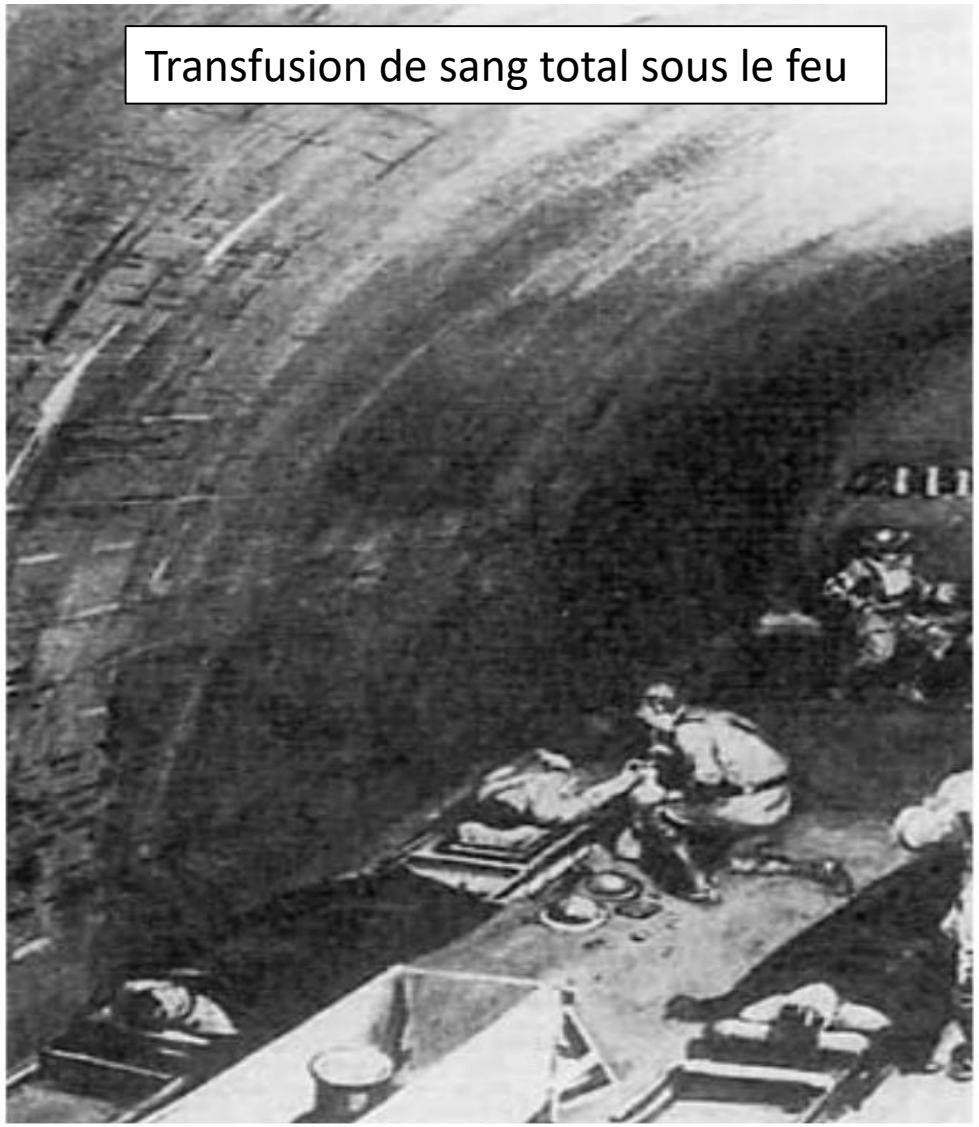
Shackelford et al JAMA 2017



Vitalis et al Injury 2017

Transfusion pendant la 1ère guerre mondiale

Captain Oswald Hope Robertson



Perspectives

1917, Robertson: ‘‘So far as my experience goes, **there is no comparison between the results of blood transfusion and saline infusion**. The effects of blood transfusion are instantaneous and usually lasting; the effects of saline too often transitory -a flash in the pan- followed by greater collapse
than before.’’

2014, Butler et al: Committee on Tactical Combat Casualty Care **prioritizes whole blood and then blood components** over crystalloids as **optimal therapy** for hemorrhagic shock resuscitation.

Conclusion

Pour éviter les morts évitables:

- **Priorité n°1: ↘ délai d'hémostase chirurgical**
- **Priorité n°2: ↘ délai de transfusion**
- **Optimiser les soins pré-hospitaliers: « Prolonged field care »**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