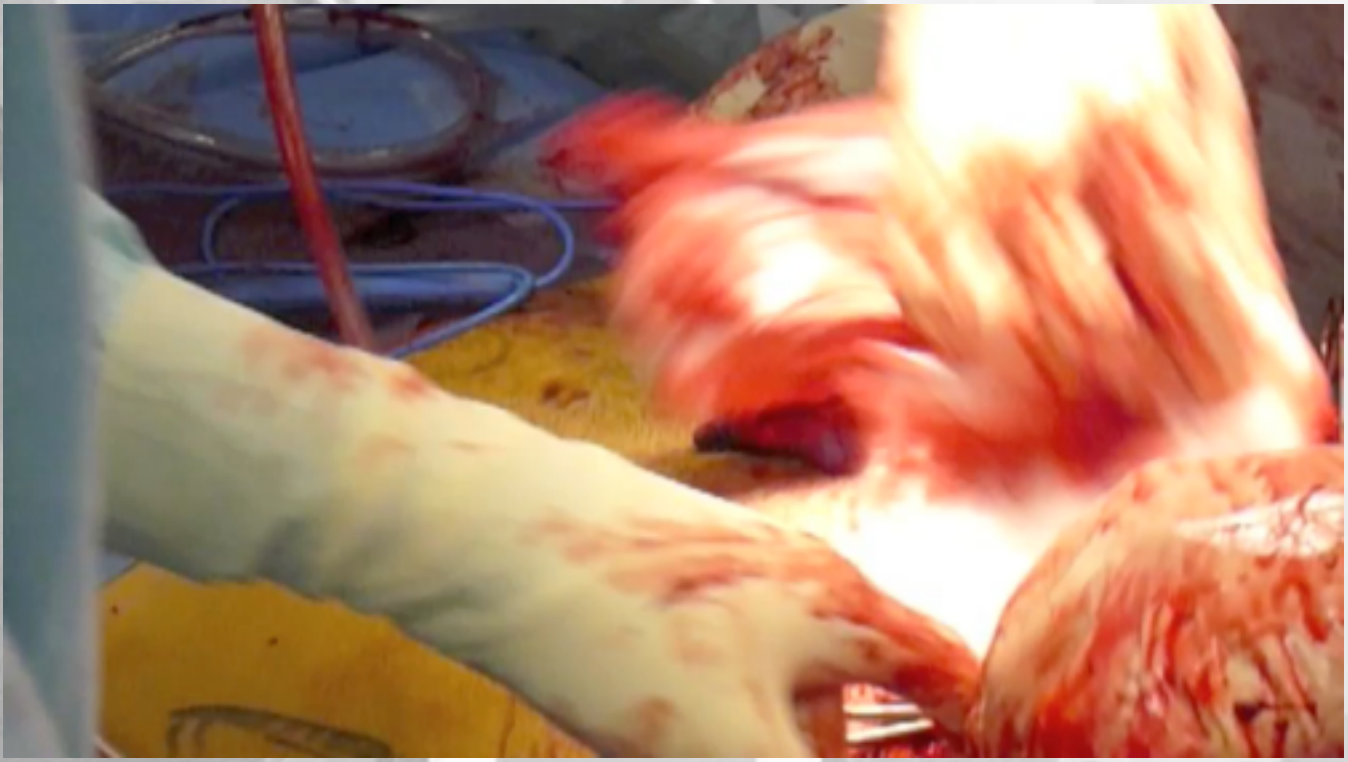
Prise en charge du blessé de guerre MEDEVAC

MP DABAN JL

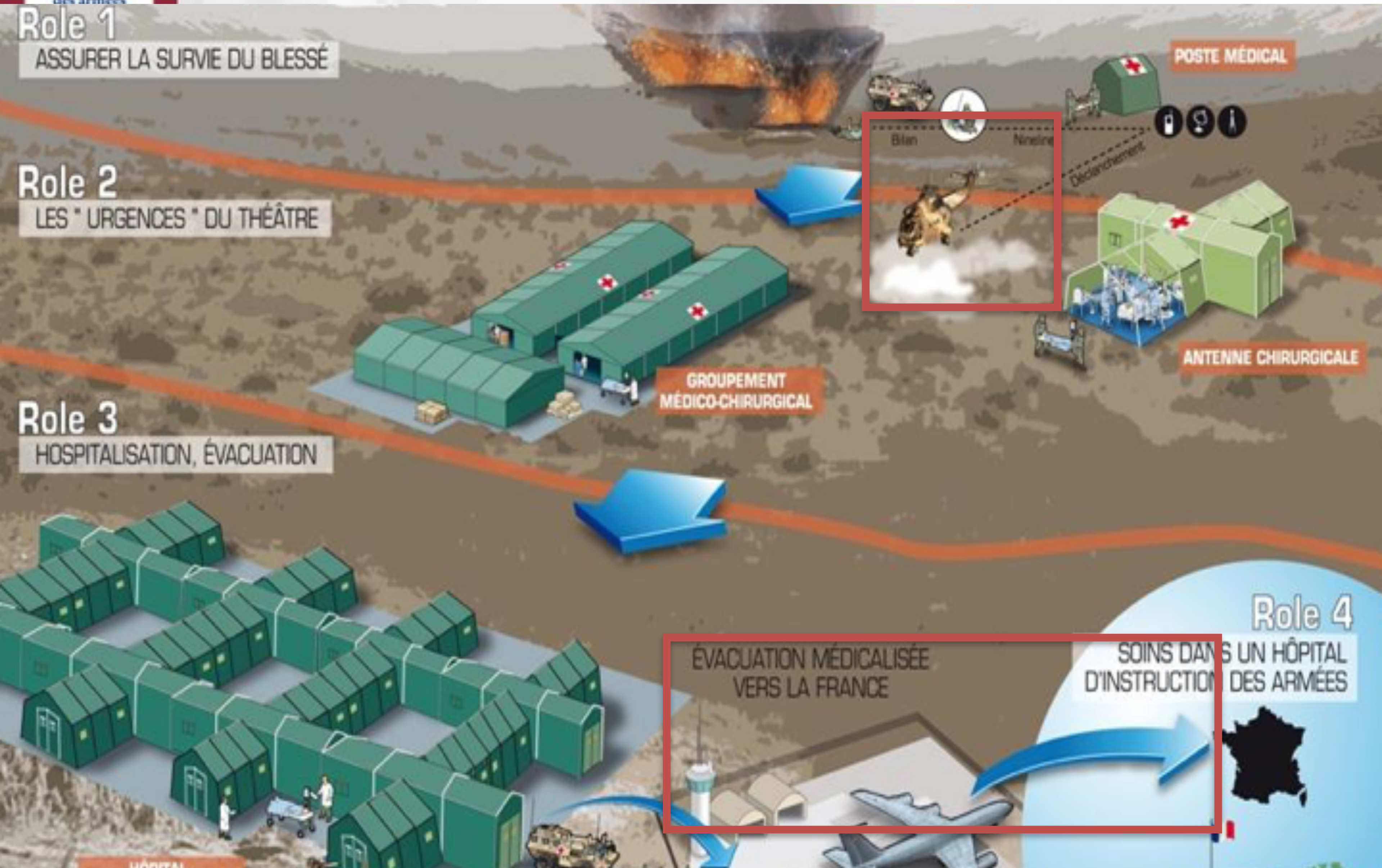
Anesthésie HIA Percy



CONGRES CTSA

Avril 2016

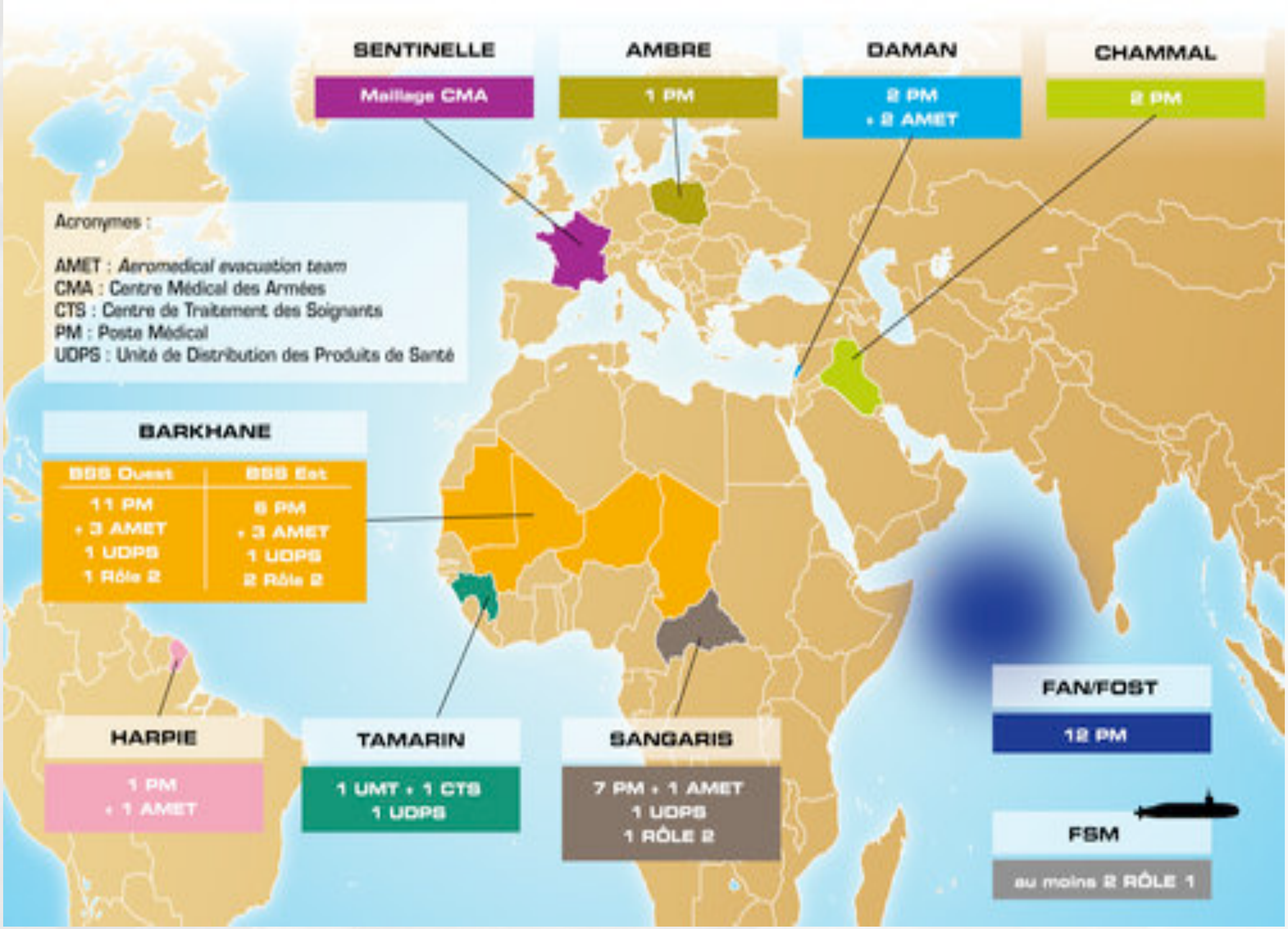
Chaîne santé en opération



Service de santé des armées

Votre vie, notre combat

OPEX 2016



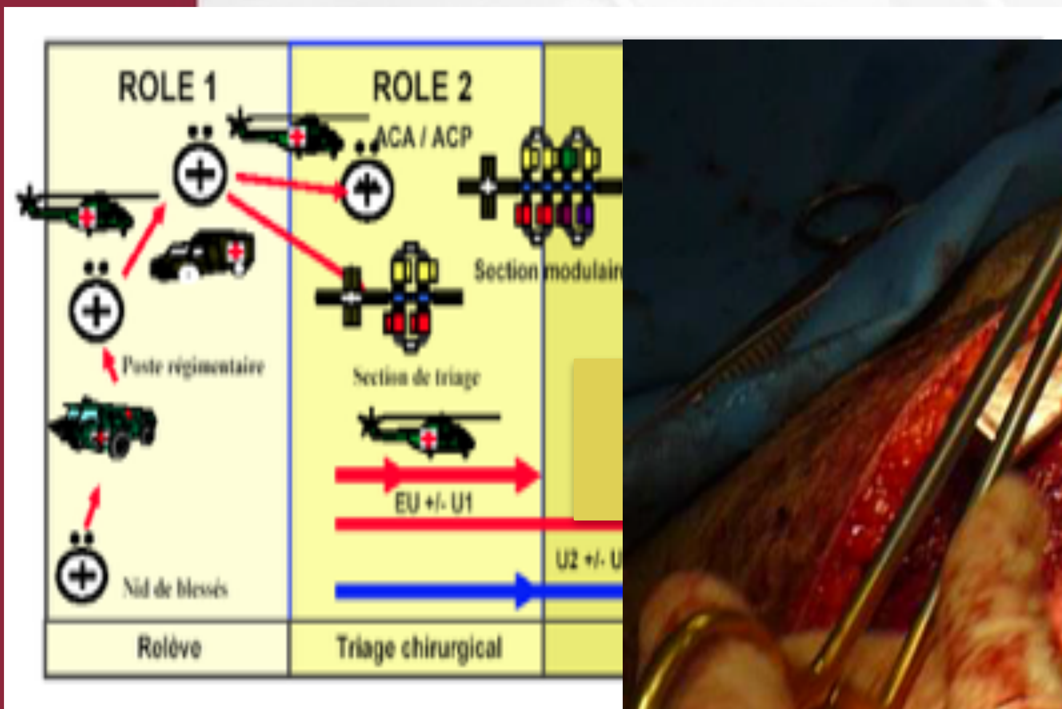
MINISTÈRE DE LA DÉFENSE

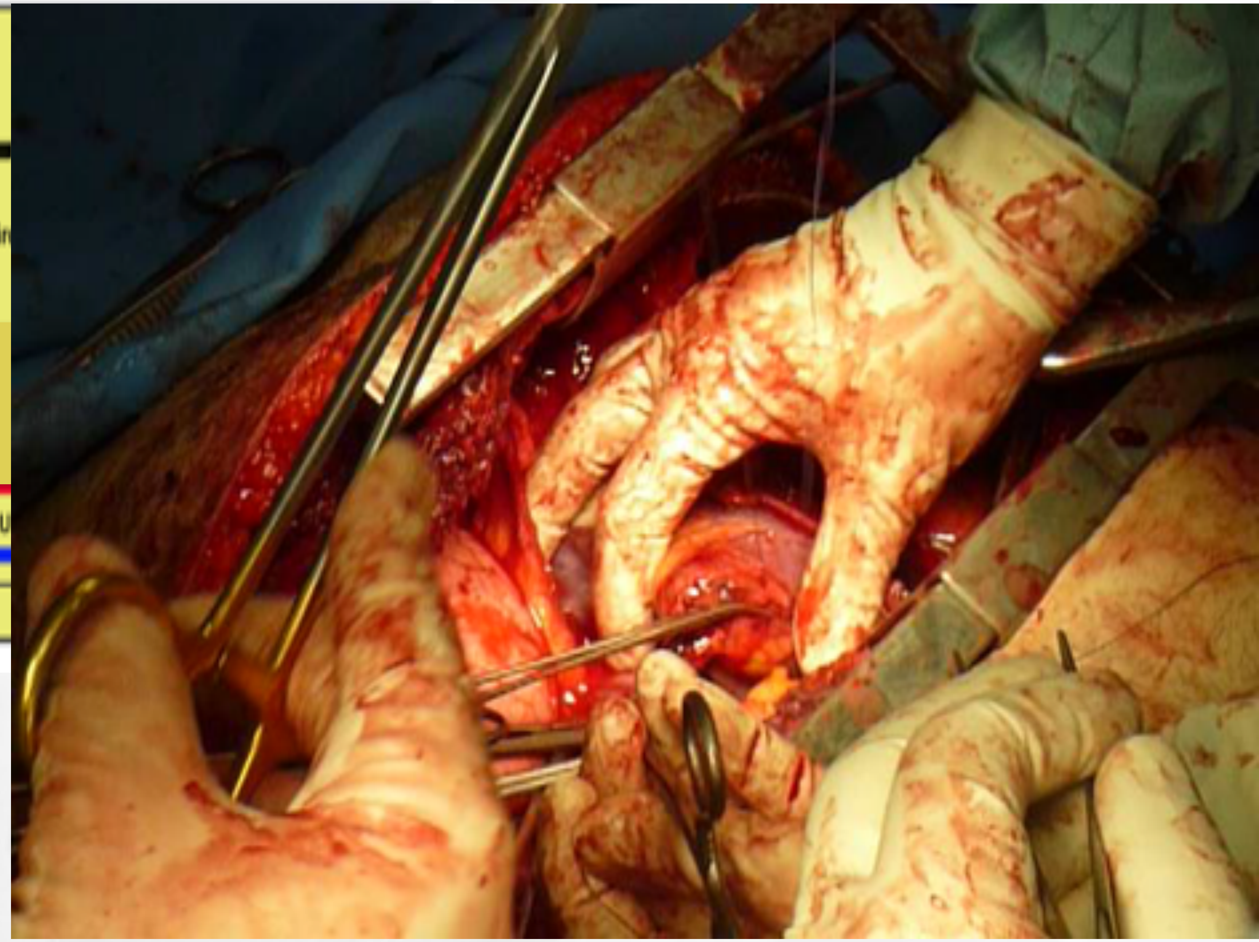
Chaîne de survie médicalisée
Le blessé « mobile »

Service de santé des armées

Votre vie, notre combat

Amener le blessé en < 1 heure

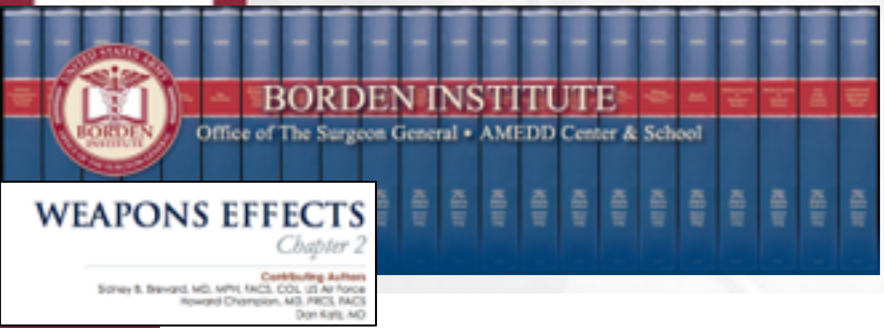


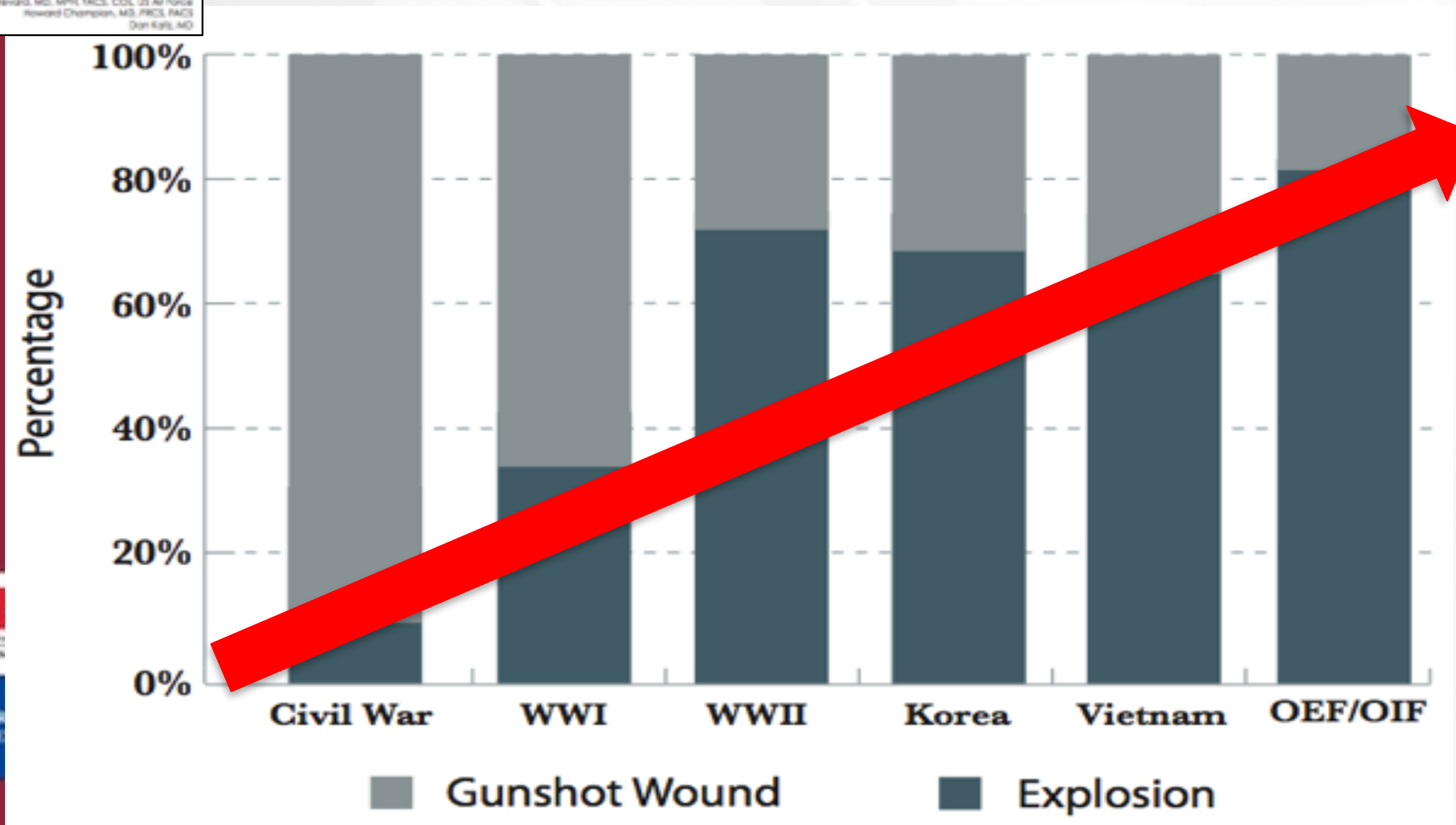


MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Contexte



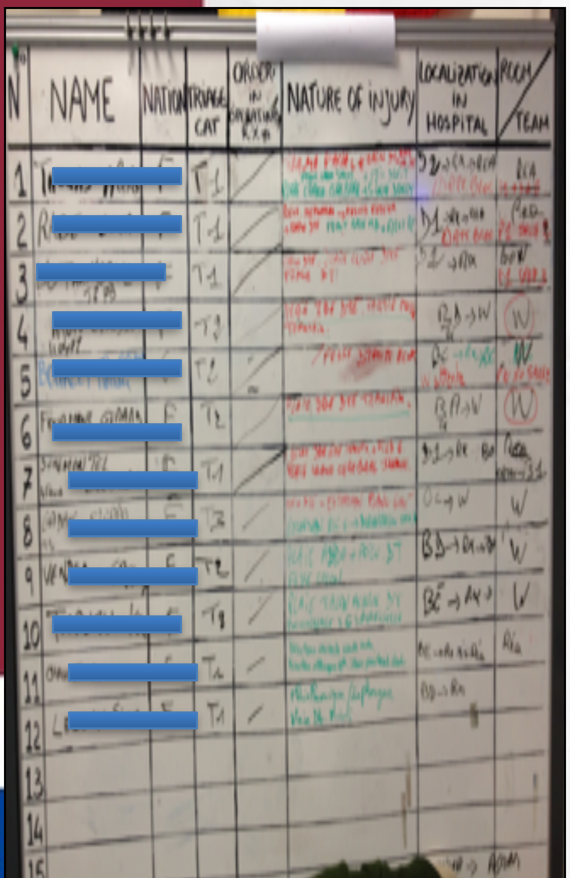


Service de santé des armées

Votre vie, notre

Spécificités militaires

Blessés multiples



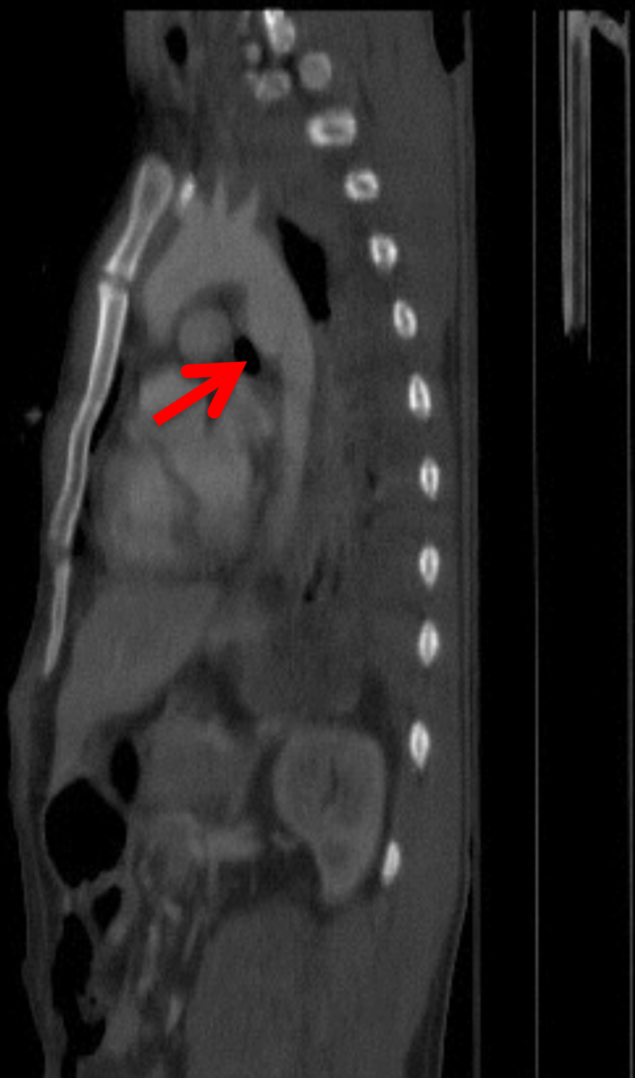
80 % des blessés
EXPLOSION

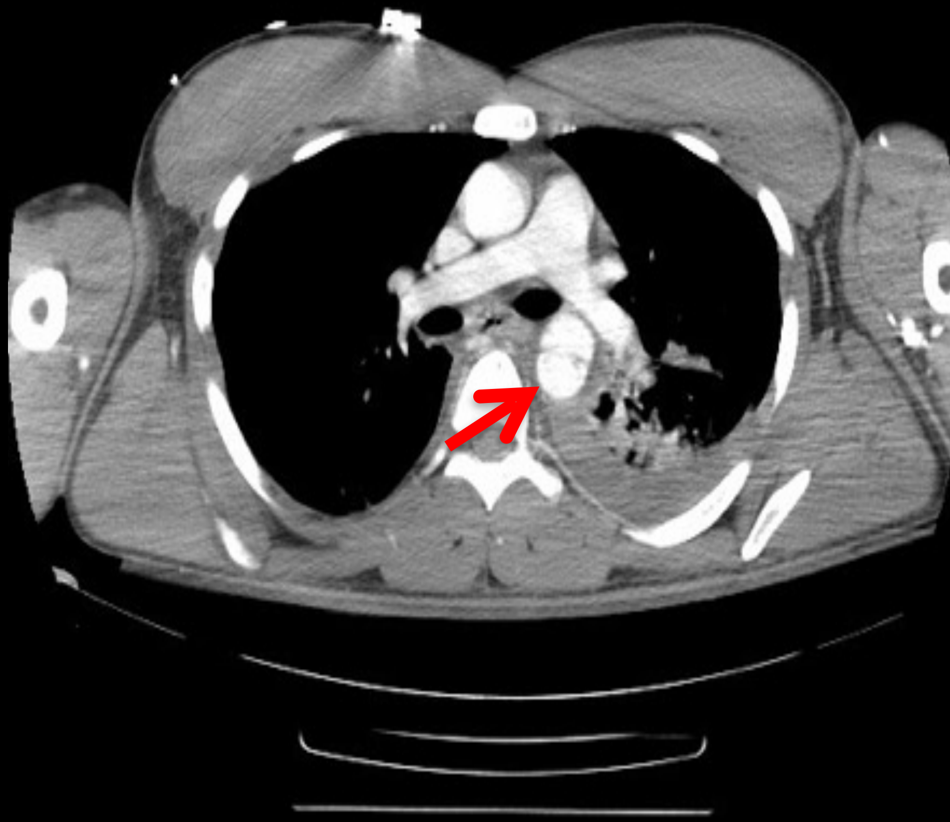
Environnement hostile

Contraintes logistiques

Lésions multiples

Exemple de bilan lésionnel



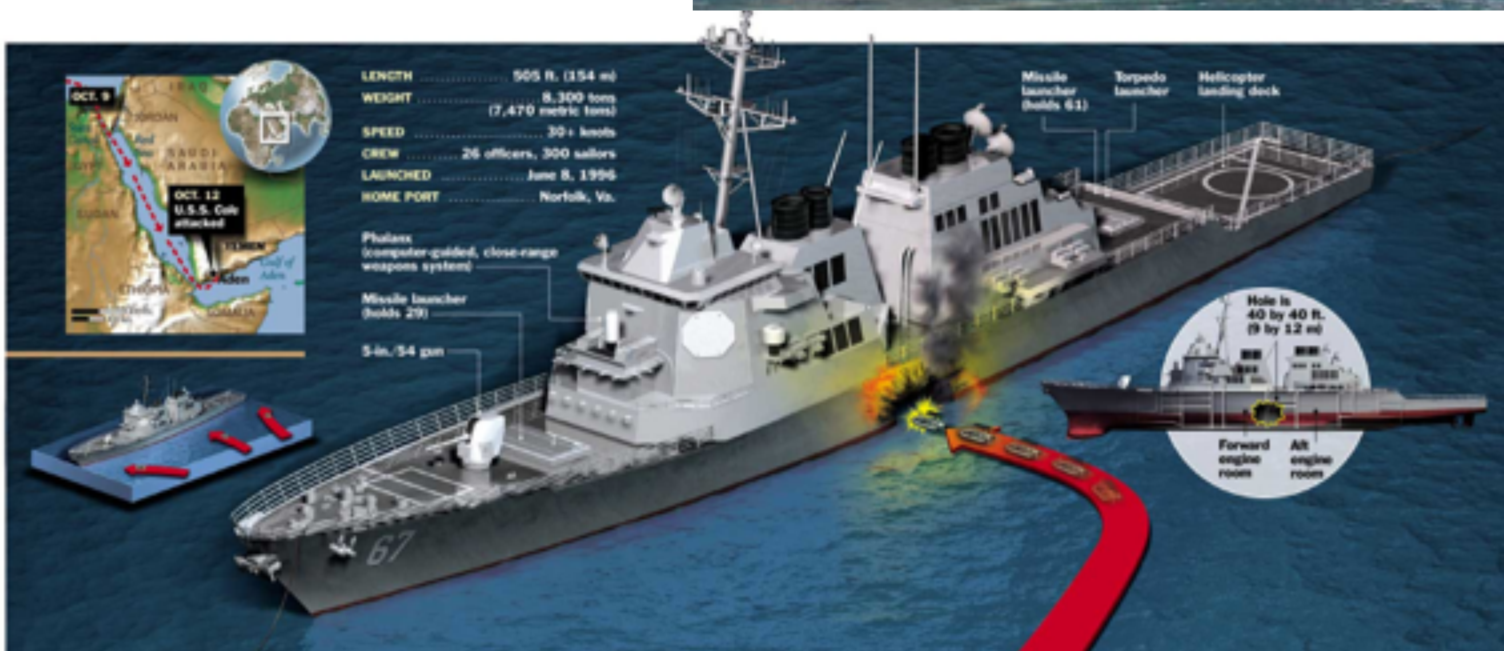


Can J Surg 2014

REVIEW • REVUE

Damage control resuscitation: history, theory and technique

Damage control: le concept

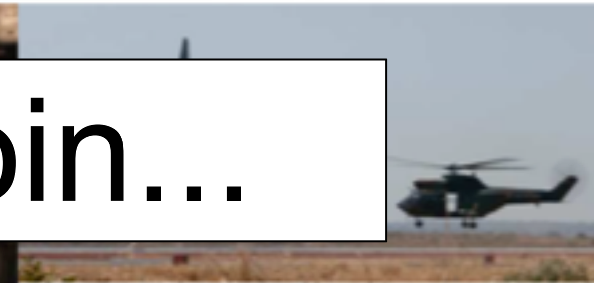


Le cadre espace temps : élongation-isolement

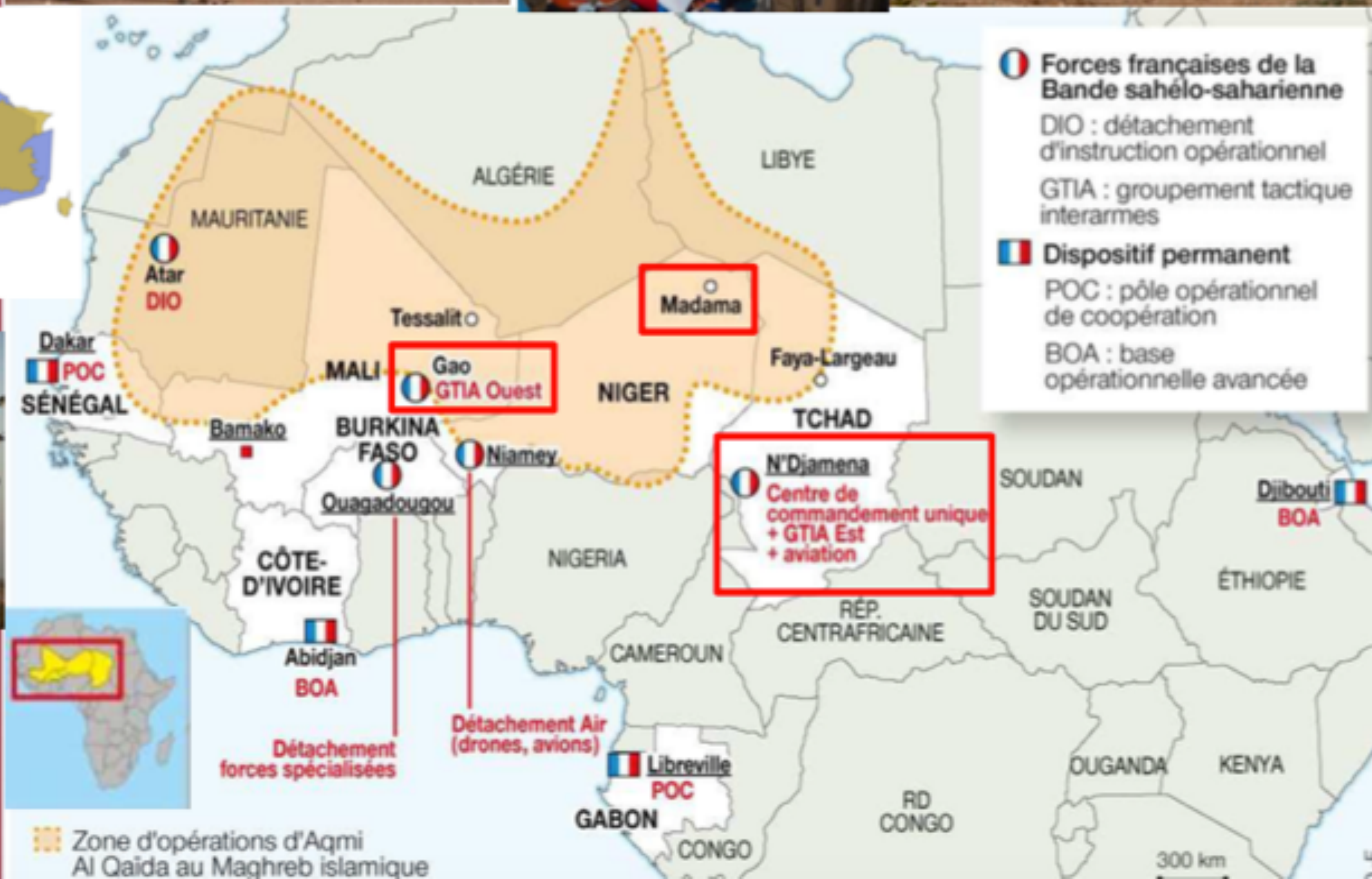
Service de santé des armées

Votre vie, notre combat





Le port est loin...



MINISTÈRE DE LA DÉFENSE

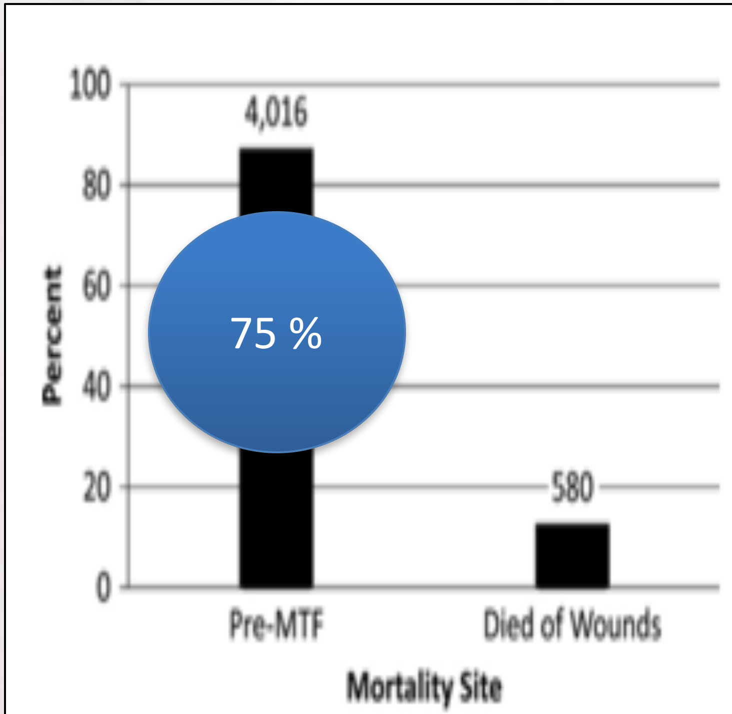
Votre vie,
notre combat

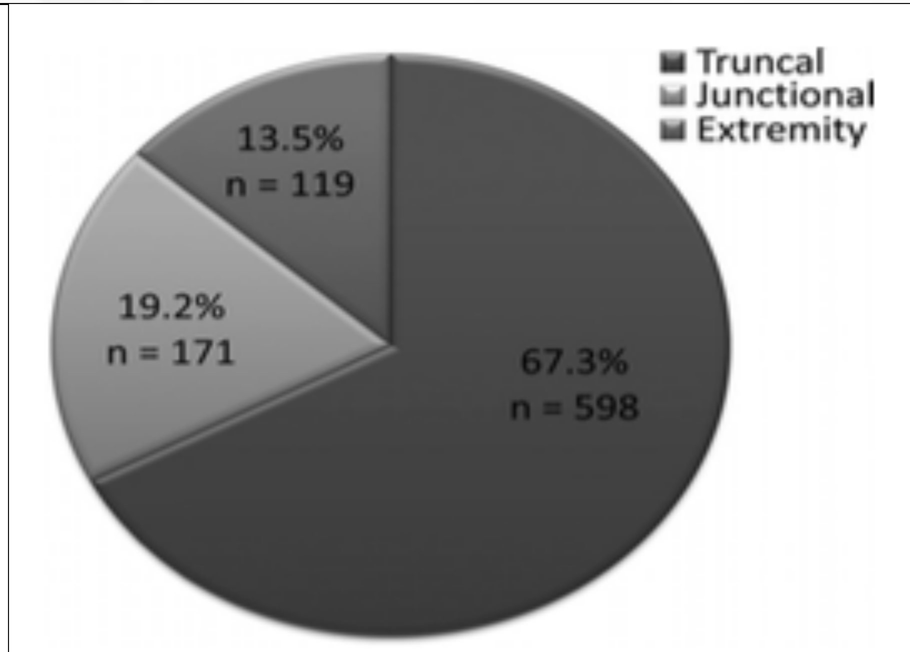
Mortalité précoce au combat

ORIGINAL ARTICLE

Death on the battlefield (2001–2011): Implications for the future of combat casualty care

Brian J. Eastridge, MD, Robert L. Mabry, MD, Peter Seguin, MD, Joyce Cantrell, MD, Terrill Tops, MD, Paul Uribe, MD, Olga Mallett, Tamara Zubko, Lynne Oetjen-Gerdes, Todd E. Rasmussen, MD, Frank K. Butler, MD, Russell S. Kotwal, MD, John B. Holcomb, MD, Charles Wade, PhD, Howard Champion, MD, Mimi Lawnick, Leon Moores, MD, *and* Lorne H. Blackbourne, MD





Anatomic focus of lethal PS hemorrhage.

Kill in action

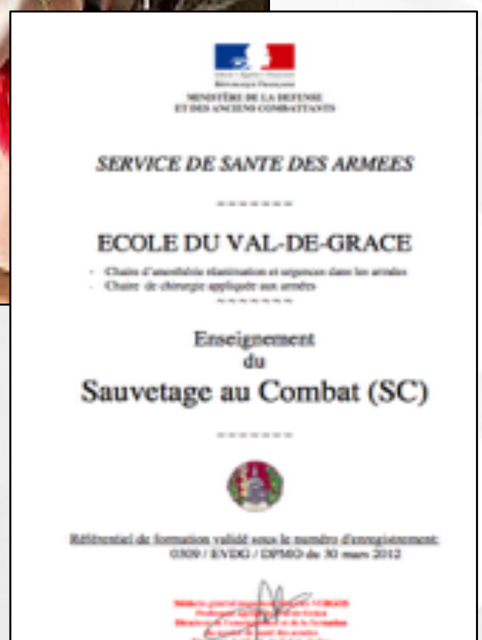
Mortalité évitable

Service de santé des armées

Votre vie, notre combat

« Sauvetage au combat »

- Tout combattant est un soignant
  - Agir en moins de 10 minutes



SERVICE DE SANTE DES ARMEES

ECOLE DU VAL-DE-GRACE

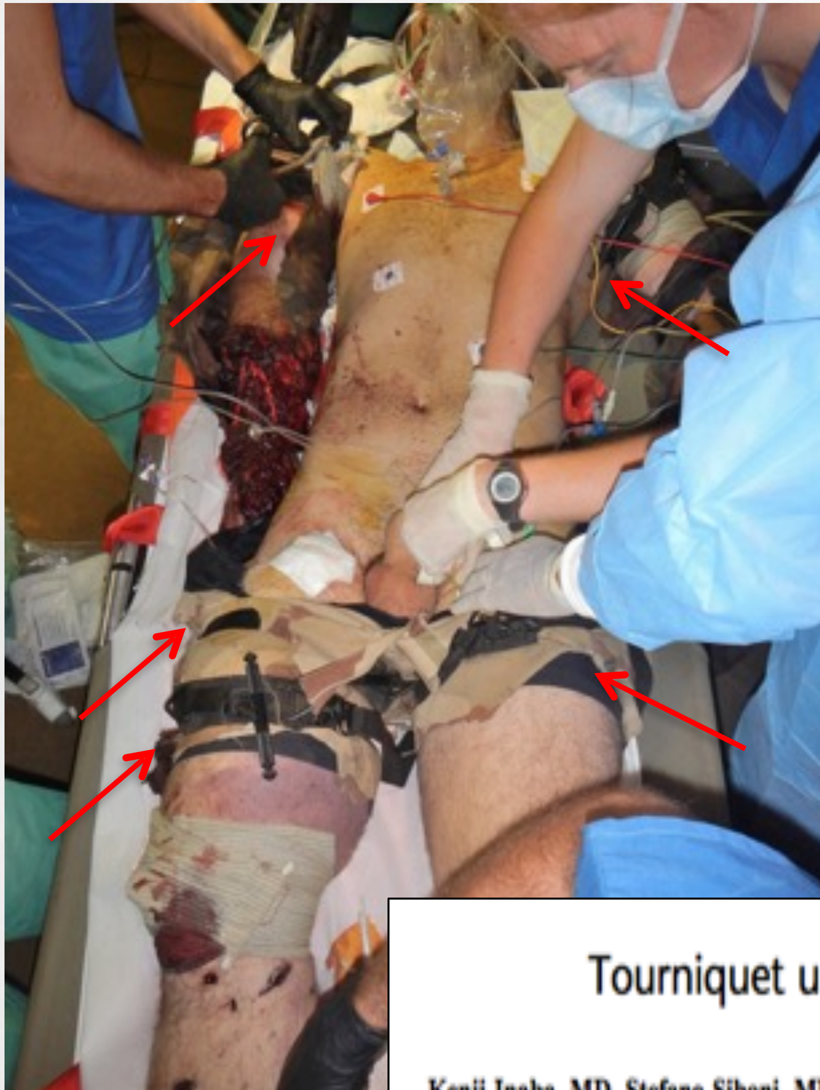
Enseignement
du
Sauvetage au Combat (SC)

Référentiel de formation validé sous le numéro d'enregistrement:
0309 / EVDG / DPMO du 30 mars 2012

MINISTÈRE DE LA DÉFENSE

Gestes de sauvetage

Votre vie,
notre combat



Tourniquet use for civilian extremity trauma

Kenji Inaba, MD, Stefano Siboni, MD, Shelby Resnick, MD, Jay Zhu, MD, Monica Darlene Wong, MS, Tobias Haltmeier, MD, Elizabeth Benjamin, MD, PhD, *and* Demetrios Demetriades, MD, PhD, *Los Angeles, California*

J Trauma Acute Care Surg. 2015;79: 232-237

DC « *ground zero* » 2016
SAMU opérationnel

Service de santé des armées

Votre vie, notre combat

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Ministère de la Défense

Service de santé des armées

Votre vie, notre combat

Garrot en milieu civil

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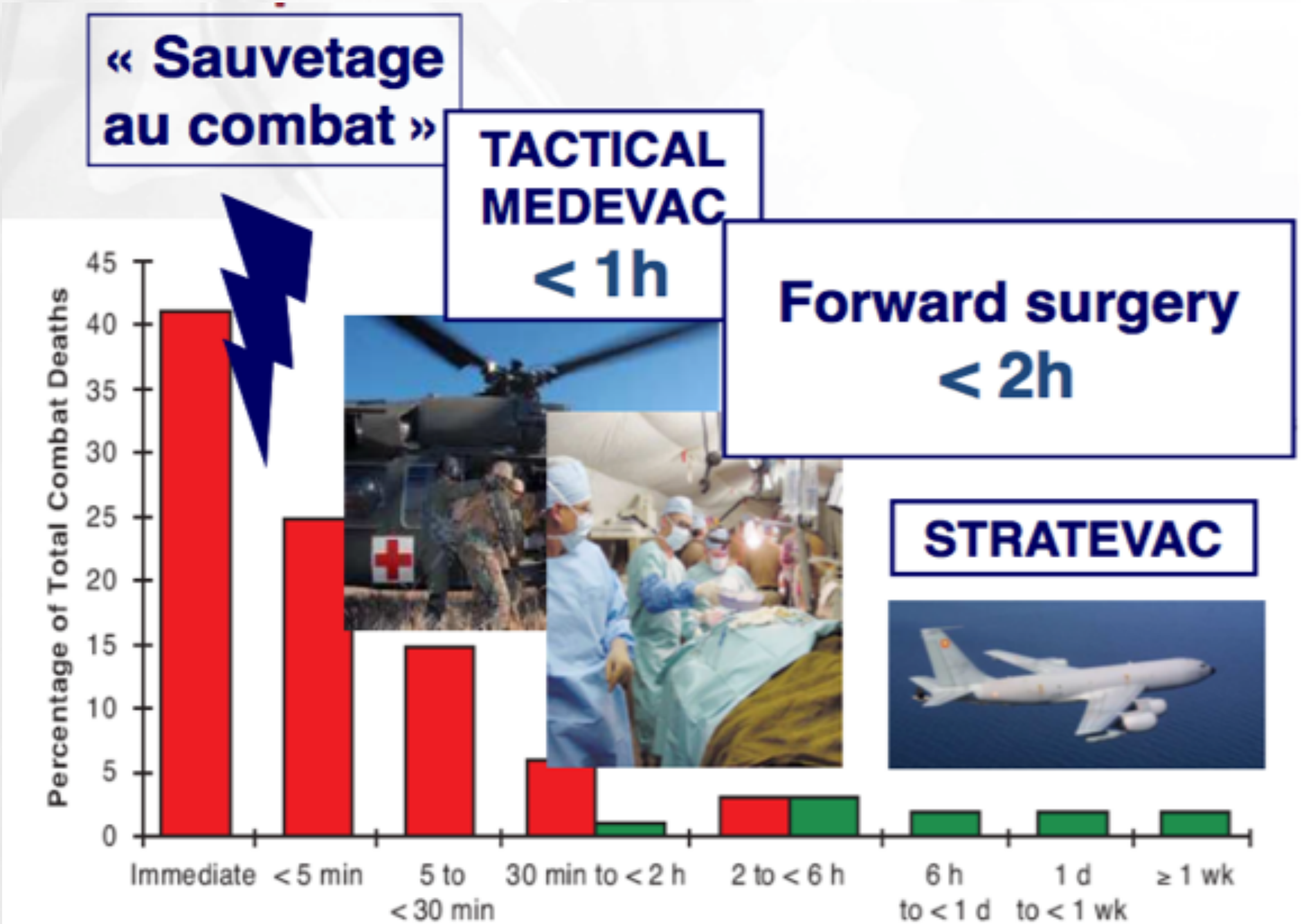
MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie,
notre combat

Damage control « ground zero »



MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

Extraction - Tactical MEDEVAC

Detail	9 Line Message
1 Location (grid of pick up zone)	1
2 Call sign & frequency	2
3 Number of patients / precedence	3
A URGENT P1	IN HOSPITAL (ROLE 2/3)
B PRIORITY P2	IN HOSPITAL (ROLE 2/3) IN 4 HOURS
C ROUTINE P3	IN HOSPITAL (ROLE 2/3) IN 24 HOURS
4 Special equipment: A None, B Hoist, C Extrication, D Ventilator	4 A B C D
5 Number to be carried: L Litter (stretcher), A Ambulatory (walking), E Escorts (e.g. children)	5 L A E
6 Security at pick up zone: N No enemy, P Possible enemy, E Enemy in area, X Hot pick up zone	6 N P E X
7 Pick up zone marking methods: A Panels, B Pyro, C Smoke, D None, E Other (explain)	7 A B C D E
8 No. of patients by national status: A Coalition mil, B Civilian with coalition forces, C Non coalition security forces, D Non coalition civilian, E Opposing forces / PW / Detainee, F Children	8 A B C D E F
9 Pick up zone Terrain / Obstacles	9

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MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

Prehospital Blood Transfusion versus Crystalloid Alone in the Air Medical Transport of Trauma Patients

Michael P. Sumida, MD,[1] Karen Quinn, RN,[1] Patricia L. Lewis, RN,[1] Yonna Jones, RN,[1] Donald E. Barker, MD, FACS,[1] David L. Ciraulo, DO, MPH,[2] Vernon Cowell, MD, MPH,[2] Stephen Luk, MD,[2] Diane Murphy, RN, CEN,[2] Lenworth Jacobs, MD, MPH, FACS[2]

NEGATIF ???

Civil
Rétrospectif
31 Pas transfo
17 transfu

Table 2 Physiologic Variables, Fluid Utilization, and Flight Time Comparisons (Reported as Means)

Group (N)	pH	PCO_2	HCO_3	PO_2	Lactated Ringer (mL)	Blood (mL)	Total fluid (mL)	Length of flight
A (31)	7.37	33.7	21.4	241.2	2929.5	XXX	2929.5	12.4 min
B (17)	7.23	33.3	14.6	237.1	3112.3	710.7	3905.2	33.5 min
P value	.008	.858	.0001	.923	.730	XXX	.131	.0001

Note: Twenty-one patients DOA at the trauma centers met the protocol but were excluded.

MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

ORIGINAL SCIENTIFIC ARTICLES

Pre-Trauma Center Red Blood Cell Transfusion Is Associated with Improved Early Outcomes in Air Medical Trauma Patients

Joshua B Brown, MD, Jason L Sperry, MD, MPH, FACS, Anisleidy Fombona, BS, Timothy R Billiar, MD, FACS, Andrew B Peitzman, MD, FACS, Francis X Guyette, MD, MPH

Level I trauma center

propensity score

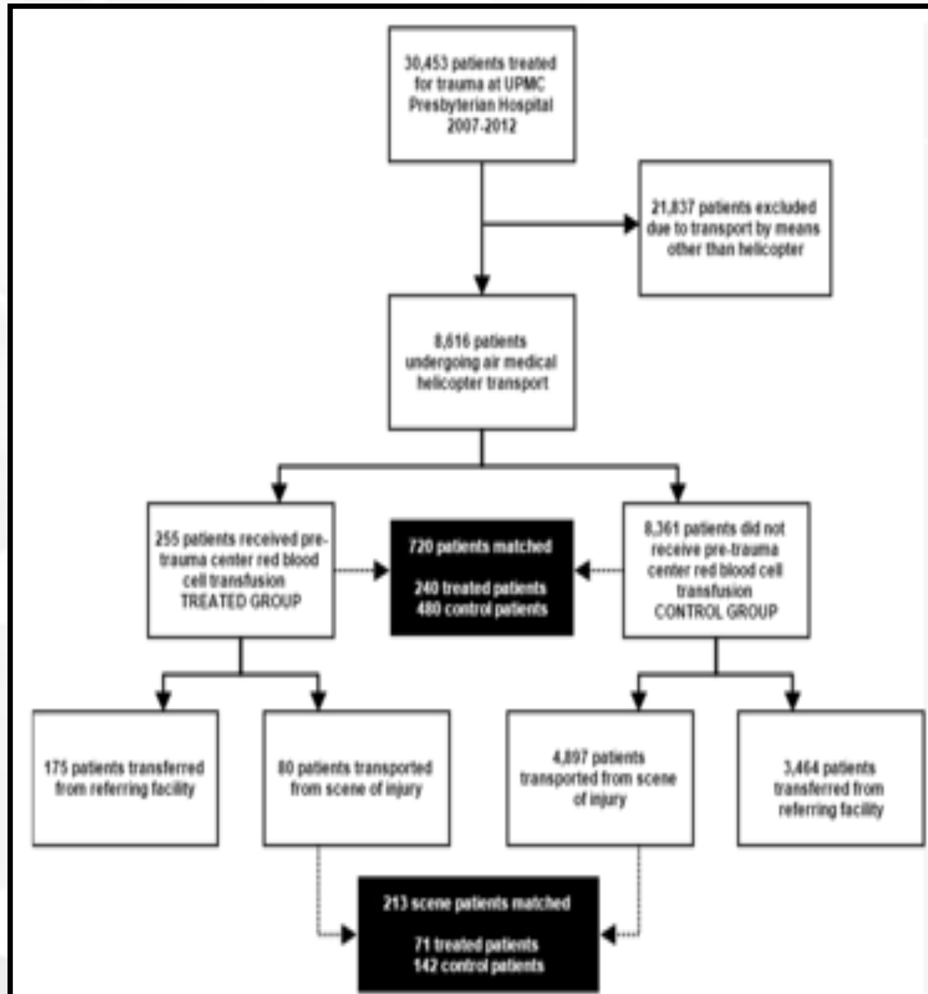
Table 1. Protocol for Helicopter Emergency Medical Services Red Blood Cell Transfusion

RBC transfusion should be administered after 1 to 2 L crystalloid total has been received by an injured patient and any one of the following are present:

1. Hypotension with systolic blood pressure <90 mmHg
2. Changes in mental status
3. Changes in skin color (pallor, mottling, or cyanosis)
4. Tachycardia with heart rate >120 bpm
5. Capillary refill >2 s
6. Urine output <30 mL/h for ≥4 h (inter-facility transports)
7. Lactate level ≥4 mmol/L
8. Shock index (HR/SBP) >0.9
9. RBC transfusion initiated at a referring facility (inter-facility transports)

In cases of penetrating wounds or clinical evidence of active bleeding, RBC can be initiated earlier through consultation with a medical command physician.

HEMS, helicopter emergency medical services; HR, heart rate; SBP, systolic blood pressure.



Ministère de la Défense

http://dx.doi.org/10.1016/j.jamcollsurg.2015.01.006

Service de santé des armées

Votre vie, notre combat

ORIGINAL SCIENTIFIC ARTICLES

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Level I trauma center

propensity score

	AOR for PTC RBC	95% CI	p Value
All HEMS			
24-h survival	4.91	1.51–16.04	0.01
Shock on admission	0.28	0.09–0.85	0.03
TIC	1.39	0.87–2.24	0.17
In-hospital survival	1.06	0.42–2.61	0.90

« PTC RBC was independently associated with an increased probability of 24-hour survival, decreased risk of shock on admission, ***and lower 24-hour RBC transfusion requirement in severely injured*** *air medical trauma patients with evidence of prehospital shock »*

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MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

Journal of Trauma and Acute Care Surgery, Publish Ahead of Print
DOI: 10.1097/TA.0000000000001045

Février 2016

Blood transfusion: In the air tonight?

Retrospective cohort study

Level One Trauma Center

2007 to 2013

5581 patients included in the study, 231 (4%) received PBT

		No PBT	PBT	
Death in hospital	390			0.212
No		75% (147)	70% (136)	
Yes		25% (48)	30% (59)	
Death in 24hr	390			0.291
No		84% (164)	80% (156)	
Yes		16% (31)	20% (39)	

Négatif …

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Votre vie, notre combat

Service de santé des armées

ORIGINAL ARTICLE

Prehospital blood transfusion in the en route management of severe combat trauma: A matched cohort study

David J. O'Reilly, FRCS, Jonathan J. Morrison, MRCS, Jan O. Jansen, FRCS, FFICM, Amy N. Apodaca, PhD, Todd E. Rasmussen, MD, and Mark J. Midwinter, MD, FRCS, Birmingham, United Kingdom

		439 PBT	1592 No PBT	
In-hospital transfusion	PRBC	2 (1–8.5) [0–49]	0 (0–3.5) [0–26]	<0.001**
	FFP	2 (0–7.5) [0–44]	0 (0–1) [0–20]	<0.001**
	Cryoprecipitate	0 (0–0) [0–4]	0 (0–0) [0–3]	0.068**
	Platelets	0 (0–0) [0–7]	0 (0–0) [0–6]	<0.007**
Total PRBC		4 (2–10) [0–53]	0 (0–3.5) [0–26]	<0.001**
Total FFP		2 (2–9) [1–44]	0 (0–1) [0–20]	<0.001**
Any in-hospital PRBC transfusion		75 (77)	38 (39)	<0.001**
Massive transfusion		12 (12)	8 (8)	0.388*
FFP/PRBC ratio		1 (0.83–1.23)	0.46 (0–0.72)	<0.001**
Mortality		8 (8.2)	19 (19.6)	0.013**

Service de santé des armées

Votre vie, notre combat

SHORT COMMUNICATION

Risk Management Analysis of Air Ambulance Blood Product Administration in Combat Operations

Nicole Powell-Dunford, Jose F. Quesada, Robert F. Malsby, Victoria Chou, Robert T. Gerhardt, Kirby R. Gross, and Stacy A. Shackelford

Juin Oct 2013

Afgha Hélico

61 transfusions

Group O PRBC // group AB and group A plasma

TABLE II. COMPARISON OF VITAL STATUS PRE- AND POST-TRANSFUSION, $N = 38$

Vital Sign or Marker	Definition	Pre-Transfusion Median (IQR)	Post-Transfusion Median (IQR)	*P*-Value*
SBP[†]	Systolic BP	86 (70–104)	108 (85–127)	0.001
HR[††]	Heart rate	133 (125–141)	125 (110–138)	0.000
Shock Index (SI)[‡]	HR/SBP	1.6 (1.2–2.0)	1.1 (1.0–1.5)	0.000
Modified Shock Index (MSI)	HR/mean BP[‡‡]	2.2 (1.7–2.6)	1.7 (1.3–2.1)	0.000

Pas d'effet adverse

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Transfusion en préhospitalier

Remote damage control

Service de santé des armées

Votre vie, notre combat

Freeze dried plasma and fresh red blood cells for civilian prehospital hemorrhagic shock resuscitation

Geir A. Sunde, MD, Bjarne Vikenes, MD, Geir Strandenes, MD, Kjell-Christian Flo, Tor A. Hervig, MD, PhD, Einar K. Kristoffersen, MD, PhD, *and* Jon-Kenneth Heltne, MD, PhD, *Bergen, Norway*

16 patients

Adverse Events

No transfusion reactions or complications were recorded with FDP or tranexamic acid given by the HEMS.

République Française

Ministère de la Défense

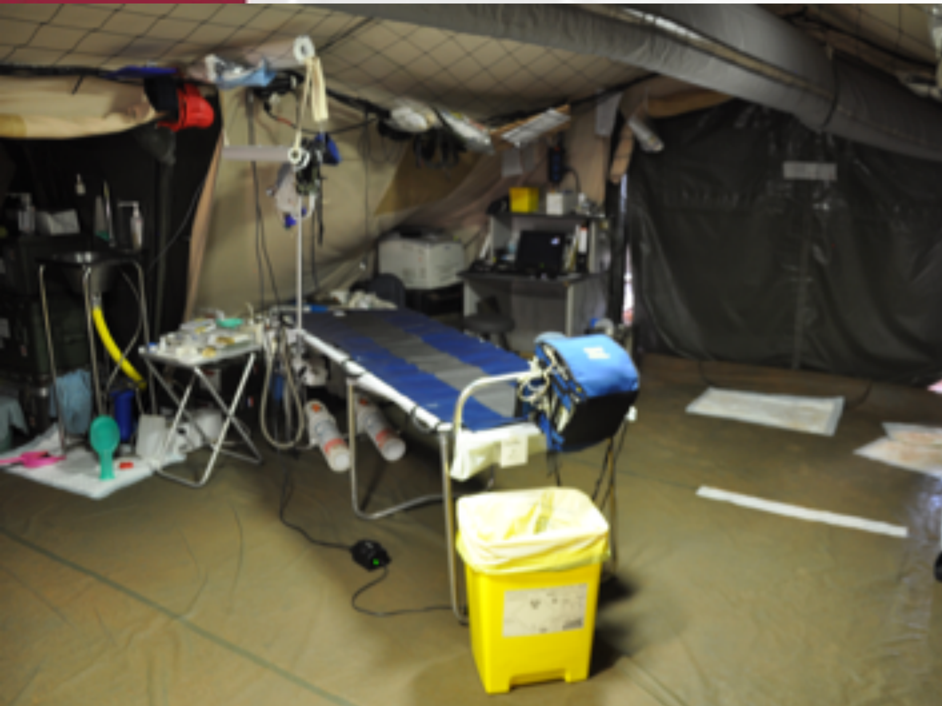
DAMAGE CONTROL TEMPS 1 CHIR

« LUTTE CONTRE LES VOIES D'EAU »

« LUTTE CONTRE L'INCENDIE »

« Un verre à une minute
Un seau à deux minutes
Une citerne à trois minutes ... »

Wiki



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MINISTÈRE
DE LA DÉFENSE

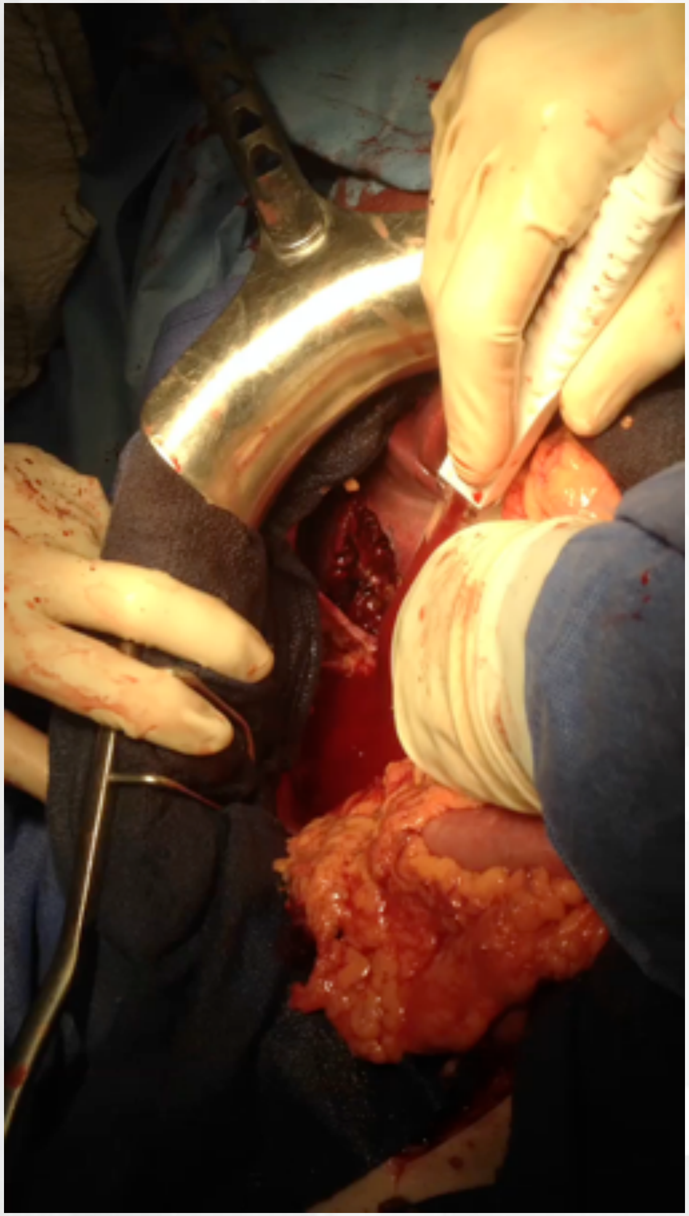
Chirurgie écourtée

- Exploration
- Hémostase
- Contrôle contamination

< 1 HEURE

NATO Handbook war surgery
(www.vnh.org/EWSurg/EWSTOC.html)

« Voies d'eau »



Transfusion ++++

Service de santé des armées

Votre vie, notre combat

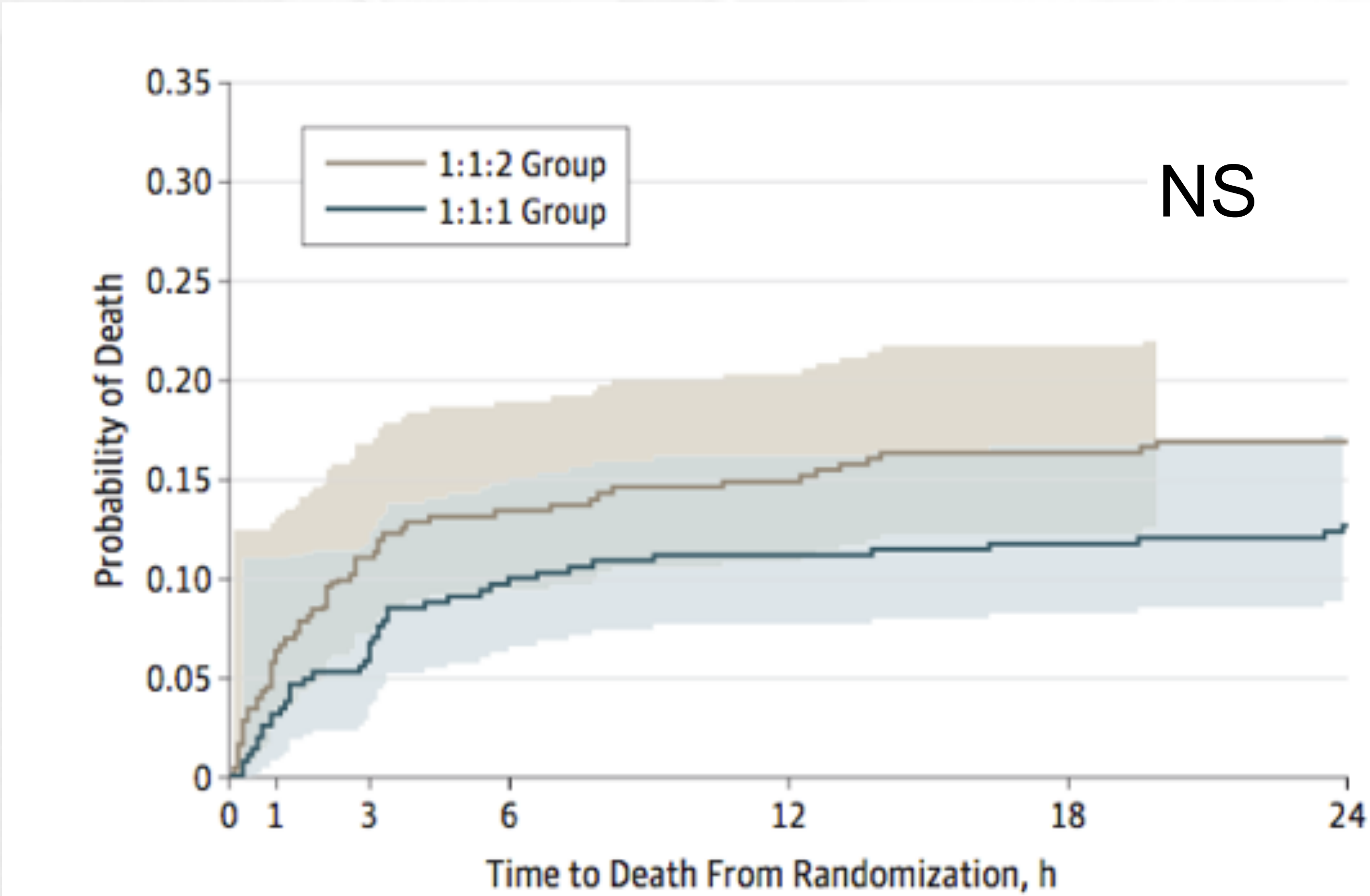
Original Investigation

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; Barbara C. Tilley, PhD; Sarah Baraniuk, PhD; Erin E. Fox, PhD; Charles E. Wade, PhD; Jeanette M. Podbielski, RN;

1:1:1(338 patients)
6CGR/6PFC/1 CPA
Vs
1:1:2 (342 patients)

Mortalité H24



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Ministère de la Défense

Transfusion de sang frais total (TSFT)

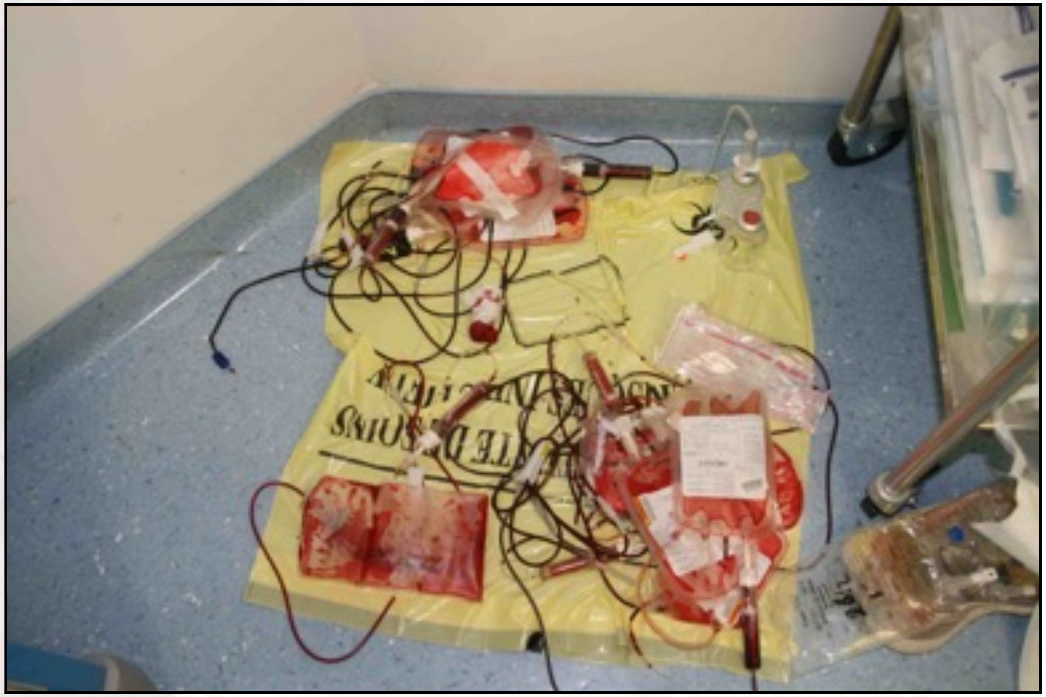
- Collecté sur place
- Non fractionné
  - Pas de déleucocytation
- Sécurité transfusionnelle
- Stockage

1 poche de SFT
- 38-50 % Ht
- 150-400 000 plaq/ml
- Taux de facteurs 100 %

1 CGR+1PFC+1CUP
- 29 % Ht
- 80-90 000 plaq/ml
- Taux de facteurs 65 %

Service de santé des armées

Votre vie, notre combat



Society of Cardiovascular Anesthesiologists

Cardiovascular Anesthesiology Section Editor: Charles W. Hogue, Jr.
Perioperative Echocardiography and Cardiovascular Education Section Editor: Martin J. London
Hemostasis and Transfusion Medicine Section Editor: Jerrold H. Levy

SPECIAL ARTICLE

CME

Fresh Whole Blood Use for Hemorrhagic Shock: Preserving Benefit While Avoiding Complications

Philip C. Spinella, MD,* Heather L. Reddy, PhD,† Jennifer S. Jaffe, MPH,* Andrew P. Cap, MD, PhD, FACP,† and Raymond P. Goodrich, PhD†

Transfusion support of patients with hemorrhagic shock has changed over time with the development of storage and processing methods. Transfusion medicine developed during World War I with the use of whole blood, and now in the developed world, component therapy predominates. In contrast, there is still clinical use of fresh whole blood (FWB) in the developing world, in a minority of children's hospitals, and in combat settings. Although there is a rationale for the use of FWB in massively bleeding patients compared with the use of individual components, it has rarely been analyzed in prospective randomized clinical trials. Recent retrospective studies in adult trauma and mixed critically ill patients have revived this decades-old controversial question of the value of FWB for patients with severe shock and coagulopathy or those at risk. The risks of FWB use have also been highlighted recently, which has caused some to focus on reducing these risks with alternative processing and storage methods. It is important to recognize that current processing and storage methods for components have also not been adequately explored to determine whether they affect clinical outcomes. In this article, we review potential benefits and risks of FWB use for patients with hemorrhagic shock from any cause, and how current and future processing and storage methods may affect efficacy and safety of FWB in this population. We intend this review to stimulate hypothesis generation and clinical investigation in determining when FWB may be indicated and how to optimally process and store FWB to maximize its risk-benefit ratio. (Anesth Analg 2012;115:751–8)

Sang total

Service de santé des armées

Votre vie, notre combat

Blood far forward: Time to get moving!

Andrew P. Cap, MD, PhD, Heather F. Pidcoke, MD, PhD, Marc DePasquale, Joseph F. Rappold, MD, Elon Glassberg, MD, MHA, Håkon S. Eliassen, Christopher K. Bjerkvig, MD, Theodor K. Fosse, MD, Shawn Kane, MD, Patrick Thompson, Robert Sikorski, MD, Ethan Miles, MD, Andrew Fisher, Kevin R. Ward, MD, Philip C. Spinella, MD, *and* Geir Strandenes, MD, *Bergen, Norway*

For situations that permit the use of whole blood collected premission, storage at 4°C for up to 10 to 15 days is feasible while retaining hemostatic function. Previous concerns regarding platelet function, requirement of ABO-specific whole blood, and inability to leukoreduce have limited the application of whole blood in this manner. But now, with the current understanding that hemostatic platelet function is superior with storage at 4°C versus 22°C, the use of group O (low titer or not) whole blood is actually safer than attempting to provide ABO-specific whole blood under emergency circumstances, and that platelet-sparing whole-blood filters are available, it is very feasible to provide whole blood to a patient with life-threatening hemorrhagic shock in the prehospital (and in-hospital) setting. In fact, two large trauma programs in the United States have begun providing whole blood to casualties with life-threatening injuries.

J Trauma Acute Care Surg. 2015;78: S2-S6

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MINISTÈRE DE LA DÉFENSE

DAMAGE CONTROL TEMPS 2
« RETOUR AU PORT »

Service de santé des armées

Votre vie, notre combat

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MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

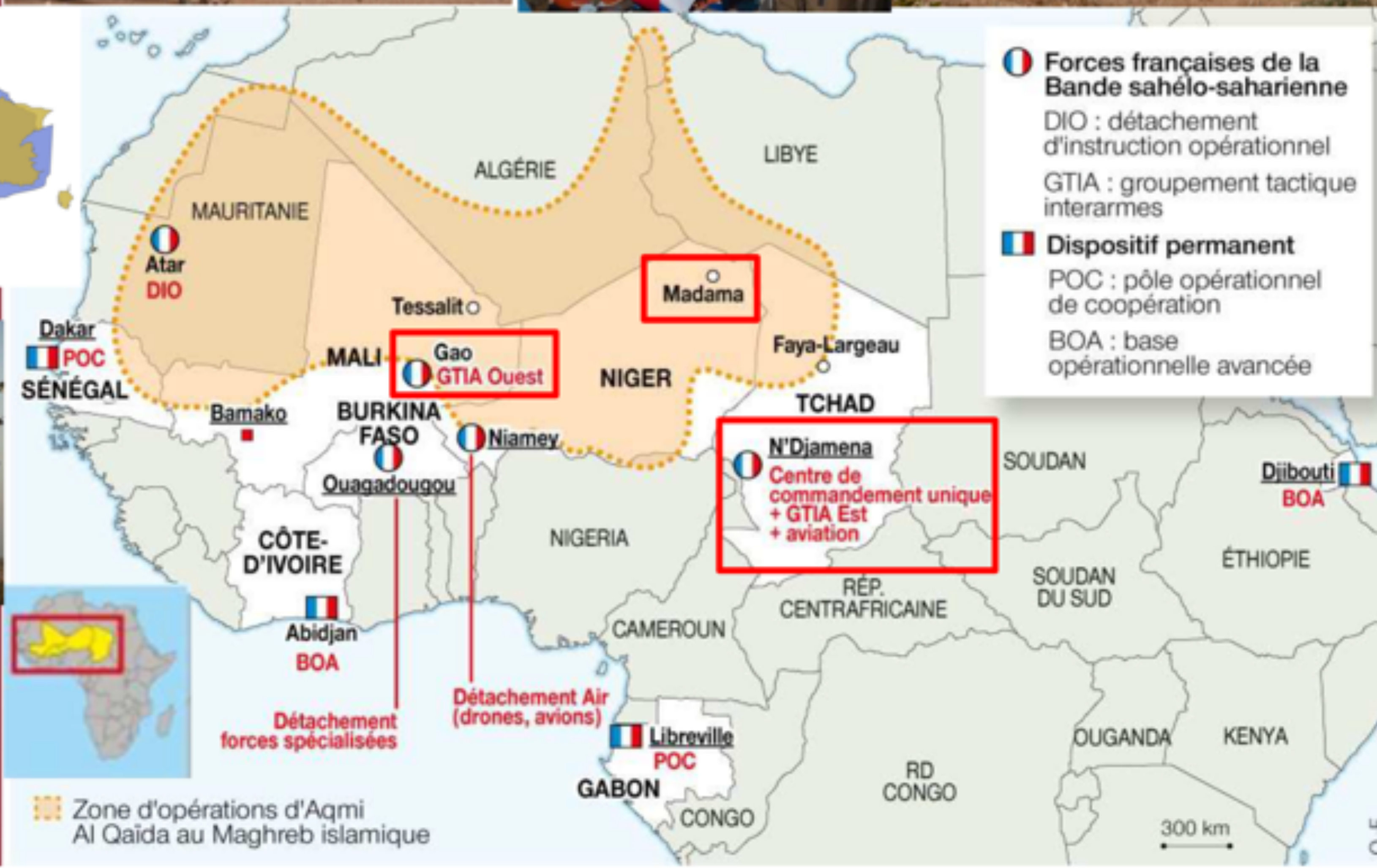
Damage Control
MEDEVAC = « NE saigne plus » !!!

MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

Le cadre espace temps : élongation-isolement



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MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

CHAINE SANTE EN OPERATIONS

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MINISTÈRE DE LA DÉFENSE

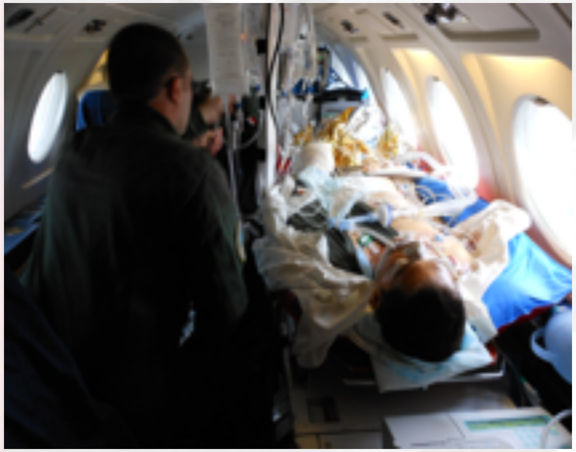
Service de santé des armées

Votre vie, notre combat

EVASAN

EVASAN individuelles

EVASAN collectives



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MINISTÈRE DE LA DÉFENSE

Service de santé des armées

Votre vie, notre combat

MEDEVAC collective

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Votre vie, notre combat

MEDEVAC collective

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Service de santé des armées

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MEDEVAC individuelle

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MEDEVAC exemple Afghan

116 EVASAN d'Afghanistan entre 2001 et 2010

4 HIA non parisiens

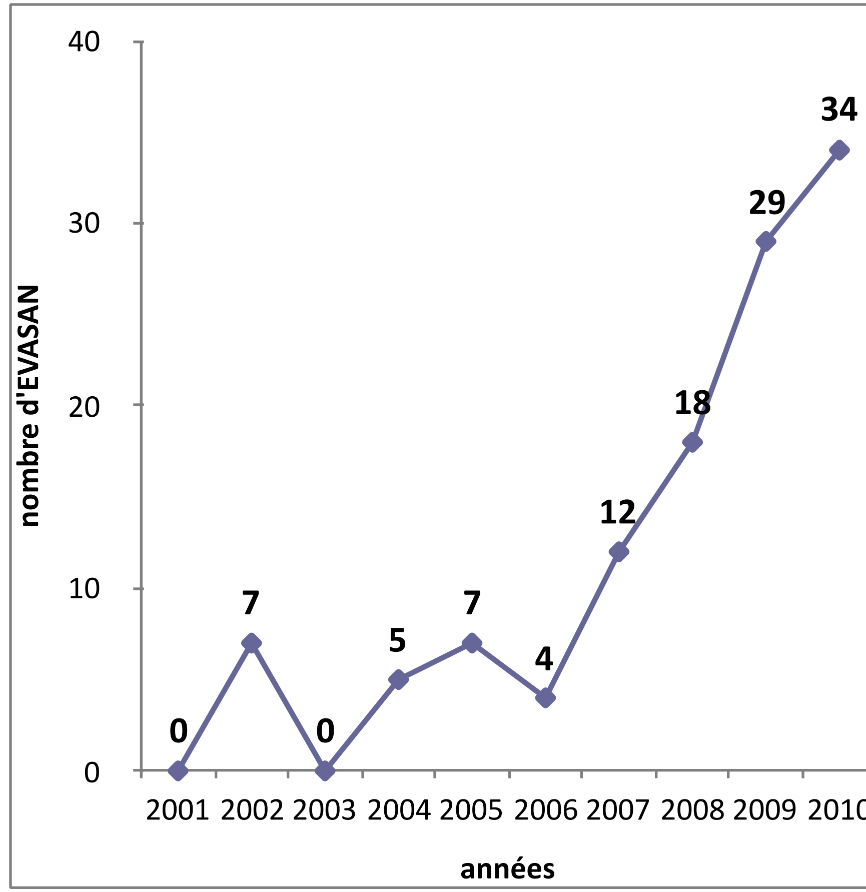
112 Paris

2 dossiers non retrouvés

110 dossiers analysés

34 pathologies médicales (31%)

76 Traumatisés (69%)
-56 au combat (74%)
-20 hors combat (26%)



BLOT - DABAN Thèse

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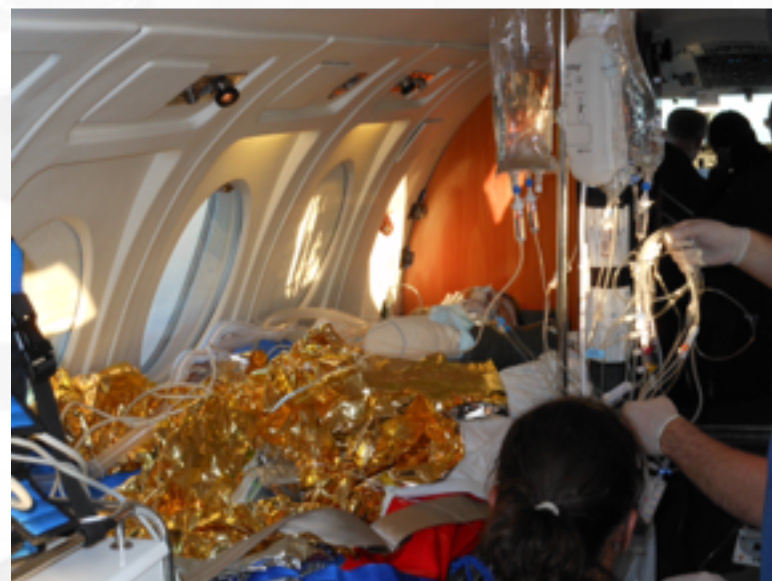
EVASAN

- Durée du rapatriement des blessés sur les HIA
  - Durée Moyenne = 1,89 (± 0,97 jour)

- 1 IDE + 1 MED spécialisé
  - +/- Présence MAR pour 68% des EVASAN

- 37% traumatisés étaient intubés-ventilés



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Transfusion durant EVASAN

- Transfusion des blessés français
  - 45% des patients transfusés au moins une fois

Afghanistan	EVASAN	HIA
28% (21)	4% (3)	35% (27)

- 5 transfusions massives
  - Soit 6,6%

Blot - DABAN

MEDEVAC
Expérience française

MC Saboureau

MECHANISM OF INJURY	BEFORE MEDEVAC			DURING MEDEVAC	
Gunshot	**3 RBC**	**2 FDP**		**1 RBC**	**1 FDP**
Blast	**3 RBC**	**4 FDP**		**3 RBC**	**2 FDP**
Severe burn					**2 FDP**
Blast	**4 RBC**	**6 FDP**		**1 RBC**	**1 FDP**
Gunshot	**6 RBC**	**6FDP**	**3 WB**	**2 RBC**	**1 FDP**
Blast	**9 RBC**	**9 FDP**	**3 WB**	**2 RBC**	**2 FDP**

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Original Article

Hypoxemia during aeromedical evacuation of the walking wounded

Jay Johannigman, MD, Travis Gerlach, MD, Daniel Cox, MD, Jon Juhasz, MD, Tyler Britton, RRT, Joel Elterman, MD, Dario Rodriquez, Jr., MSc, RRT, Thomas Blakeman, MSc, RRT, and Richard Branson, MSc, RRT, Cincinnati, Ohio

Transfusion ????

« Sixty-one casualties were evaluated during AE from Bagram Air Base to Landstuhl Regional Medical Center.

The mean (SD) age was 26.2 (6) years, Injury Severity Score (ISS) was 8 (11), and mean SpO_2 before AE was 96% (2%).

The mean (SD) transport time was 9.3 (1.3) hours.

The mean (SD) hemoglobin at the time of enrollment was 13.2 (3.5) g/dL ***(9.4-18.0 g/dL).***

Hypoxemia (SpO_2 G 90%) was seen in 55 (90%) of 61 subjects.

The mean duration of SpO_2 less than 90% was 44 minutes.

Thirty-four patients (56%) exhibited an SpO_2 less than 85% for 11.7 (15) minutes »

Ministère de la Défense

DAMAGE CONTROL TEMPS 3
REPARATION DEFINITIVE

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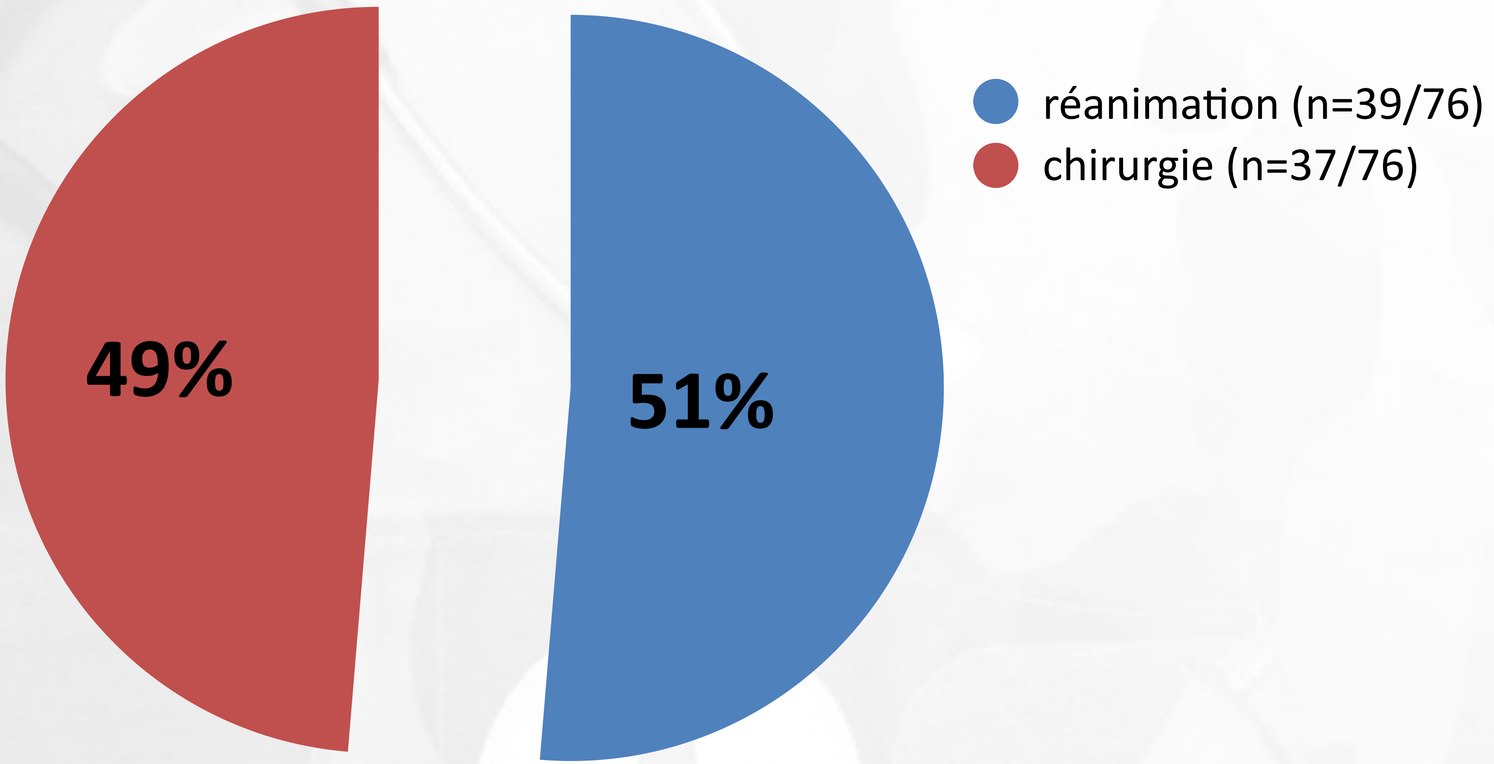
Role 4
Métropole

Prise en charge en métropole



Données Role 4

- Gravité élevée
  - IGS 2 moyen: 28,6 ± 16,5
  - ISS moyen: 22,3 ± 10,6
- DMS en réanimation: 15,5 ± 18,4 jours
- Ventilation mécanique :
  - 79% des patients (n=31/39)
  - Durée 10,7 ± 15,4 jr
- EER : 5% des patients (n=2/39)

Taux de mortalité intrahospitalière =1,3% (n=1/76)

Le blessé de guerre : le « damage control »

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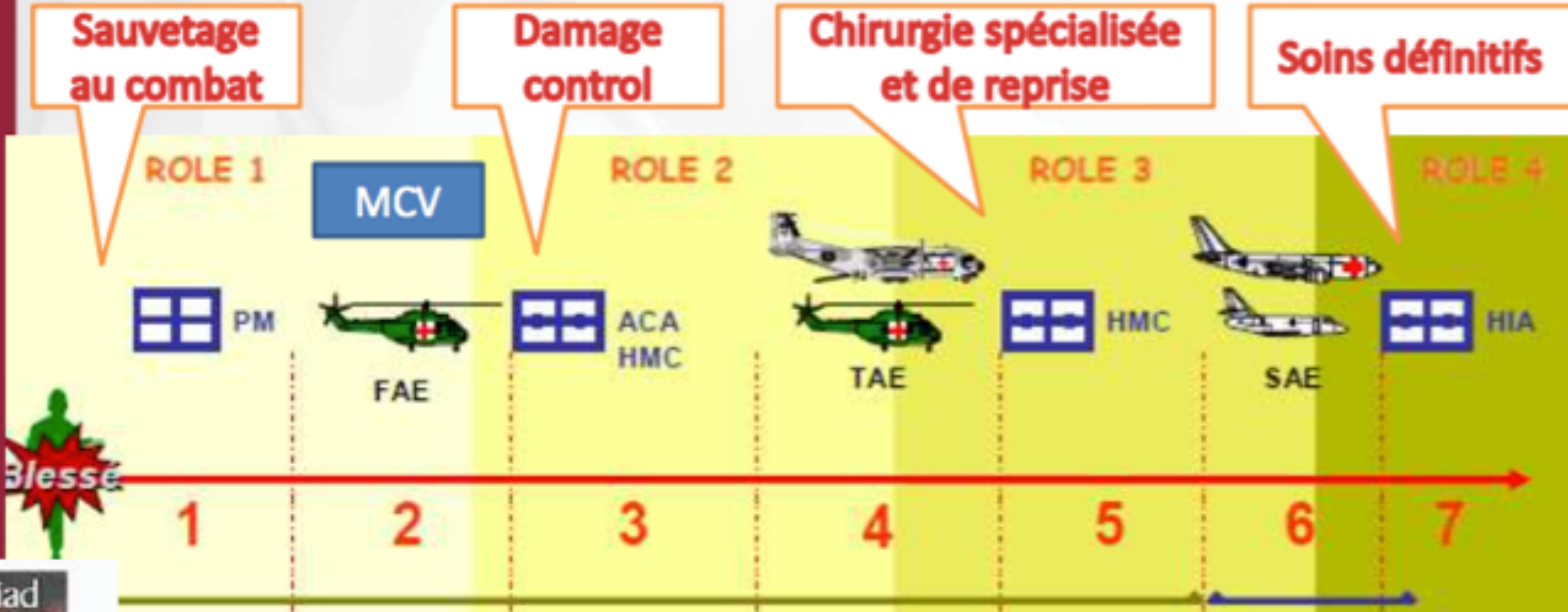

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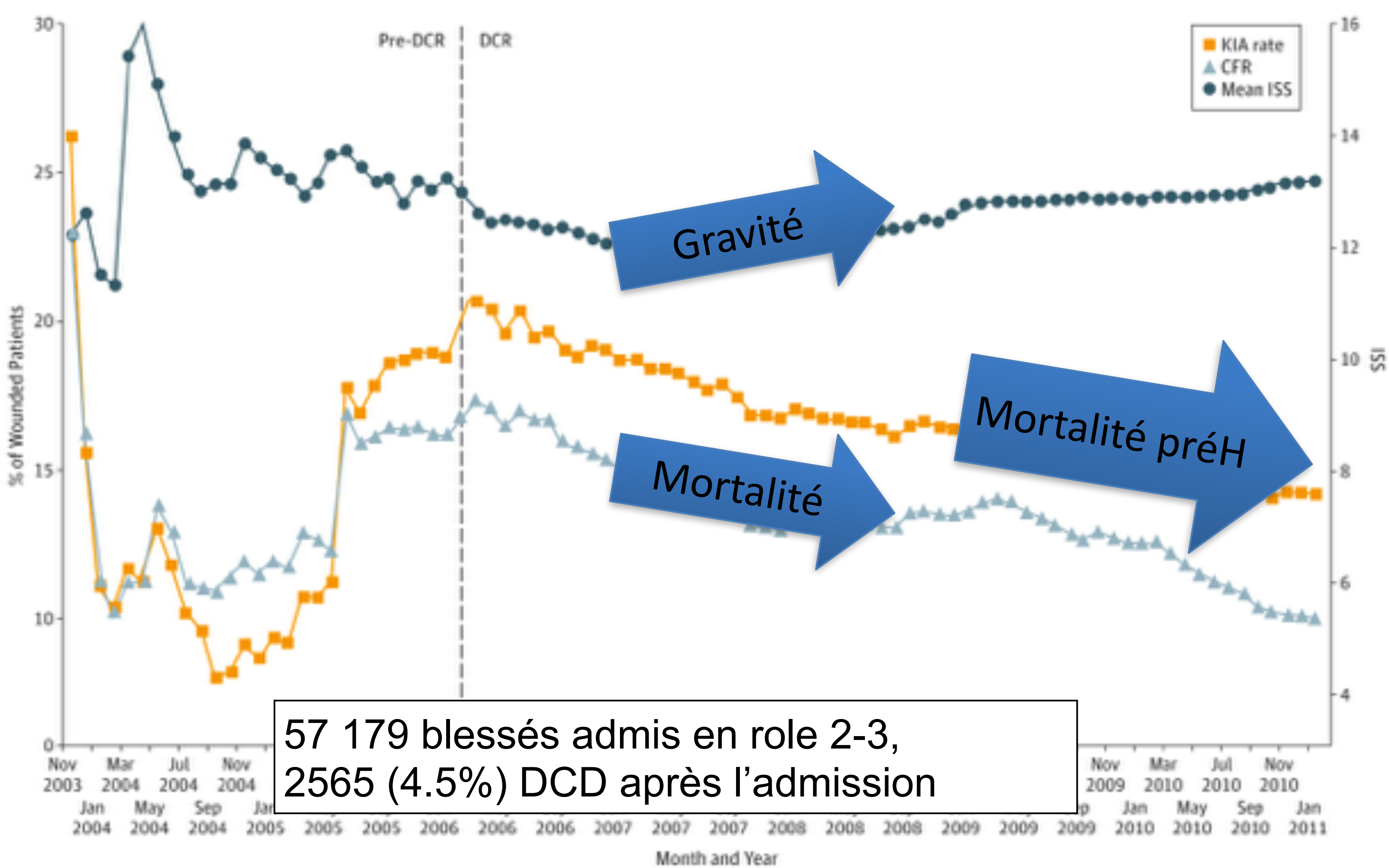
Changing Patterns of In-Hospital Deaths Following Implementation of Damage Control Resuscitation Practices in US Forward Military Treatment Facilities

Nicholas R. Langan, MD; Matthew Eckert, MD; Matthew J. Martin, MD



Langan NR, et al.JAMA Surg 2014;98431:1–9.

« Enroute care »

« La transfusion premier acteur »

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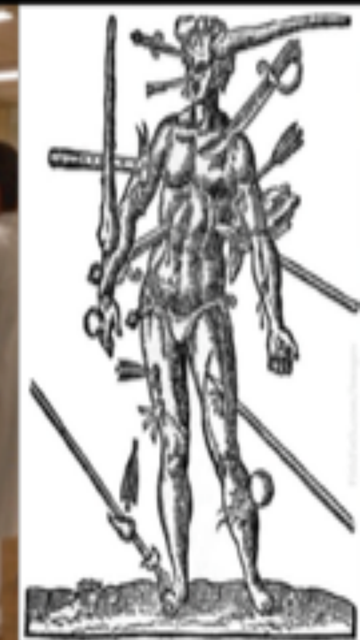

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