# ACTUALITÉS EN TRAUMATOLOGIE SÉVÈRE

## *"PAST AND FUTURE"*

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# TRAUMA SEVERE - TRIAGE

- **Association Volume and Mortality in Trauma Patients**
- **La régionalisation des soins en traumatologie sauve des vies !**
- **Trauma center : Si > 240 patients / an avec ISS > 15 : Baisse mortalité**
  - OR : 0.85 (95% CI : 0.76-0.94)

***Sewalt CA e al. J Trauma 2018***

- **Relation Volume Trauma / EMS ?**
- **Relation Volume Trauma / Praticien ?**

**Annals of Surgery Publish Ahead of Print**
**DOI:10.1097/SLA.0000000000006087**

# Association Between Emergency Medical Service Agency Volume and Mortality in Trauma Patients

Article Type: Original Study
Retrospective Cohort Study

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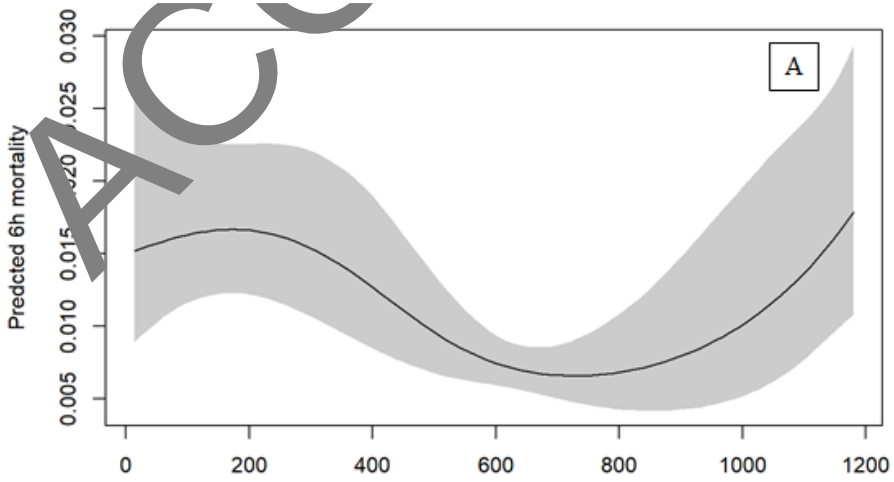
# TRAUMA SEVERE - TRIAGE

- 33151 patients (8 TC – 20 EMS) avec ISS > 9
- Régression logistique
- CJP : Mortalité H6

- **Résultats**
  - Pour chaque 50 patients en +, réduction de 5% de la mortalité à 6H!
  - Volume = Prédicteur le plus important de la Mortalité à 6h
  - Relation Volume/Outcome +++ pour
    - Si choc, IOT, Hélico : Technicité !
  - TCG : Relation Volume/Mort à H24



INDEPENDENT SUBMISSION

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# Association between physician's case volume in prehospital advanced trauma care and 30-day mortality: A registry-based analysis of 4,032 patients

**Anssi Saviluoto, MD, Jukka Pappinen, PhD, Hetti Kirves, MD, PhD, Lasse Raatiniemi, MD, PhD,** *and* **Jouni Nurmi, MD, PhD**, *Helsinki, Finland*

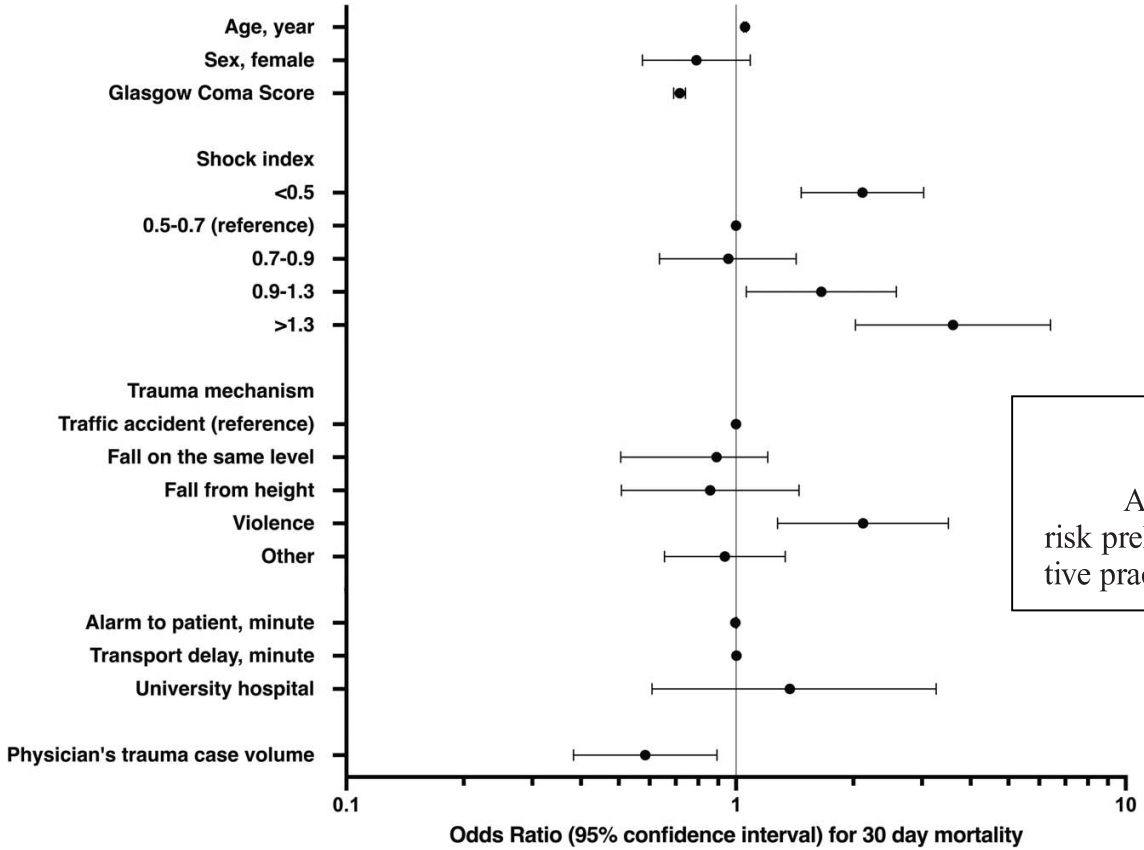
# TRAUMA SEVERE - TRIAGE

Etude rétrospective sur registre - 4.032 patients
Patients PEC 2012-2019 / Finlande
Analyse multivariée / ajustement X
Groupe < 10, 10-20, > 20 patients
Data de base NS sauf décompression PNO

**TABLE 2.** Prehospital Management and Outcomes of Trauma Patients According to physician's Trauma Case Volume During the Past 12 Months

| | <10 Cases n = 2,038 | | 10–20 Cases n = 1,512 | | >20 Cases n = 482 | | *p* |
|---|---|---|---|---|---|---|---|
| On-scene time, min | 16 | (6–28) | 16 | (8–26) | 17 | (9–27) | 0.428* |
| Transported by helicopter | 338 | (16) | 247 | (16) | 86 | (18) | 0.738** |
| Advanced airway management | | | | | | | 0.155** |
| Mask ventilation | 23 | (1.1) | 9 | (0.6) | 10 | (2.1) | |
| Supraglottic | 9 | (0.4) | 5 | (0.3) | 0 | (0) | |
| Intubation | 672 | (33) | 488 | (32) | 164 | (34) | |
| Surgical airway | 1 | (0.0) | 3 | (0.2) | 1 | (0.2) | |
| Drug facilitated airway management | 683 | (34) | 495 | (33) | 157 | (33) | 0.858** |
| Pleural decompression | 51 | (2.5) | 51 | (3.4) | 28 | (5.1) | 0.001** |
| Hemostatic procedure | 192 | (9.4) | 180 | (12) | 51 | (11) | 0.058** |
| Use of vasoactives | 411 | (20) | 280 | (19) | 113 | (23) | 0.058** |

Categorical data are presented as n (%), and continuous data as median (25–75 percentiles).
*Kruskal-Wallis test.
**Pearson $\chi^2$ test.




## CONCLUSION

A higher case volume for a prehospital physician in high-risk prehospital trauma seems to be associated with a more active practice pattern and significantly lower 30-day mortality.

INDEPENDENT SUBMISSION

OPEN

# Evaluating associations between level of trauma care and outcomes of patients with specific severe injuries: A systematic review and meta-analysis

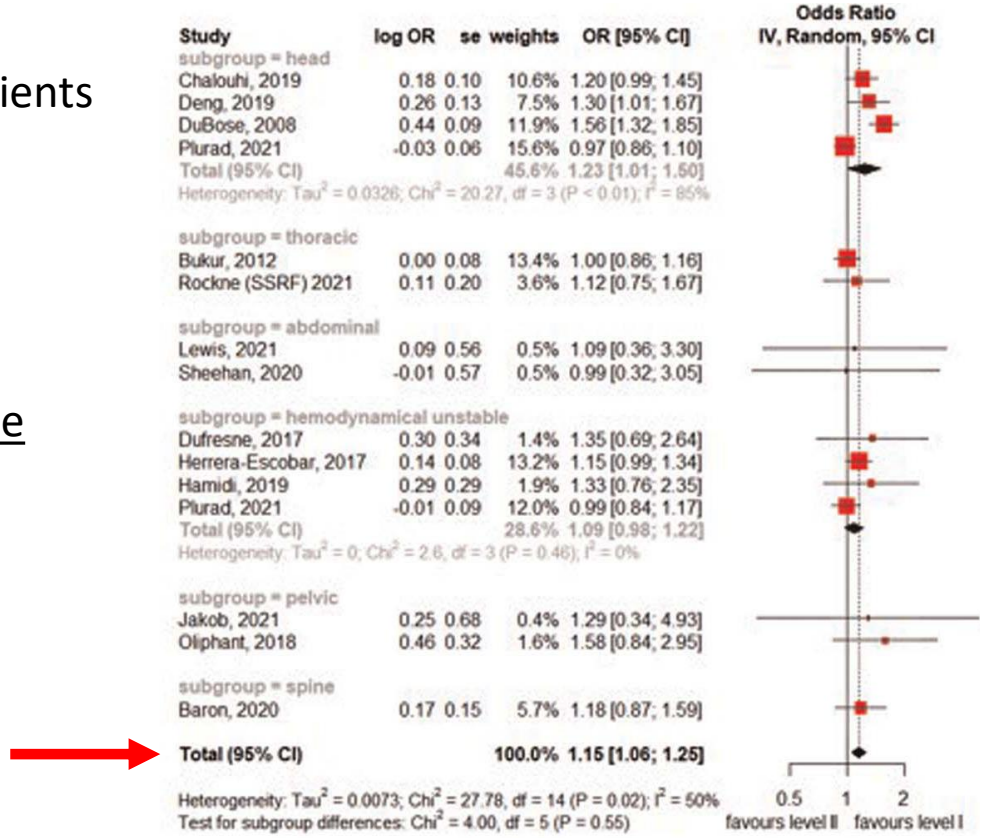
**Jan C. Van Ditshuizen, MSc, Leonne A. Rojer, MD, Esther M.M. Van Lieshout, PhD, MSc, Wichor M. Bramer, PhD, Michiel H.J. Verhofstad, MD, PhD, Charlie A. Sewalt, MD, PhD, *and* Dennis Den Hartog, MD, PhD**

2023

# TRAUMA SEVERE - TRIAGE

- **Travaux X qui montrent que le pronostic est meilleur en Trauma Center N1**
- **Méta-Analyse :**
  - 25 études / 35 soit 1,1 millions de patients
  - Question : Survie Level 1 versus Level 2 ?
  - Analyse globale puis en sous-groupe :
    - Trauma Crânien Grave
    - Etat de Choc

Mortalité hospitalière ajustée



# EN SOMMES

**Le pronostic est meilleur si :**

- Les Praticiens des SMUR prennent régulièrement des traumas en charge (> 20 / an ?)
- Ils appartiennent à une structure préhospitalière qui prends souvent en charge des traumas
- Les patients vont dans des centres de niveau 1, en particulier si lésions sévères / Choc

- Référent Trauma H24 ?
- Rôle des SMUR régionaux ?
- Grade A « transportable » en Niveau 1

Journal of Trauma and Acute Care Surgery, Publish Ahead of Print
DOI: 10.1097/TA.0000000000003827

# Antibiotic Administration within One-Hour for Open Lower Extremity Fractures is Not Associated with Decreased Risk of Infection

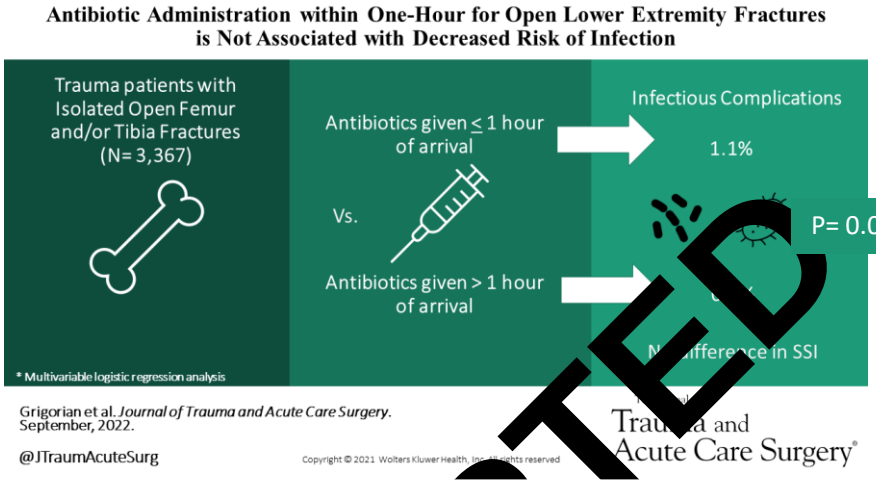
Short title: Antibiotic prophylaxis in open fractures

Areg Grigorian, MD[1,2], Morgan Schellenberg MD[2], Kenji Inaba, MD[2], Matthew Martin, MD[2], Kazuhide Matsushima MD[2], Michael Lekawa MD[1], Jeffry Nahmias, MD, MPH[1]

# TRAUMA – ATB dans l'heure ?

***Hypothèse*** : ATB dans l'heure diminue les infections en cas de Fr ouverte fémur / tibia ?

Banque de données (TQIP) – 2019
3367 patients / 2400 ATB < 1h/admission




***Infection dépends de X facteurs***
- Age / Terrain
- Degré d'ouverture
- TT associé : Transfusion !
- Délai pour chirurgie +++

ATB 2-6h / Adm et Xie Précoce ++

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

# Prehospital Tranexamic Acid for Severe Trauma

The PATCH-Trauma Investigators and the ANZICS Clinical Trials Group*

ABSTRACT

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

# Prehospital Tranexamic Acid for Severe Trauma

The PATCH-Trauma Investigators and the ANZICS Clinical Trials Group*

Trauma Sévère avec forte suspicion de TIC
Score COATS : PAS, PNO, Tr Bassin/Abdo ..
Si adm TXA < 3h/Trauma = Randomisation
1310 patients : TXA : 661 vs. Placebo : 646

- Vivant avec bon prono fctel à M6 !

**Table 1. Characteristics of the Patients at Baseline.***

| Characteristic | Tranexamic Acid (N=657) | Placebo (N=643) |
|---|---|---|
| Age — yr | 44.1±19.7 | 44.2±18.9 |
| Male sex — no. (%) | 459 (69.9) | 459 (71.4) |
| Mechanism of injury — no. (%) | | |
| Blunt | 610 (92.8) | 588 (91.4) |
| Penetrating | 44 (6.7) | 55 (8.6) |
| Burn | 3 (0.5) | 0 |
| Median initial heart rate (IQR) — beats/min† | 110.0 (88.0–130.0) | 109.0 (88.0–128.0) |
| Initial systolic blood pressure — no./total no. (%) | | |
| ≤75 mm Hg | 246/639 (38.5) | 248/626 (39.6) |
| 76–89 mm Hg | 218/639 (34.1) | 197/626 (31.5) |
| ≥90 mm Hg | 175/639 (27.4) | 181/626 (28.9) |
| Initial body temperature — °C‡ | 35.5±1.2 | 35.5±1.3 |
| Initial Glasgow Coma Scale score — no./total no. (%)§ | | |
| <9 | 229/655 (35.0) | 211/642 (32.9) |
| 9 to 12 | 51/655 (7.8) | 73/642 (11.4) |
| 13 to 15 | 375/655 (57.3) | 358/642 (55.8) |
| COAST score — no. (%)¶ | | |
| <3 | 4 (0.6) | 4 (0.6) |
| 3 | 247 (37.6) | 268 (41.7) |
| 4 | 251 (38.2) | 237 (36.9) |
| 5 | 122 (18.6) | 106 (16.5) |
| 6 | 33 (5.0) | 28 (4.4) |
| Median Injury Severity Score (IQR)‖ | 29.0 (18.0–41.0) | 29.0 (17.0–38.0) |
| Score >2 on the Abbreviated Injury Scale for head or neck — no./total no. (%)‖ | 263/643 (40.9) | 236/626 (37.7) |
| Previous anticoagulant use — no./total no. (%) | 15/584 (2.6) | 17/545 (3.1) |
| Previous antiplatelet use — no./total no. (%) | 46/581 (7.9) | 36/546 (6.6) |
| Prerandomization red-cell transfusion — no./total no. (%) | 230/655 (35.1) | 238/642 (37.1) |
| Prerandomization plasma transfusion — no./total no. (%) | 17/493 (3.4) | 24/493 (4.9) |
| Time from injury to first dose of tranexamic acid or placebo — no./total no. (%) | | |
| <1 hr | 214/656 (32.6) | 176/641 (27.5) |
| 1 to <2 hr | 297/656 (45.3) | 329/641 (51.3) |
| ≥2 hr | 145/656 (22.1) | 136/641 (21.2) |

**Table 2. Primary and Secondary Outcomes.***

| Outcome | Tranexamic Acid (N=657) | Placebo (N=643) | Risk Ratio or Hazard Ratio (95% CI)† |
|---|---|---|---|
| **Primary outcome** | | | |
| Survival with a favorable functional outcome at 6 months — no./total no. (%)‡ | 307/572 (53.7) | 299/559 (53.5) | 1.00 (0.90–1.12) |
| **Secondary outcomes** | | | |
| Death — no./total no. (%) | | | |
| 24 hr after injury | 64/657 (9.7) | 90/640 (14.1) | 0.69 (0.51–0.94) |
| 28 days after injury | 113/653 (17.3) | 139/637 (21.8) | 0.79 (0.63–0.99) |
| 6 mo after injury | 123/648 (19.0) | 144/629 (22.9) | 0.83 (0.67–1.03) |

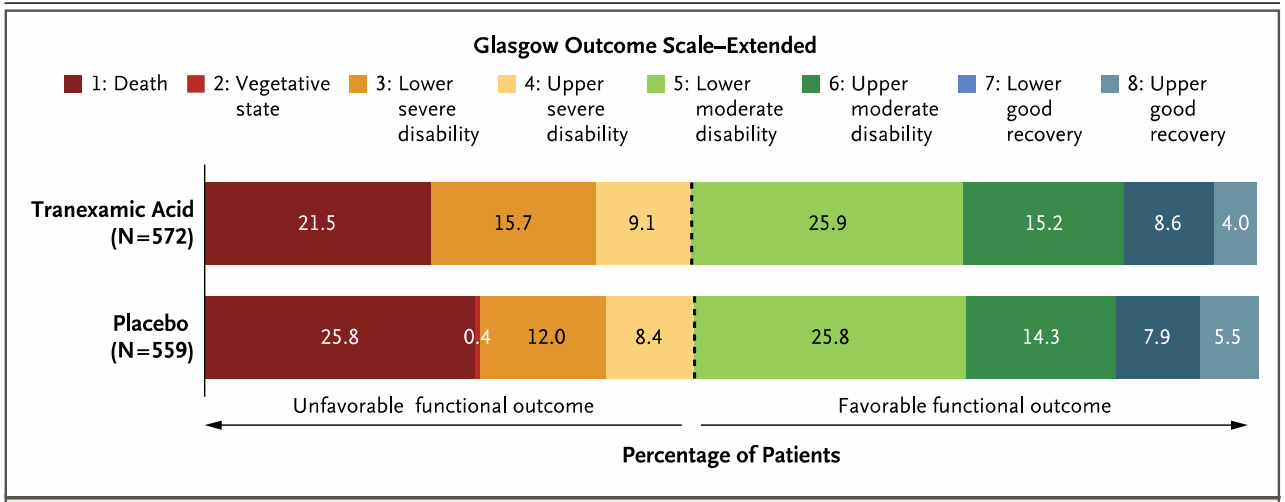



**Figure 2. Levels on the Glasgow Outcome Scale–Extended (GOS-E) at 6 Months.**

Thrombose ! NS
Sepsis ! NS

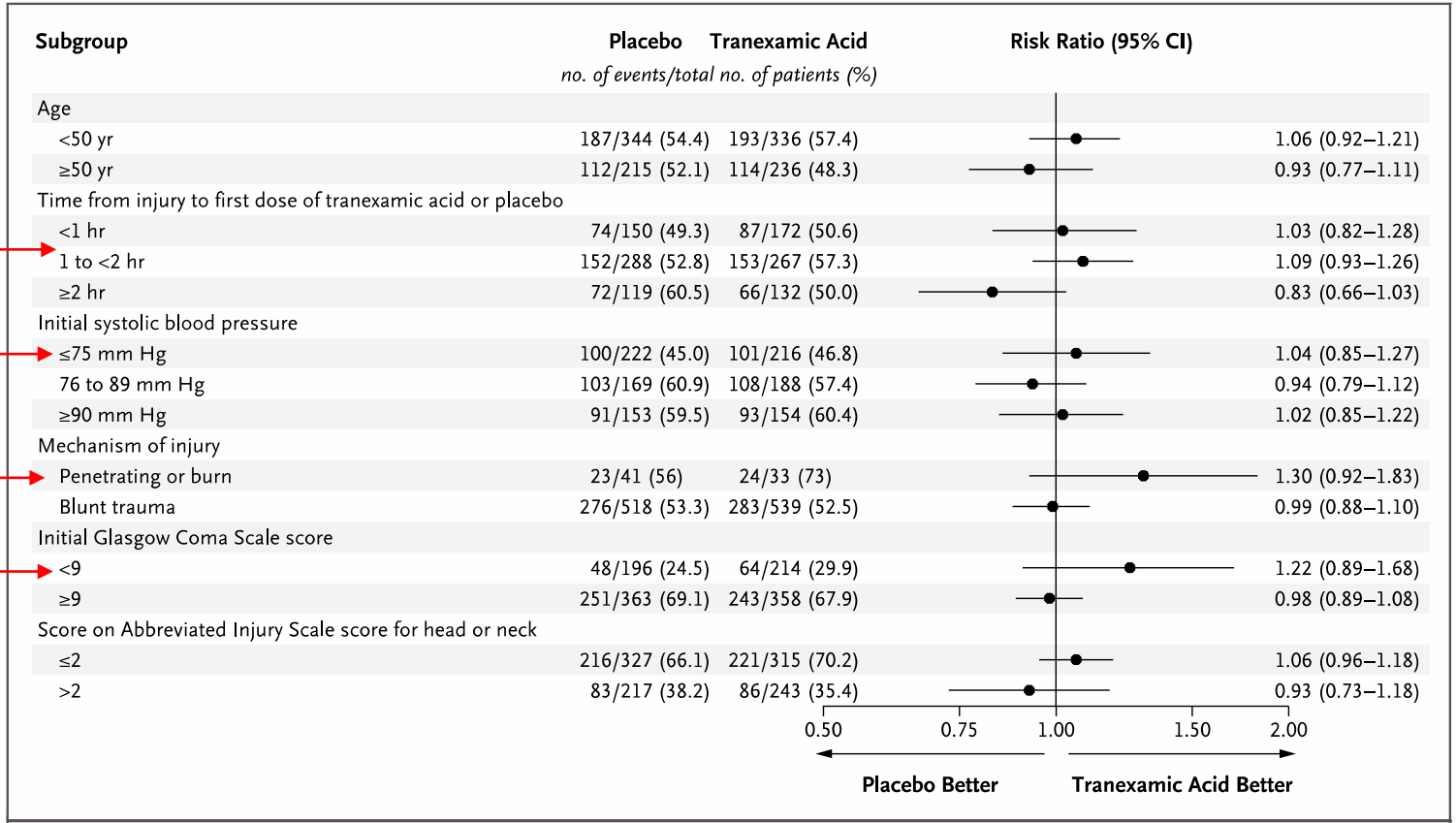



**Figure 3. Subgroup Analyses of the Primary Outcome.**

The primary outcome was survival with a favorable functional outcome at 6 months after injury, as assessed with the use of the GOS-E. Survival with a favorable functional outcome was defined as a GOS-E level of 5 ("lower moderate disability") or higher. Scores on the Abbreviated Injury Scale range from 0 to 6, with higher scores indicating more severe injury. The comparison of scores on the Abbreviated Injury Scale for the head or neck region was performed as a post hoc analysis.

RESEARCH Open Access

# Trauma-induced disturbances in ionized calcium levels correlate parabolically with coagulopathy, transfusion, and mortality: a multicentre cohort analysis from the TraumaRegister DGU®

Dries Helsloot[1,2,3*], Mark Fitzgerald[3,4], Rolf Lefering[5], Sandra Verelst[6,7], Carlo Missant[1,2] and the TraumaRegister DGU[8]

# TRAUMA – Hypocalcémie !?

Calcium Rôle ++
Diamant léthal
Enzyme hémostase ++

Etude Rétrospective
TraumaRegister DGU
2015-2019

« The aim of this study was to determine the association between the distribution and accompanying character-istics of transfusion-independent ionized calcium levels versus outcome

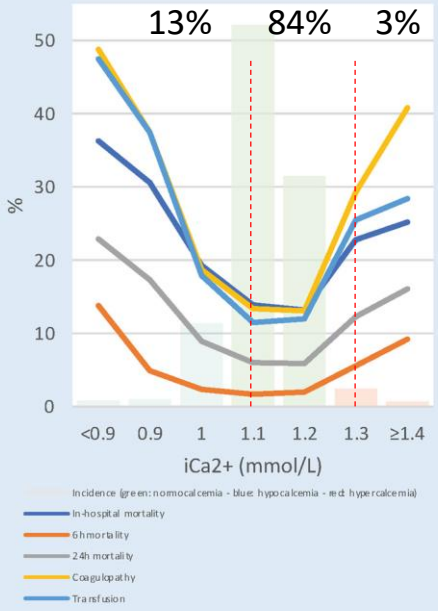
## Trauma-induced disturbances in ionized calcium levels correlate parabolically with coagulopathy, transfusion, and mortality

Helsloot et al. Critical Care 2023.

Major trauma patients
on arrival at the emergency department
n = 30 183

Measurement of
ionized calcium levels before transfusion

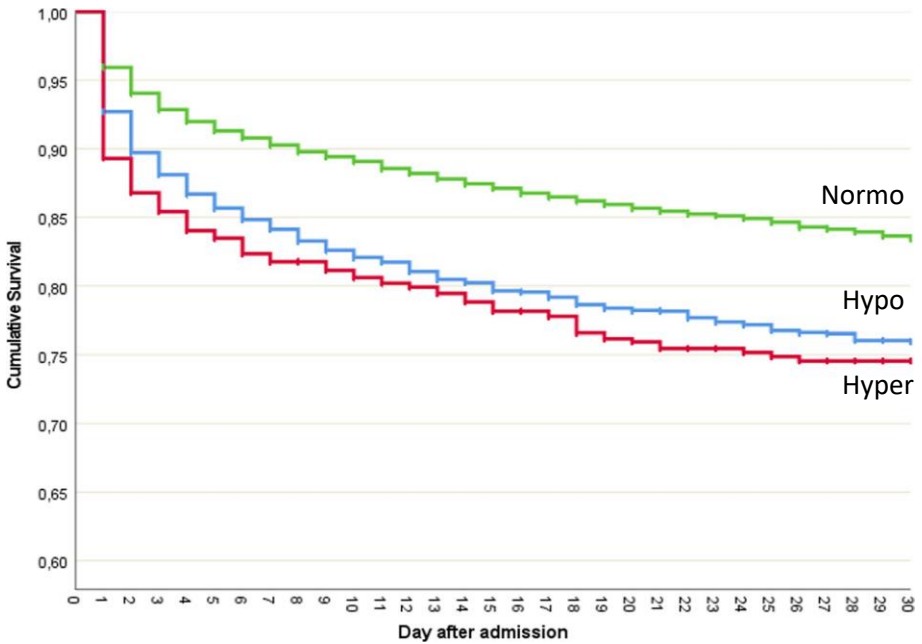
Association with coagulopathy,
transfusion requirement, and mortality




**Both hypo- and hypercalcemia are associated with worse outcomes.**

**Table 1** Relevant demographics and clinical characteristics for different ranges of ionized calcium levels

| Variables | Overall | HYPOcalcemia (< 1.10 mmol/L) | NORMOcalcemia (1.10–1.29 mmol/L) | HYPERcalcemia (≥ 1.30 mmol/L) |
|---|---|---|---|---|
| Total (%) | 30,183 (100) | 3982 (13.2) | 25,238 (83.6) | 963 (3.2) |
| Patient | | | | |
| Sex, male (%) | 21,655 (71.7) | 2933 (71.1) | 18,160 (72.0) | 662 (68.7) |
| Age, median (IQR) | 54 (35–70) | 54 (37–70) | 54 (35–70) | 55 (33–72) |
| Anticoagulation therapy before accident (%) | 4700 (15.6) | 595 (14.9) | 3953 (15.7) | 152 (15.8) |
| Accident mechanism | | | | |
| Blunt (%) | 27,872 (95.5) | 3563 (93.4) | 23,436 (95.9) | 873 (94.1) |
| Injury severity | | | | |
| ISS, median (IQR) | 21 (14–29) | 22 (16–29) | 20 (14–29) | 22 (16–29) |
| Pre- clinical vital signs | | | | |
| sBP ≤ 90 mmHg (%) | 2791 (10.5) | 512 (15.0) | 2125 (9.5) | 154 (18.2) |
| Shock Index ≥ 1 (%) | 3478 (13.5) | 587 (18.1) | 2746 (12.7) | 145 (18.1) |
| GCS ≤ 8 (%) | 7032 (24.7) | 1237 (33.1) | 5532 (23.2) | 263 (28.7) |
| Pre- clinical therapy | | | | |
| Volume administration > 1000 ml (%) | 4189 (15.2) | 548 (15.5) | 3456 (14.9) | 185 (20.8) |
| Intubation (%) | 9757 (33.1) | 1518 (39.5) | 7846 (31.8) | 393 (41.4) |
| TXA (%) | 4430 (15.0) | 672 (17.5) | 3593 (14.6) | 165 (17.4) |
| Cathecholamines (%) | 3269 (11.1) | 567 (14.7) | 2514 (10.2) | 188 (19.8) |
| Vital signs on admission | | | | |
| sBP ≤ 90 mmHg (%) | 3072 (10.6) | 588 (15.5) | 2301 (9.4) | 183 (19.8) |
| Shock Index ≥ 1 (%) | 3860 (13.5) | 691 (18.7) | 2976 (12.4) | 193 (21.7) |
| Temperature < 35 °C (%) | 2089 (10.8) | 386 (16.1) | 1600 (9.8) | 103 (16.6) |
| Laboratory values on admission | | | | |
| Hb, g/dL, mean (SD) | 12.87 (2.22) | 12.30 (2.58) | 13.01 (2.10) | 11.73 (2.77) |
| Coagulopathy (PTT ≥ 40 s and/or INR 1.4) (%) | 4532 (15.0) | 873 (21.9) | 3352 (13.3) | 307 (31.9) |
| Base Excess, mean (SD) | − 2.20 (4.77) | − 3.65(6.09) | − 1.82 (4.28) | − 6.19 (7.28) |
| Acidosis, BE < − 6 (%) | 4555 (15.2) | 997 (25.3) | 3180 (12.7) | 378 (40.1) * |




Our findings do not support routine early empiric calcium supplementation

RESEARCH Open Access

# Association of red blood cells and plasma transfusion versus red blood cell transfusion only with survival for treatment of major traumatic hemorrhage in prehospital setting in England: a multicenter study

Harriet Tucker[1], Karim Brohi[1,2], Joachim Tan[3], Christopher Aylwin[4], Roger Bloomer[5], Rebecca Cardigan[6], Ross Davenport[1,2], Edward D. Davies[7], Phillip Godfrey[8], Rachel Hawes[9,10], Richard Lyon[11], Josephine McCullagh[2], Simon Stanworth[6,12], Julian Thompson[13,14], James Uprichard[15], Simon Walsh[4,16], Anne Weaver[2] and Laura Green[1,2,6*]

- Transfusion préhospitalière : Probablement utile mais aucune preuve de son efficacité !
- Hypothèse : Comparaison de l'administration PH CGR vs. CGR + PFC vs. RCP (sang déleucocyté faible en PLT) sur mortalité H24 et D30.

Etude rétro (Groupe CGR, 2015-2018) et prospective (CGR+PFC ou RCP, 2018-2020)
Effet sur l'outcome après ajustement sur Age, mécanisme, FC et PAS PH.

**Table 1** Study patient characteristics for different arms

| | RBC<br>*N* = 223 | RBC + P<br>*N* = 391 | RCP<br>N = 295 |
|---|---|---|---|
| | **Median (Interquartile Range) unless otherwise stated** | | |
| Age, mean (SD) | 36.0 (19.3) | 42.9 (19.8) | 35.6 (19.2) |
| Male, *n* (%) | 178 (80.5%) | 287 (75.5%) | 244 (83.8%) |
| Time from injury to scene arrival (mins) | 22.5 (14.3, 25.2) | 31.4 (26.3, 36.8) | 24.6 (14.8,26.1) |
| Time from injury to hospital arrival (mins) | 79.3 (64.2, 89.7) | 97.4 (75.2, 107.4) | 81.5 (67.4, 91.2) |
| Blunt Injury, *n* (%) | 124 (55.6%) | 304 (80.0%) | 151 (51.9%) |
| Injury Severity Score* | 33.7 (24, 41) | 31.6 (23, 44) | 30.1 (22, 43) |
| AIS Head > 3 | 27/100 (27%) | 51/217 (24%) | 38/180 21% |
| Prehospital physiology | | | |
| *SBP (mmHg)* | 82.0 (68.0;95.0) | 78.0 (67.0;90.0) | 79.0 (59.0;100) |
| *HR (bpm)* | 121 (110;133) | 110 (81.0;130) | 109 (85.5;135) |
| *HR 0 and SBP 0, n (%)* | 55 (25%) | 81 (21%) | 89 (31%) |
| *SBP < 90, n (%)* | 198 (88%) | 341 (89%) | 243 (84%) |
| **Resuscitative and coagulopathy markers at hospital arrival** | | | |
| | ***N* = 87**/158†** | ***N* = 178**/285†** | ***N* = 194**/214†** |
| *INR > 1.2, n (%)* | 29 (38%) | 52 (30%) | 39 (29%) |
| *Base Excess (mmol/L)* | − 8.00 (− 12.88;− 4.93) | − 5.60 (− 9.90;− 2.42) | − 7.80 (− 14.12;− 3.00) |
| *pH* | 7.16 (7.01;7.27) | 7.24 (7.12;7.32) | 7.17 (7.01;7.29) |
| *Lactate (mmol/L)* | 4.90 (2.80;8.70) | 4.10 (2.40;7.00) | 6.50 (3.30;11.2) |

**Table 3** Association between different treatment and 24-h mortality

| Model 1 | CRUDE | | | |
|---|---|---|---|---|
| | OR | 95%CI | | P value |
| RBC | 1 | | | |
| RBC + P | 0.39 | 0.20 | 0.77 | 0.006 |
| RCP | 0.74 | 0.57 | 0.95 | 0.021 |

Lower odds of death for RBC + P and RCP vs RBC

| Model 3 | Adjusted for injury, age, HR & SBP + interaction between treatment and injury | | | |
|---|---|---|---|---|
| *Blunt* | | | | |
| RBC | 1 | | | |
| RBC + P | 0.94 | 0.48 | 1.86 | 0.863 |
| RCP | 1.03 | 0.75 | 1.41 | 0.848 |
| *Penetrating* | | | | |
| RBC | 1 | | | |
| RBC + P | 0.22 | 0.10 | 0.53 | 0.001 |
| RCP | 0.39 | 0.20 | 0.76 | 0.006 |

It was driven by penetrating injury

No association between RCP or RBC + P with 30-day survival vs

Research

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

# Efficacy and Safety of Early Administration of 4-Factor Prothrombin Complex Concentrate in Patients With Trauma at Risk of Massive Transfusion

## The PROCOAG Randomized Clinical Trial

Pierre Bouzat, MD, PhD; Jonathan Charbit, MD; Paer-Selim Abback, MD; Delphine Huet-Garrigue, MD; Nathalie Delhaye, MD; Marc Leone, MD, PhD; Guillaume Marcotte, MD; Jean-Stéphane David, MD, PhD; Albrice Levrat, MD; Karim Asehnoune, MD, PhD; Julien Pottecher, MD, PhD; Jacques Duranteau, MD, PhD; Elie Courvalin, MD; Anais Adolle, MSc; Dimitri Sourd, MSc; Jean-Luc Bosson, MD, PhD; Bruno Riou, MD, PhD; Tobias Gauss, MD; Jean-François Payen, MD, PhD; for the PROCOAG Study Group

JAMA

**QUESTION** Does 4-factor prothrombin complex concentrate (4F-PCC) reduce 24-hour blood product consumption in patients with trauma at risk of massive transfusion?

**CONCLUSION** There was no significant reduction of 24-hour blood product consumption after administration of 4F-PCC among patients with trauma at risk of massive transfusion, compared with placebo, but thromboembolic events were more common.



## POPULATION

233 Men 91 Women

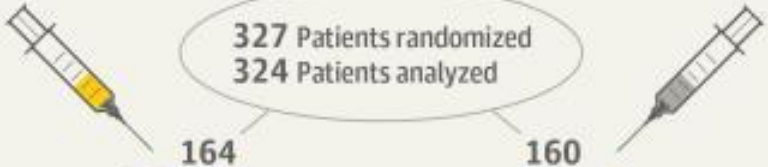
Adults with trauma at risk of major transfusion

Median age: 39 years

## LOCATION

12
Level I trauma centers in France

## INTERVENTION




## PRIMARY OUTCOME

Total number of all blood product units (red blood cells, fresh frozen plasma, and platelet concentrate) consumed within the first 24 hours after arrival in the trauma bay

## FINDINGS

Median 24-hour blood consumption

**4F-PCC**
**12 U** (IQR, 5-19)

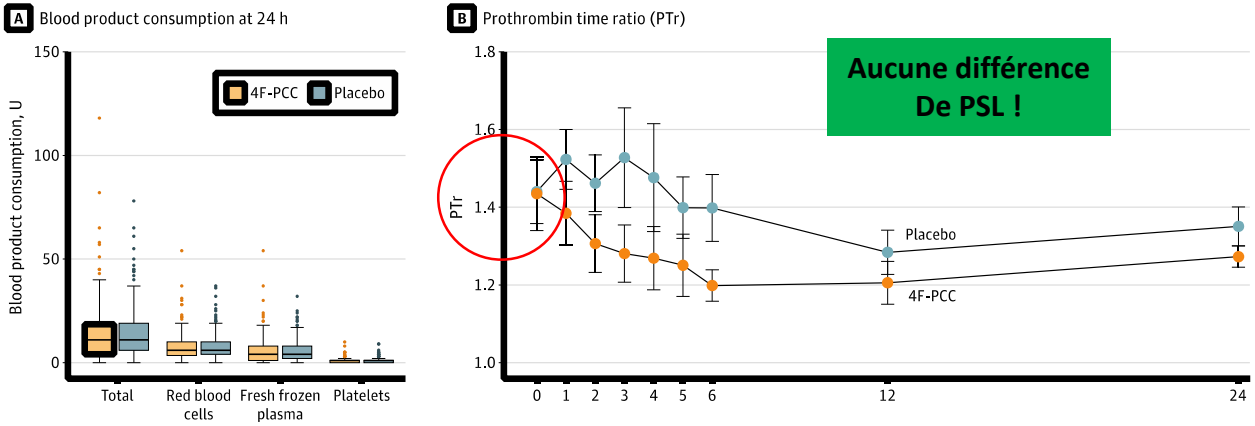
**Placebo**
**11 U** (IQR, 6-19)

The between-group difference was not clinically or statistically significant

**Absolute difference, 0.2 U**
(95% CI, −2.99 to 3.3); $P = .72$

Bouzat P, Charbit J, Abback PS, et al; for the PROCOAG Study Group. Efficacy and safety of early administration of 4-factor prothrombin complex concentrate in patients with trauma at risk of massive transfusion: the PROCOAG randomized clinical trial. *JAMA*. Published online March 21, 2023. doi:10.1001/jama.2023.4080

Figure 2. Transfusion-Related Secondary Outcomes by Treatment Group




**Aucune différence De PSL !**

**Plus d'ETE !**

PCC Placebo

**Pas de bénéfice au PCC !**
**Risque de ETE …**

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Critical Care

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# Thromboelastometry-guided haemostatic resuscitation in severely injured patients: a propensity score-matched study

Jean-Stéphane David[1,2*], Arthur James[3], Maxime Orion[1], Agathe Selves[3], Mélody Bonnet[1], Pauline Glasman[3], Charles-Hervé Vacheron[1,4,5] and Mathieu Raux[6]

# TECHNIQUES VISCOELASTIQUE ?

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## Thromboelastometry-guided haemostatic resuscitation in severely injured patients: a propensity score-matched study

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*Crit Care 2023*

**Comparaison Trauma Data Bank APHP versus HCL : 2012 à 2019**

***Critère Inclusion : Au moins 1 CGR / H24***

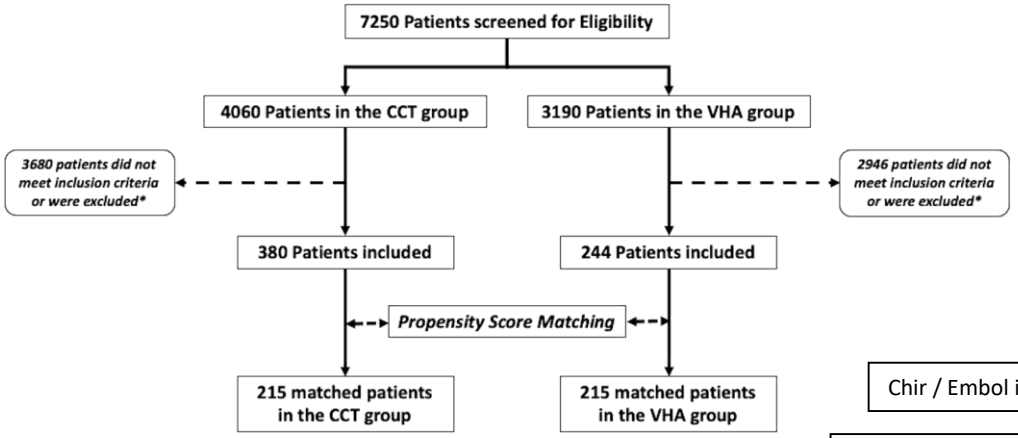


**Fig. 2** Study flowchart. *refers to exclusion criteria's

Chir / Embol idem

Timing Hémostase idem

| | After matching | | p value |
|---|---|---|---|
| | CCT ($n=215$) | VHA ($n=215$) | |
| Age | 38 [26–54] | 40 [26–55] | 0.53 |
| Male sex | 144 (66) | 144 (67) | 0.76 |
| Penetrating Trauma | 37 (17) | 30 (14) | 0.35 |
| *Prehospital data* | | | |
| SBP—mmHg | 100 [76–125] | 98 [70–120] | 0.20 |
| Cardiac arrest | 8 (4) | 21 (10) | ***0.03*** * |
| GCS | 11 [3–15] | 13 [3–15] | 0.90 |
| Norepinephrine use | 107 (50) | 111 (51) | 0.70 |
| Fluids (ml) | 1250 [750–1750] | 1475 [888–2000] | ***0.03*** * |
| *Admission data* | | | |
| SBP—mmHg | 90 [68–120] | 96 [75–115] | 0.72 |
| ISS | 34 [22–45] | 34 [22–45] | 0.58 |
| AIS head | 3 [0–4] | 2 [0–5] | 0.96 |
| Lactate—mmol/L | 4.3 [2.6–7.4] | 4.3 [2.4–7.5] | 0.90 |
| Haemoglobin—g/dL | 9.5 [8.1–11.2] | 9.7 [8.1–11.5] | 0.49 |
| TIC | 170 (79) | 168 (78) | 0.81 |
| $PT_{ratio}$ | 1.5 [1.3–1.9] | 1.4 [1.2–1.8] | 0.10 |
| Fibrinogen—g/L | 1.4 [1.0–1.9] | 1.5 [0.9–1.9] | 0.17 |
| Platelets—G/L | 182 [135–221] | 194 [145–240] | 0.08 |
| TXA H-3 | 207 (96) | 208 (97) | 0.79 |
| *Blood products and coagulatic* | | | |
| RBC—units | 9 [6–12] | 3 [2–6] | ***< 0.01*** |
| Massive transfusion | 91 (42) | 32 (15) | ***< 0.01*** |
| FFP—units | 7 [4–12] | 0 [0–4] | ***< 0.01*** |
| FFP or PCC given | 209 (97) | 94 (44) | ***< 0.01*** |
| PC—units | 3.9 [0.0–7.8] | 0 [0–0] | ***< 0.01*** |
| PC given | 137 (64) | 51 (24) | ***< 0.01*** |
| FC—g | 3.0 [1.5–4.5] | 3.0 [1.5–6.0] | 0.06 |
| FC given | 167 (79) | 167 (78) | 0.71 |
| Fib/RBC ratio | 0.4 [0.3–0.5] | 1.0 [0.8–1.5] | ***< 0.01*** |
| FFP/RBC ratio | 0.8 [0.7–1.0] | 0.7 [0.5–1.0] | 0.08 |
| *Outcomes* | | | |
| Alive and free of MT | 112 (52) | 162 (75) | ***< 0.01*** |
| Early death (< 24 h) | 44 (20) | 42 (20) | 0.81 |
| Survival at Day 28 | 144 (67) | 137 (64) | 0.48 |
| ICU LOS (days) | 8 [2–23] | 7 [1–19] | 0.19 |

# TECHNIQUES VISCOELASTIQUE ?

Alive and free of MT : 75% (VHA) vs. 52% (CCT), p< 0.001

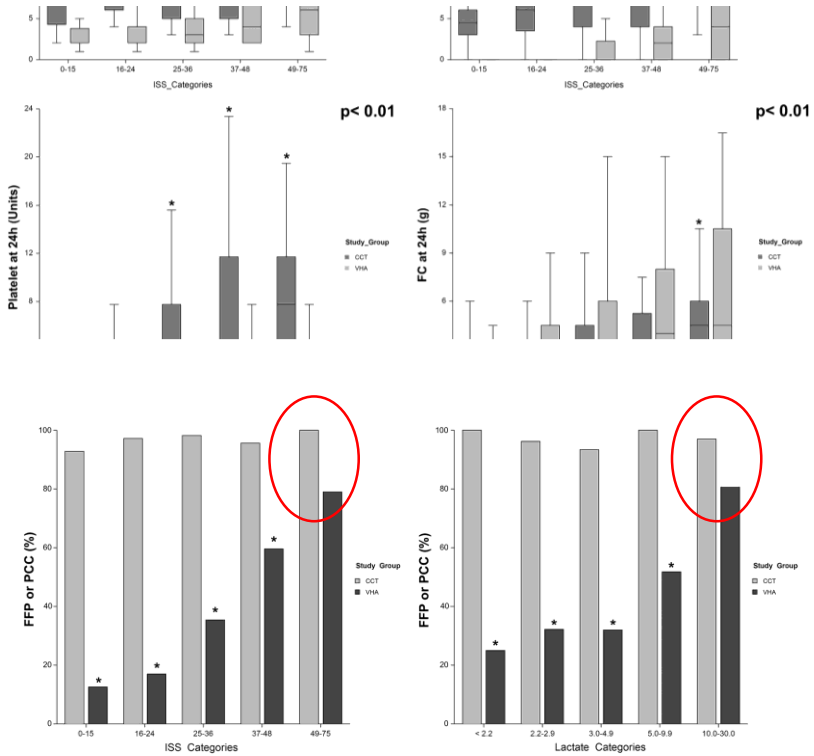


**Fig. 5** Comparison of the administration rate of FFP or PCC according to injury severity or admission lactate (mmol $L^{-1}$) in the matched cohort. *$p < 0.05$ for the comparison between ISS or lactate categories. Comparison made using ANOVA and the Tukey–Kramer multiple comparison test. Data are mean %

**Table 2** Primary outcome and mortality before and after propensity matching

| Variable | Odds ratio (95% Confidence Interval) | *p* value |
|---|---|---|
| *After matching (ref: Group VHA)* | | |
| Alive and free of massive transfusion | 2.81 (1.87–4.23) | ***< 0.01*** |
| Massive transfusion | 0.24 (0.15–0.38) | ***< 0.01*** |
| Early death (< 24 h) | 0.94 (0.59–1.51) | 0.81 |
| Survival at day 28 | 0.87 (0.58–1.29) | 0.48 |

Bolditalic value indicates *p* considered as significant if < 0.05

**Comparison to the cost of blood products and coagulation factor concentrates**

CCT : 4092 E (2510-5916)
VHA : 2357 E (1108-5020)
P< 0.001

***Aussi bien et bien moins cher …***

→ **PHRC VISCO-TAC**

Research

JAMA Surgery | Original Investigation

# Association of Whole Blood With Survival Among Patients Presenting With Severe Hemorrhage in US and Canadian Adult Civilian Trauma Centers

Crisanto M. Torres, MD, MPH; Alistair Kent, MD, MPH; Dane Scantling, DO, MPH; Bellal Joseph, MD; Elliott R. Haut, MD, PhD; Joseph V. Sakran, MD, MPH, MPA

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***CHU Grenoble***
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- Place du Sang Total en cas d'hémorragie massive PH
- Place du Calcium !?