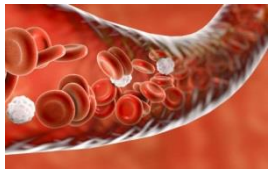
Hôpital Européen
MARSEILLE | L'humain au cœur de nos soins



Fondation AMBROISE PARÉ 1846

Agence Régionale de Santé Île-de-France

Journée régionale d'hémovigilance
PROVENCE ALPES COTE D'AZUR

Epargne sanguine sur cathéter artériel

Dr Jérôme ALLARDET-SERVENT – Réanimation

Dr Vanessa METZ – Pharmacie

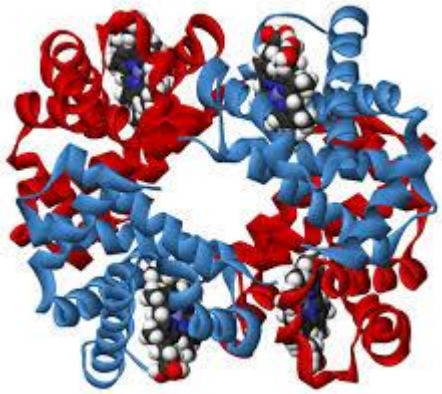
Dr Camille AUBERT – CSTH

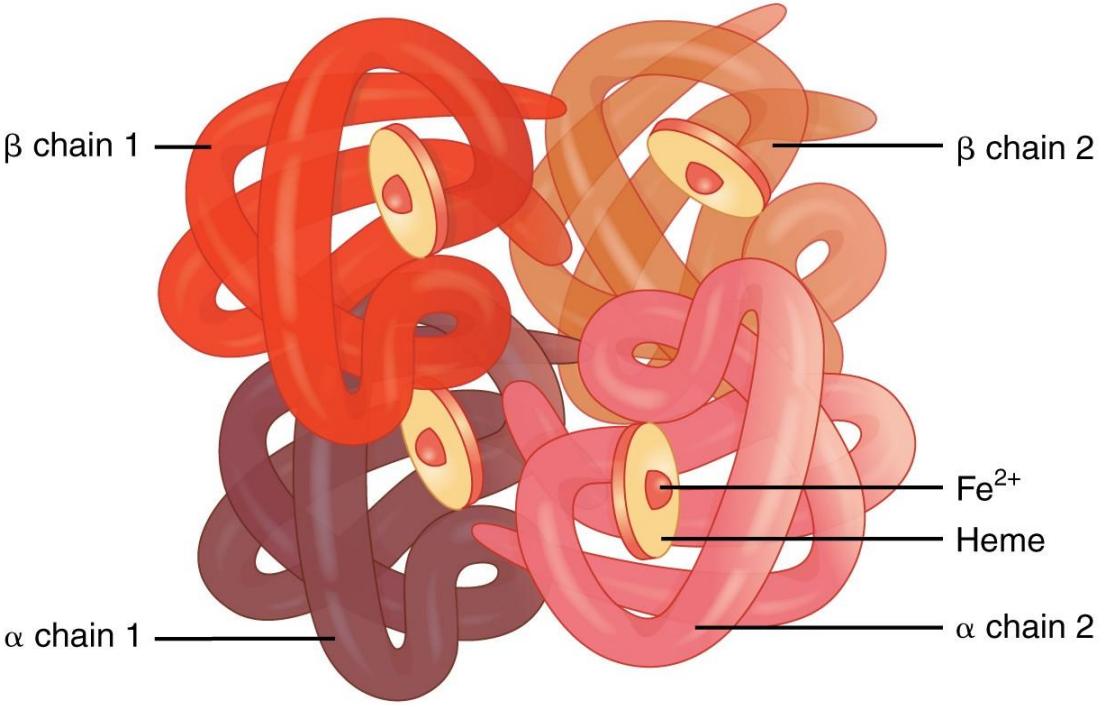
Hôpital Européen Marseille

j.allardetservent@hopital-europeen.fr

Hémoglobine: transporteur d'O_2

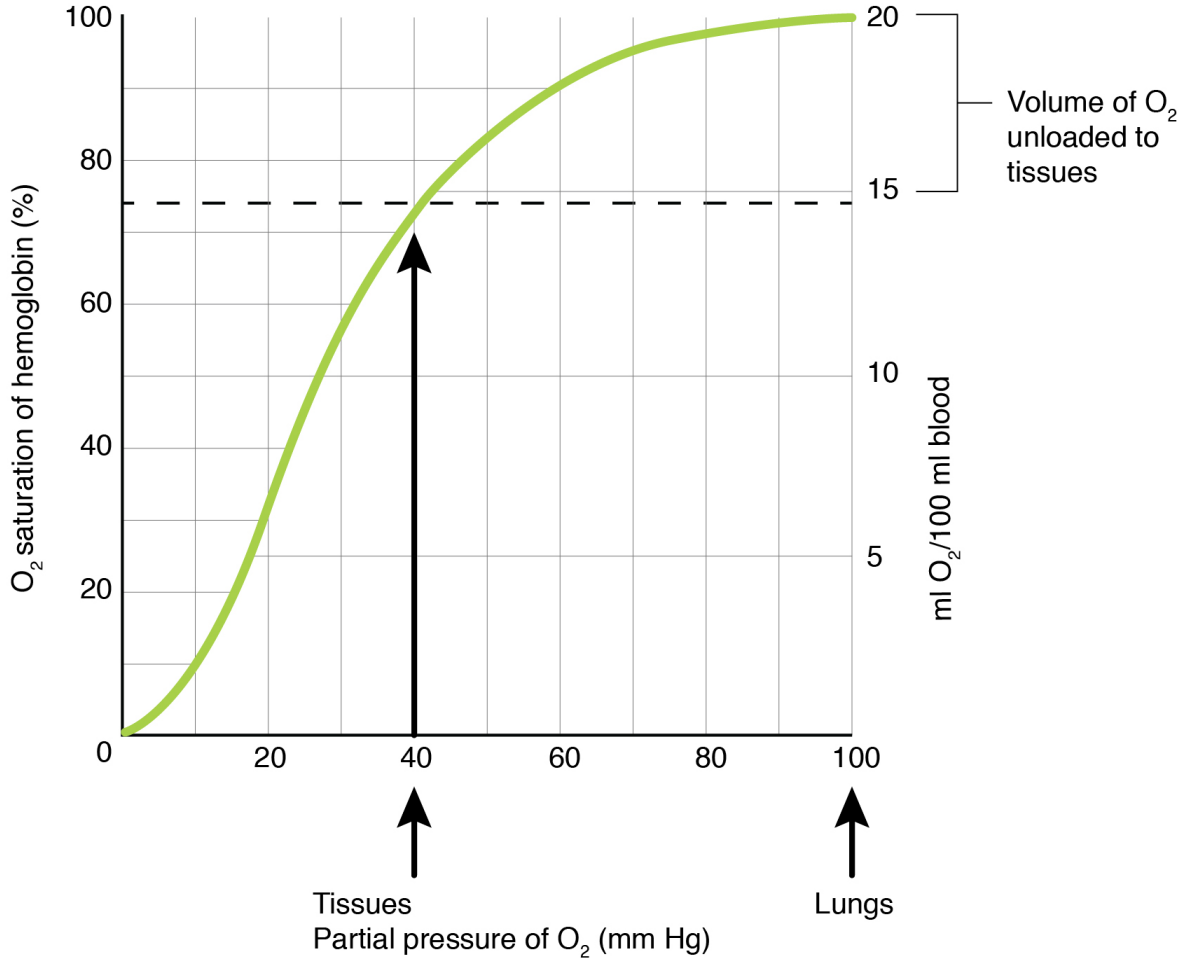
1 mole d'Hémoglobine fixe 1,39 g d'O_2



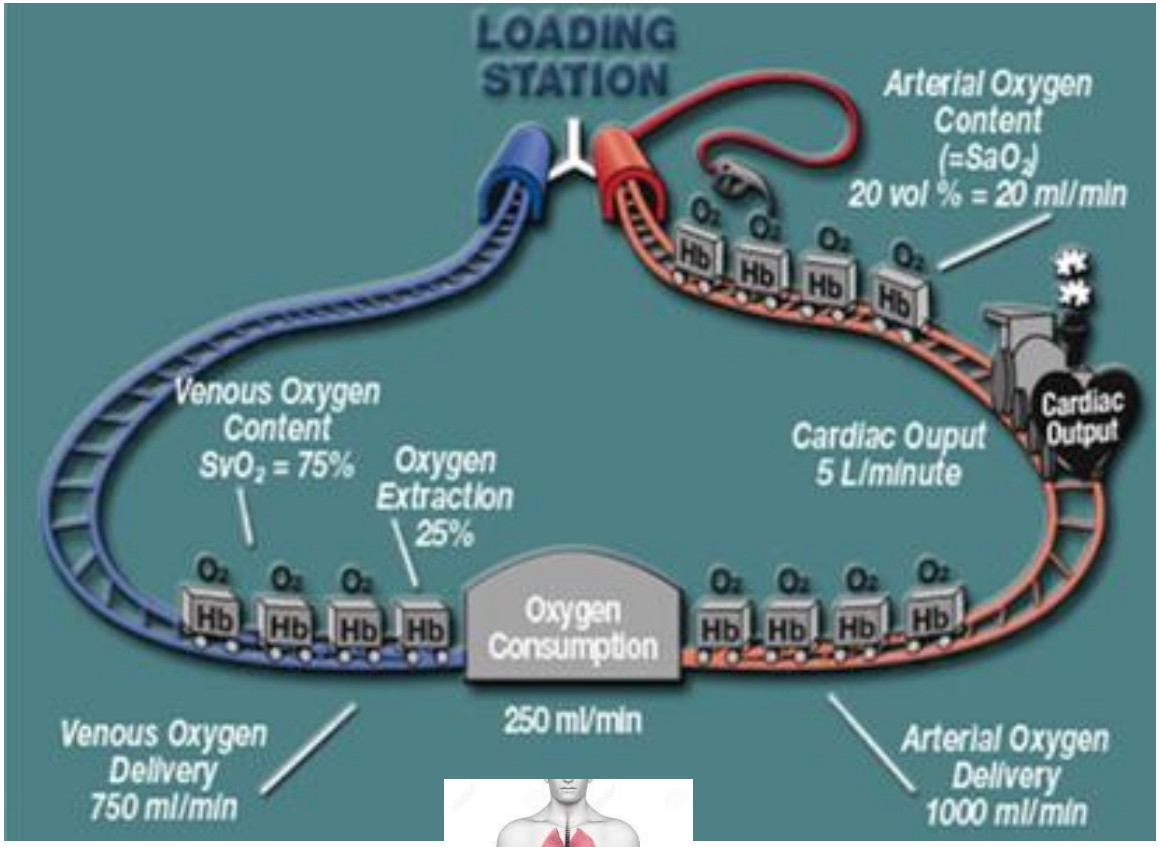


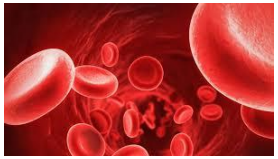
Hémoglobine: transporteur d'O_2

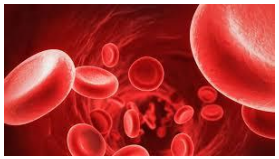
Liaison réversible de l'O_2 avec affinité variable



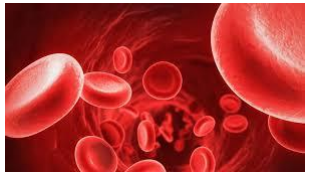
Transport de l'O_2







Contenu sanguin en O_2



$$C_xO_2 = (Hb \times SO_2 \times 1{,}34) + (PO_2 \times 0{,}0031)$$

Combiné à Hb

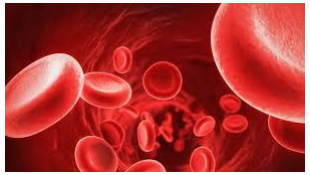
Dissout dans sang

$$CaO_2 = (Hb \times SaO_2 \times 1{,}39) + (PaO_2 \times 0{,}0033) = 20 \text{ mL/dL d'}O_2$$

$$CvO_2 = (Hb \times SvO_2 \times 1{,}39) + (PvO_2 \times 0{,}0033) = 15 \text{ mL/dL d'}O_2$$

$$DavO_2 = CaO_2 - CvO_2 = 5 \text{ mL/dL d'}O_2$$

Transport de l'O_2



$$T_{av}O_2 = C_{av}O_2 \times Qc \times 10$$

Contenu en O2

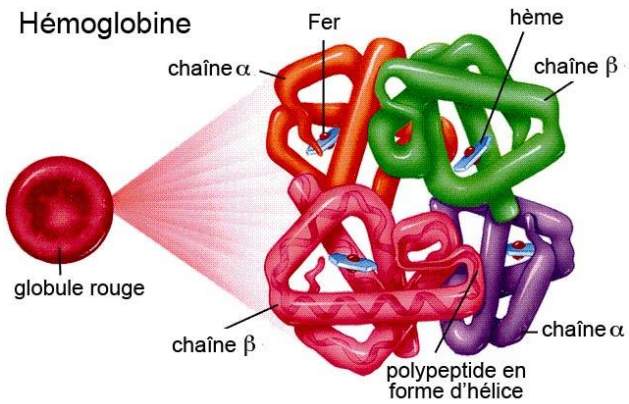
Quantité / unité temps

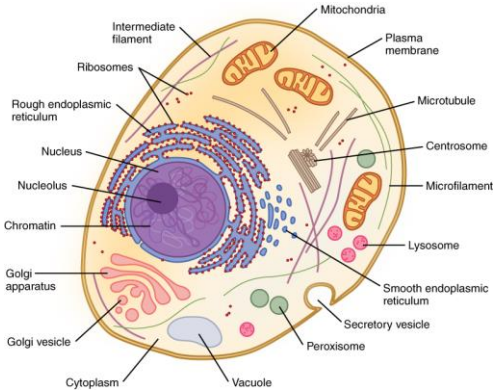
$$TaO_2 = CaO_2 \times Qc \times 10 = 1000 \text{ mL/dL d'}O_2$$

$$TvO_2 = CvO_2 \times Qc \times 10 = 750 \text{ mL/dL d'}O_2$$

Pourquoi une Tranfusion ?

CGR ➔ ↗ CaO_2 ➔ ↗ TaO_2 ➔ ↗ VO_2



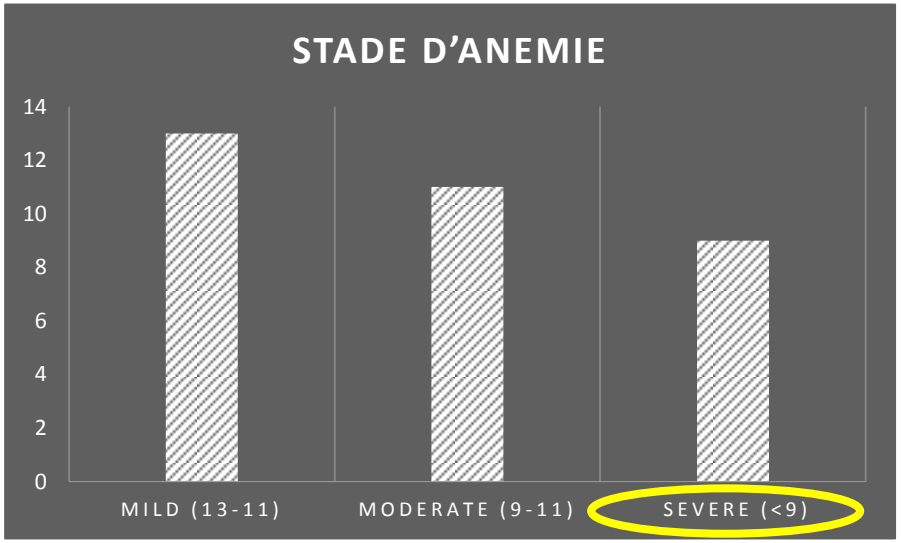


Anémie : Quel niveau d'Hb ?

The definition of anemia: what *is* the lower limit of normal of the blood hemoglobin concentration?

Table 4. Proposed lower limits of normal for hemoglobin concentration of the blood for white and black adults

Group	Hemoglobin, g/dL
White men, y	
20-59	13.7
60+	13.2
White women, y	
20-49	12.2
50+	12.2
Black men, y	
20-59	12.9
60+	12.7
Black women, y	
20-49	11.5
50+	11.5



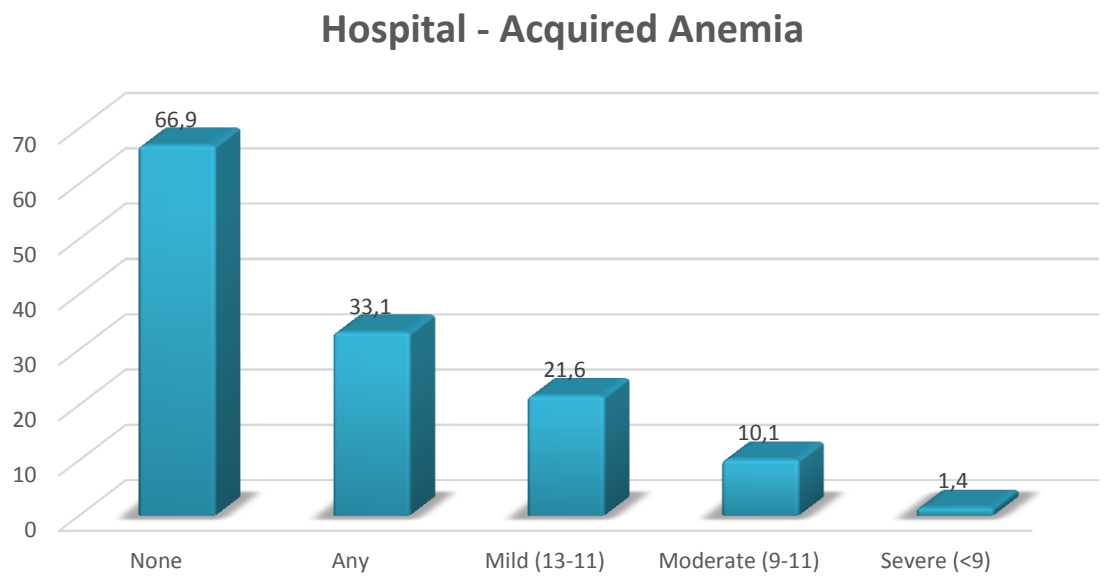
Blood. 2006; 107:1747-1750

Anémie : Incidence (Hôpital)

Incidence, Predictors, and Outcomes of Hospital-Acquired Anemia

n=11309

Cohorte rétrospective (Médecine - 6 Hôpitaux) : absence d'anémie à l'admission



Journal of Hospital Medicine 2017;12:317-322.

Anémie : Incidence (Hôpital)

Incidence, Predictors, and Outcomes of Hospital-Acquired Anemia

n=11309

Baseline Characteristics of Hospitalized Medicine Patients (N=11,309)

	HAA Severity[a]				
	None	Mild	Moderate	Severe	*P*
N	7563	2445	1142	159	
Age, mean (SD), y	59.6 (17.1)	59.7 (17.5)	63.3 (16.9)	65.3 (16.0)	<0.001
Female, n (%)	4487 (59.3)	1188 (48.6)	948 (83.0)	114 (71.7)	<0.001
Hematocrit on admission, median (IQR)	41 (39-43)	41 (38-42)	38 (37-41)	39 (37-42)	<0.001
Receipt of blood transfusion, n (%)	44 (0.6)	75 (3.1)	136 (11.9)	43 (27.0)	<0.001
LOS, median (IQR), d	3 (2-5)	4 (3-7)	6 (4-10)	8 (5-12)	<0.001
Any discharge diagnoses, n (%)[c]					
Hemorrhage	64 (0.9)	48 (1.96)	83 (7.3)	30 (18.9)	<0.001
Coagulation or hemorrhagic disorder	264 (3.5)	146 (6.0)	84 (7.4)	23 (14.5)	<0.001

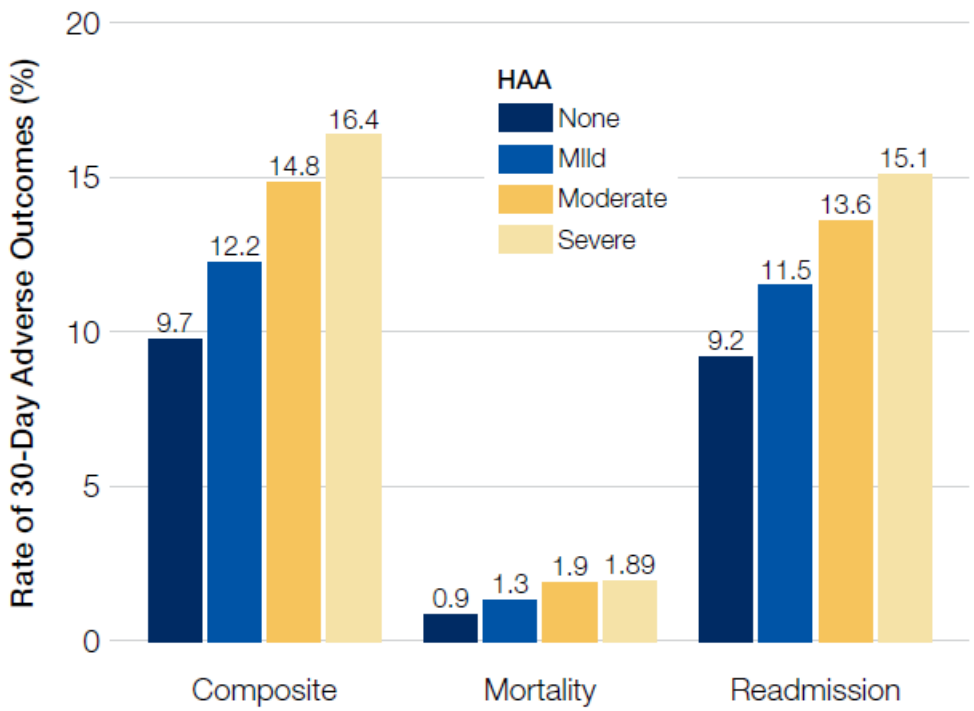
Journal of Hospital Medicine 2017;12:317-322.

Anémie : Incidence (Hôpital)

Incidence, Predictors, and Outcomes of Hospital-Acquired Anemia

n=11309

Incidence of adverse outcomes by severity of HAA.



Journal of Hospital Medicine 2017;12:317-322.

Anémie : Incidence (Réanimation)

Cohorte prospective

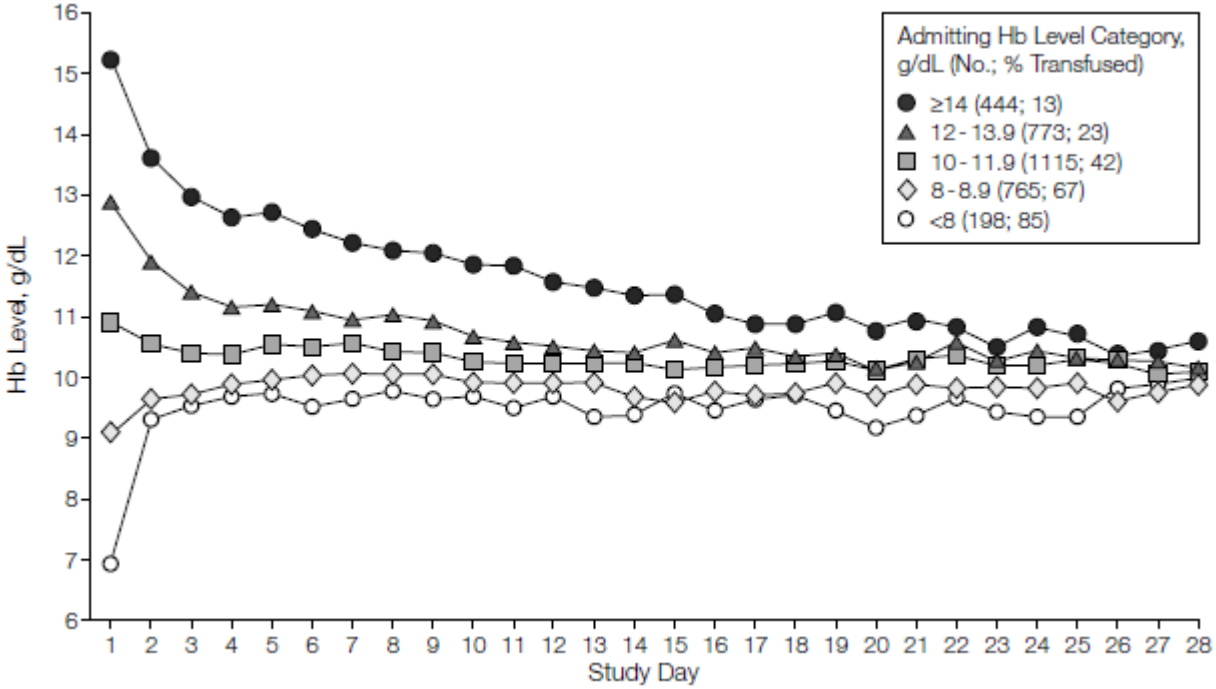
n=3295

Anemia and Blood Transfusion in Critically Ill Patients

10 mL / Prélèvement

41 mL / 1ère 24 h

Course of Hemoglobin (Hb) Patterns by Admitting Hb Level Category



JAMA. 2002;288:1499-1507

Anémie : rôle des bilans biologiques

La quantité de sang prélevé impacte sur la survenue d'une anémie acquise à l'Hôpital

n=17676

ORIGINAL INVESTIGATION

ONLINE FIRST | LESS IS MORE

Diagnostic Blood Loss From Phlebotomy and Hospital-Acquired Anemia During Acute Myocardial Infarction

Adam C. Salisbury, MD, MSc; Kimberly J. Reid, MS; Karen P. Alexander, MD; Frederick A. Masoudi, MD, MSPH; Sue-Min Lai, PhD, MS, MBA; Paul S. Chan, MD, MSc; Richard G. Bach, MD; Tracy Y. Wang, MD, MHS, MSc; John A. Spertus, MD, MPH; Mikhail Kosiborod, MD

Arch Intern Med.
Published online August 8, 2011.
doi:10.1001/archinternmed.2011.361

Anémie : rôle des bilans biologiques

La quantité de sang prélevé impacte sur la survenue d'une anémie acquise à l'Hôpital

n=17676

Table 2. Diagnostic Blood Loss (DBL) Estimates During Hospitalization With Acute Myocardial Infarction

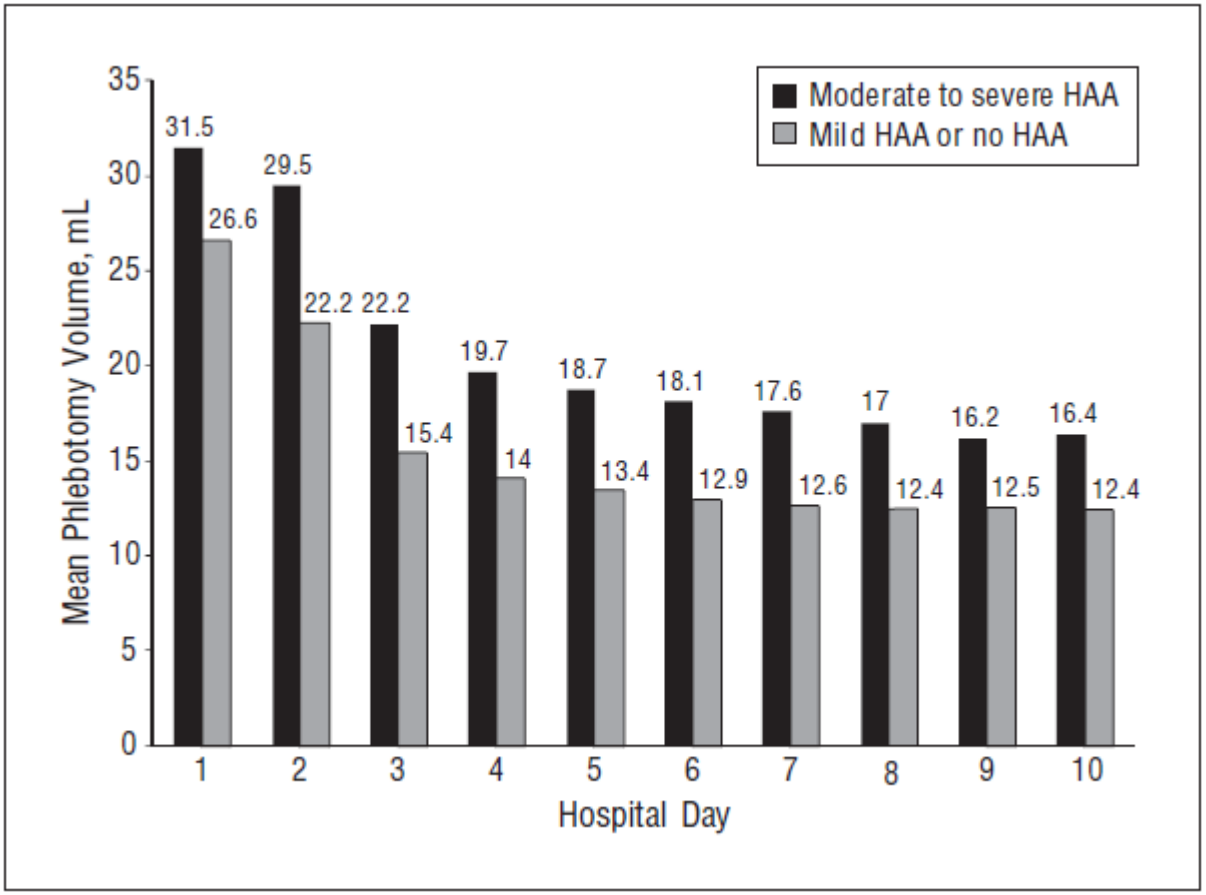
DBL	Moderate to Severe Hospital-Acquired Anemia, Mean (SD)	
	Yes (n=3551)	No (n=14 125)
Total DBL, mL	173.8 (139.3)	83.5 (52.0)
Median [IQR]	132.0 [88.5-209.0]	69.5 [51.0-99.5]
DBL per 24 h, mL	24.4 (34.1)	22.8 (20.9)
Median [IQR]	21.1 (16.0-28.8)	20.5 (15.6-26.7)
Type of tests obtained[b]		
Arterial blood gas	18.3 (19.7)	7.7 (6.9)
Serum chemistries and other serum studies	69.6 (63.3)	35.8 (23.5)
Coagulation laboratory test	26.6 (28.5)	15.3 (16.8)
Hematology laboratory test	47.4 (38.7)	21.3 (12.5)
Blood cultures	12.0 (20.1)	3.4 (9.5)

[a] $P<.001$ for all comparisons.
[b] Reported values represent the mean (SD) values in milliliters among patients who had the respective laboratories drawn during the course of their hospitalization.

Anémie : rôle des bilans biologiques

La quantité de sang prélevé impacte sur la survenue d'une anémie acquise à l'Hôpital

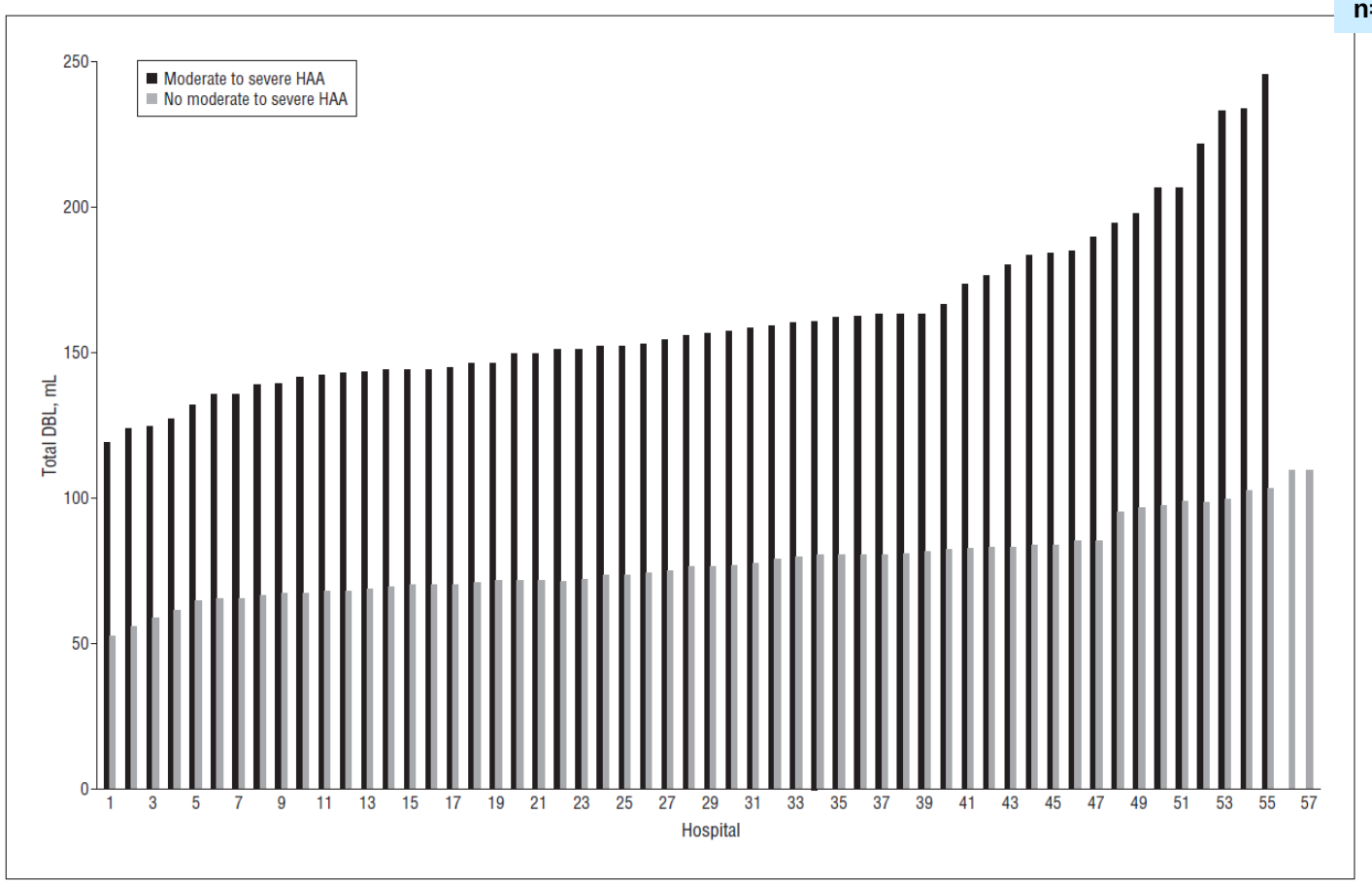
n=17676



Anémie : rôle des bilans biologiques

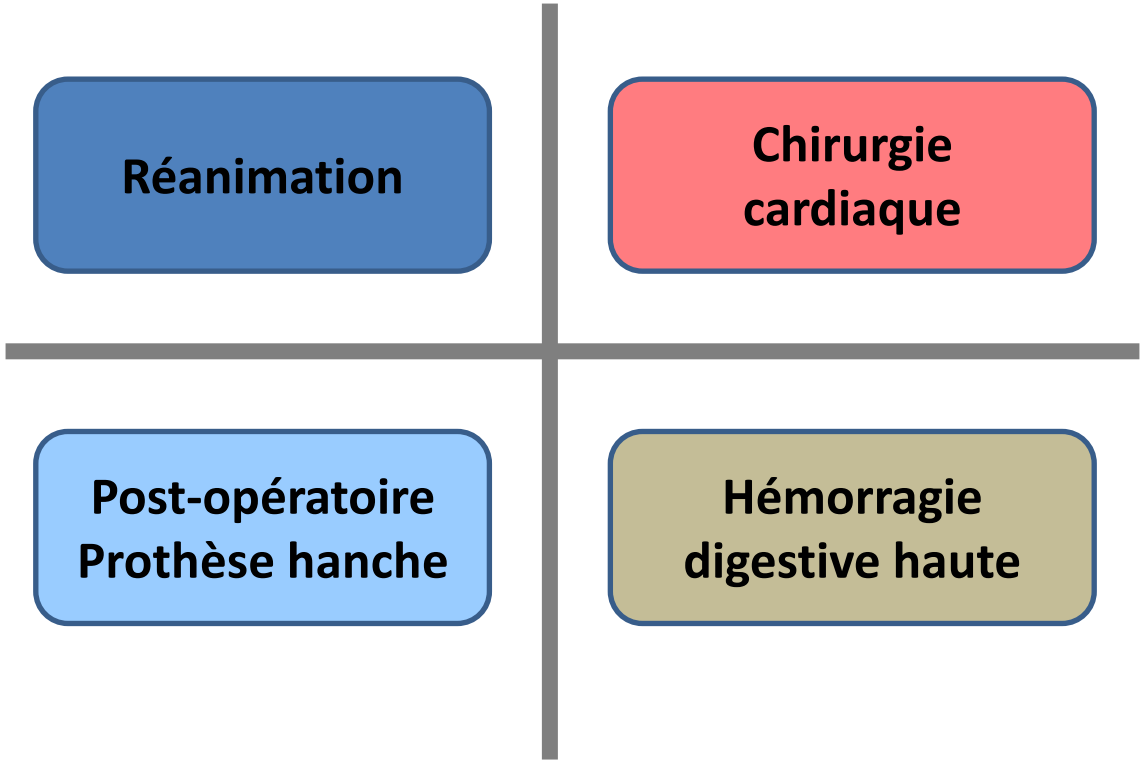
La quantité de sang prélevé impacte sur la survenue d'une anémie acquise à l'Hôpital

n=17676



Quel seuil transfusionnel ?

Principales études et leurs domaines d'application



Lancet 2013; 381: 1845-54

Quel seuil transfusionnel ?

Principales études et leurs domaines d'application

Key clinical trials of red blood cell transfusions

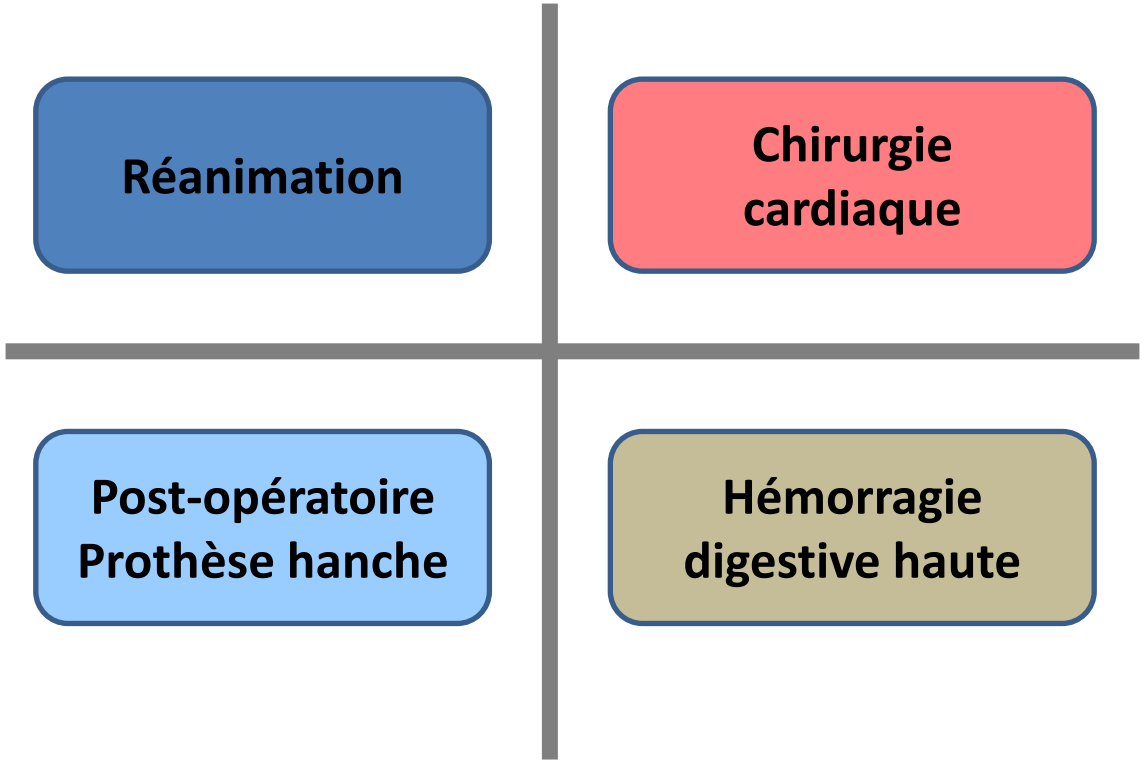
	Hb concentration threshold (g/L)	Patients transfused	Deviation from transfusion protocol	Mean Hb concentration at transfusion (g/L)	Participation of eligible patients
Intensive care[33]	70 *vs* 100	67% *vs* 99%	1·4% *vs* 4·3%	85 (SD 7)* *vs* 107 (SD 7)*	41%
Cardiothoracic surgery[34]	80 *vs* 100	47% *vs* 78%	1·6% *vs* 0·0%	91 (90–92) *vs* 105 (104–106)	75%
Repair of hip fracture[35]	80 *vs* 100	41% *vs* 97%	9·0% *vs* 5·6%	79 (SD 6) *vs* 92 (SD 5)	56%
Acute upper gastrointestinal bleeding[36]	70 *vs* 90	49% *vs* 86%	9·0% *vs* 3·0%	73 (SD 14) *vs* 80 (SD 15)	93%

Hb=haemoglobin. *Average daily Hb. †Different grading systems were used for documenting bleeding.

Lancet 2013; 381: 1845-54

Quel seuil transfusionnel ?

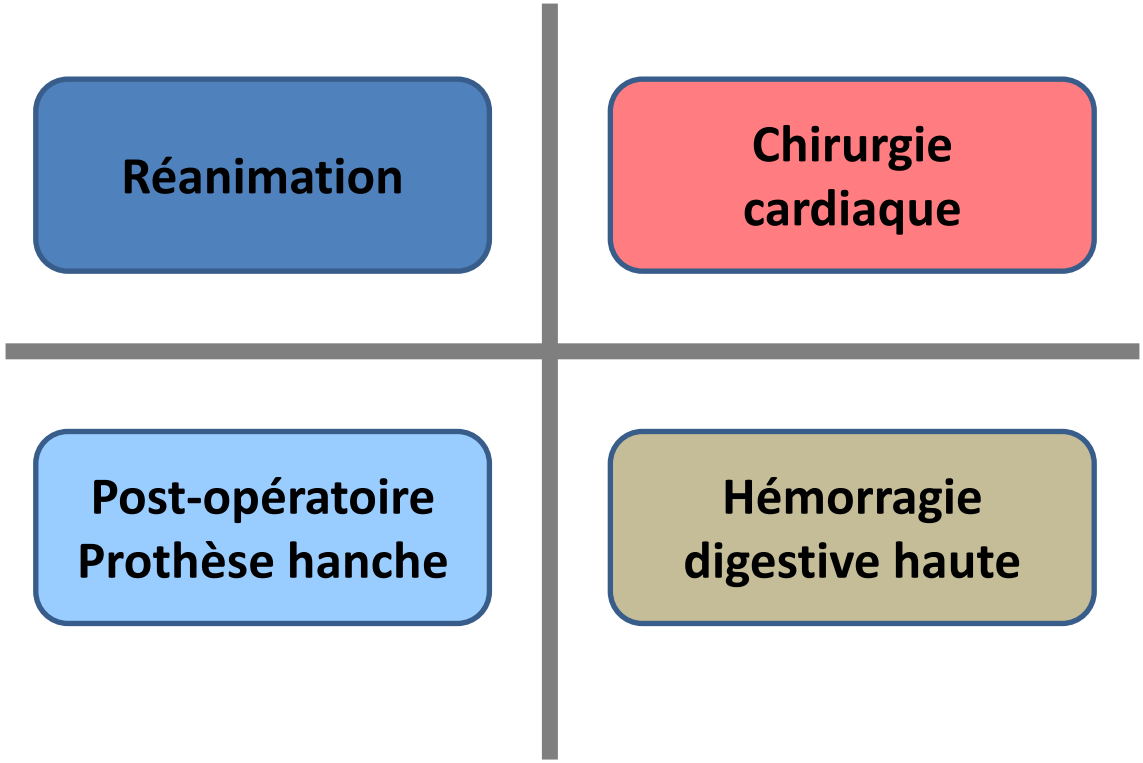
Principales études et leurs domaines d'application



Lancet 2013; 381: 1845-54

Quel seuil transfusionnel ?

Principales études et leurs domaines d'application



Lancet 2013; 381: 1845-54

Hôpital Européen
MARSEILLE | L'humain au cœur de nos soins

Fondation AMBROISE PARÉ 1846

Etude TRISS : 2014

Stratégie Restrictive (≤ 7 g/dl) vs Stratégie Libérale (≤10 g/dl)

n=998

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 9, 2014 VOL. 371 NO. 15

Lower versus Higher Hemoglobin Threshold for Transfusion in Septic Shock

Lars B. Holst, M.D., Nicolai Haase, M.D., Ph.D., Jørn Wetterslev, M.D., Ph.D., Jan Wernerman, M.D., Ph.D., Anne B. Guttormsen, M.D., Ph.D., Sari Karlsson, M.D., Ph.D., Pär I. Johansson, M.D., Ph.D., Anders Åneman, M.D., Ph.D., Marianne L. Vang, M.D., Robert Winding, M.D., Lars Nebrich, M.D., Helle L. Nibro, M.D., Ph.D., Bodil S. Rasmussen, M.D., Ph.D., Johnny R.M. Lauridsen, M.D., Jane S. Nielsen, M.D., Anders Oldner, M.D., Ph.D., Ville Pettilä, M.D., Ph.D., Maria B. Cronhjort, M.D., Lasse H. Andersen, M.D., Ulf G. Pedersen M.D., Nanna Reiter, M.D., Jørgen Wiis, M.D., Jonathan O. White, M.D., Lene Russell, M.D., Klaus J. Thornberg, M.D., Peter B. Hjortrup, M.D., Rasmus G. Müller, M.D., Morten H. Møller, M.D., Ph.D., Morten Steensen, M.D., Inga Tjäder, M.D., Ph.D., Kristina Kilsand, R.N., Suzanne Odeberg-Wernerman, M.D., Ph.D., Brit Sjøbø, R.N., Helle Bundgaard, M.D., Ph.D., Maria A. Thyø, M.D., David Lodahl, M.D., Rikke Mærkedahl, M.D., Carsten Albeck, M.D., Dorte Illum, M.D., Mary Kruse, M.D., Per Winkel, M.D., D.M.Sci., and Anders Perner, M.D., Ph.D., for the TRISS Trial Group* and the Scandinavian Critical Care Trials Group

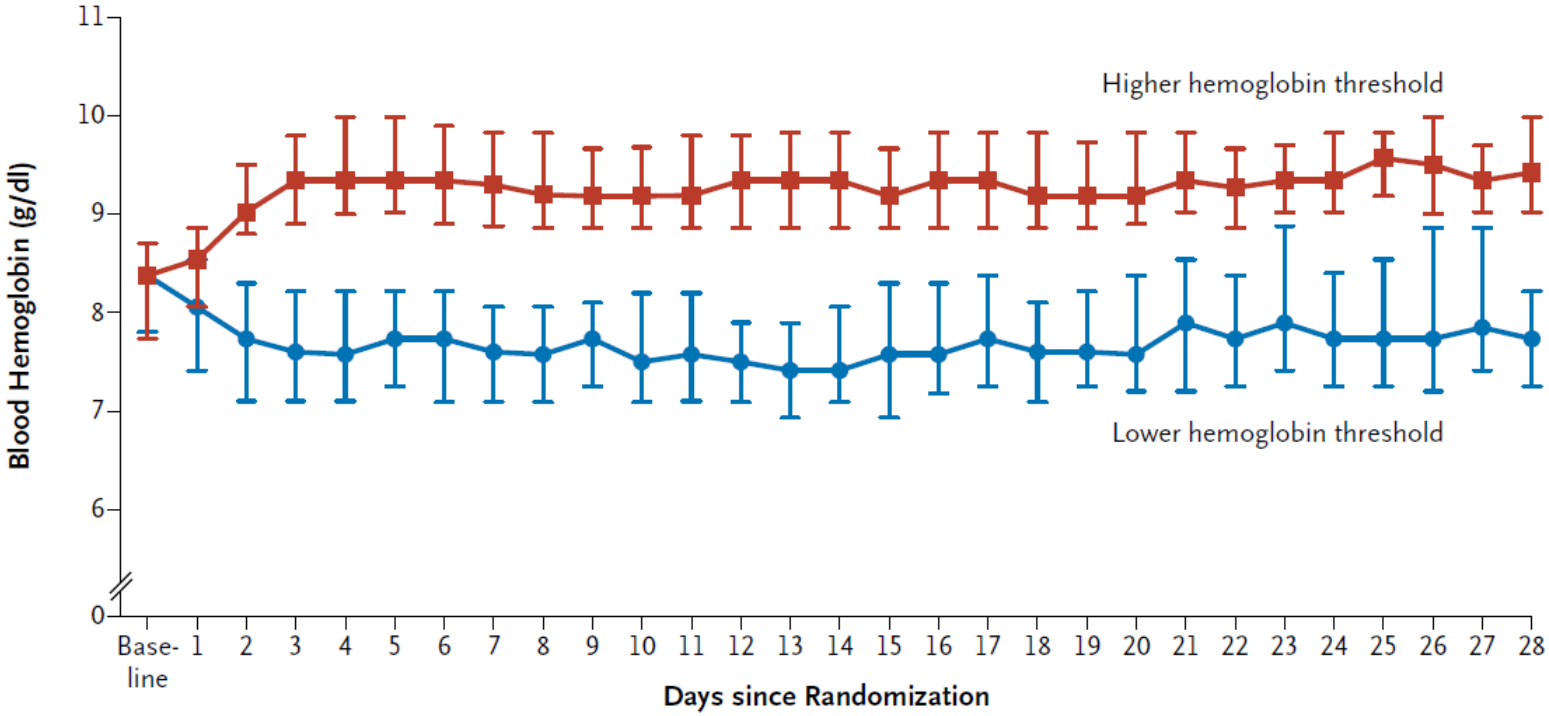
N Engl J Med 2014;371:1381-91.

Etude TRISS : 2014

Stratégie Restrictive (≤ 7 g/dl) vs Stratégie Libérale (≤10 g/dl)

n=998

Blood Hemoglobin Levels in Patients in the ICU at Baseline and after Randomization.

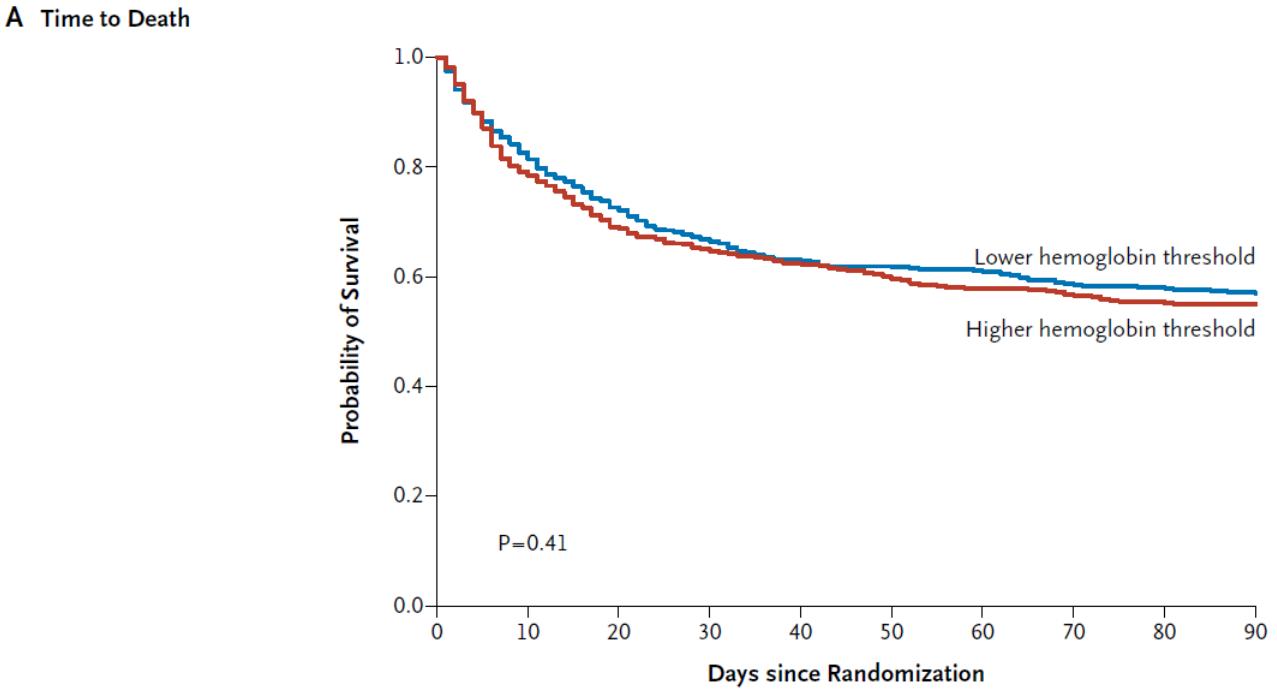


N Engl J Med 2014;371:1381-91.

Etude TRISS : 2014

Stratégie Restrictive (≤ 7 g/dl) vs Stratégie Libérale (≤10 g/dl)

n=998



No. at Risk				
Lower hemoglobin threshold	502	334	306	286
Higher hemoglobin threshold	496	321	287	273

N Engl J Med 2014;371:1381-91.

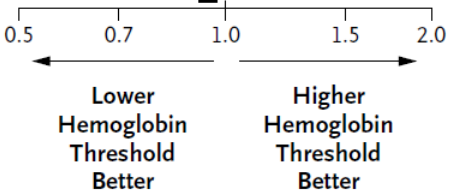
Etude TRISS : 2014

Stratégie Restrictive (≤ 7 g/dl) vs Stratégie Libérale (≤10 g/dl)

n=998

B Relative Risk of the Primary Outcome

Subgroup	Lower Hemoglobin Threshold	Higher Hemoglobin Threshold	Relative Risk (95% CI)	P Value for Heterogeneity
	no. of events/no. of patients in subgroup			
Age				0.85
>70 yr	93/173	98/185	0.98 (0.79–1.18)	
≤70 yr	123/329	125/311	0.94 (0.75–1.14)	
Chronic cardiovascular disease				0.25
Yes	42/75	33/66	1.08 (0.75–1.40)	
No	174/427	190/430	0.90 (0.75–1.06)	
SAPS II at baseline				0.06
>53	112/207	139/226	0.83 (0.64–1.04)	
≤53	104/295	84/270	1.10 (0.91–1.30)	
All patients	216/502	223/496	0.94 (0.78–1.09)	



N Engl J Med 2014;371:1381-91.

Quel seuil transfusionnel ?

Recommandation Française : HAS 2014

HAS
HAUTE AUTORITÉ DE SANTÉ

ansm
Agence nationale de sécurité du médicament et des produits de santé

SYNTHÈSE DE LA RECOMMANDATION DE BONNE PRATIQUE

Transfusions de globules rouges homologues : produits, indications, alternatives

Anesthésie, réanimation, chirurgie, urgence
Novembre 2014

Grade des recommandations

A	Preuve scientifique établie	C	Faible niveau de preuve
B	Présomption scientifique	AE	Accord d'experts

Quel seuil transfusionnel ?

Recommandation Française : HAS 2014

ANÉMIE AIGUË

Indication, modalités et seuil transfusionnel en anesthésie

B	Le seuil critique ($\dot{T}aO_2$ crit) chez l'homme anesthésié est de l'ordre de 5 mLO_2/kg/min.
AE	Pour conserver une marge de sécurité suffisante, le seuil de sécurité du transport artériel de l'oxygène aux tissus ($\dot{T}aO_2$ crit) recommandé chez l'adulte est situé à 10 mlO_2/kg/min. Il découle de ces données physiologiques que la tolérance à l'anémie aiguë est fonction des possibilités d'augmentation du débit cardiaque, ce qui explique d'une part que la correction de l'hypovolémie soit la première urgence, d'autre part que le seuil transfusionnel soit plus élevé chez les personnes atteintes d'insuffisance cardiaque. L'augmentation de la $\dot{V}O_2$ (fièvre, agitation…) réduit la tolérance à l'anémie.
B	Les seuils transfusionnels suivants d'hémoglobine au cours de la période périopératoire sont recommandés : • 7 g/dl chez les personnes sans antécédents particuliers ; • 10 g/dl chez les personnes ne tolérant pas cliniquement les concentrations d'hémoglobine inférieures ou atteintes d'insuffisance coronarienne aiguë ou d'insuffisance cardiaque avérée ou bêta-bloquées.
AE	Il est recommandé, au cours de la période périopératoire, de privilégier un seuil transfusionnel de 8-9 g/dl chez les personnes ayant des antécédents cardio-vasculaires.

Quel seuil transfusionnel ?

Recommandation Française : HAS 2014

ANÉMIE AIGUË

Indications, modalités et seuil transfusionnel en réanimation

Prise en charge en réanimation

B	Le seuil transfusionnel de 7 g/dl est recommandé en l'absence d'insuffisance coronarienne aiguë, y compris chez les patients ayant une cardiopathie chronique équilibrée. En présence d'une insuffisance coronarienne aiguë, le seuil transfusionnel est alors de 10 g/dl d'Hb.

Cas particulier du seuil transfusionnel chez le patient traumatisé

B	Hors traumatisme crânien et hors transfusion massive, le seuil transfusionnel recommandé est de 7 g/dl en l'absence de mauvaise tolérance clinique.

Cas particulier de la prise en charge des hémorragies digestives

B	Le seuil transfusionnel recommandé est de 7g/dl dans le cadre d'une hémorragie digestive.

Quel seuil transfusionnel ?

Recommandation Française : HAS 2014

Indications, modalités et seuil transfusionnel en réanimation

Cas particulier de la transfusion massive

Dans ce cas particulier, il est recommandé d'associer les CGR à du plasma thérapeutique et des concentrés de plaquettes.

En dehors du cadre de la transfusion massive, il n'est pas recommandé d'associer la prescription de plasma thérapeutique à celle de CGR.

NIVEAUX D'URGENCE

Urgence vitale immédiate (UVI) : obtention des CGR la plus rapide possible, délivrance sans délai.
Urgence vitale (UV) : obtention des CGR en moins de 30 minutes.
Urgence relative (UR) : obtention des CGR dans un délai de 2 à 3 heures.

AE	Le délai d'obtention des CGR prime sur celui des résultats d'examens immuno-hématologiques.

Hôpital Européen
MARSEILLE | L'humain au cœur de nos soins

Fondation AMBROISE PARÉ 1846

Quel seuil transfusionnel ?

REVIEW ARTICLE

The NEW ENGLAND JOURNAL of MEDICINE

Indications for and Adverse Effects of Red-Cell Transfusion

Jeffrey L. Carson, M.D., Darrell J. Triulzi, M.D., and Paul M. Ness, M.D.

N Engl J Med 2017;377:1261-72.

Quel seuil transfusionnel ?

Red-Cell Transfusion Guidelines

Sponsor and Year	Recommended Hemoglobin Concentration as Threshold for Transfusion			Comments
	Overall	Subgroups	Cardiovascular Disease	
AABB, 2016[9]	Restrictive transfusion threshold of 7 g/dl for hospitalized adults who are hemodynamically stable, including critically ill patients, and 8 g/dl for patients undergoing orthopedic or cardiac surgery and those with preexisting cardiovascular disease	No recommendation for patients with acute coronary syndromes or thrombocytopenias or for those requiring long-term transfusion	8 g/dl in patients with preexisting cardiovascular disease	Good practice includes consideration of overall clinical situation, patient's preference, and alternative therapies, in addition to hemoglobin concentration

≤ 7 g/dL
Tous les patients

≤ 8 g/dL
Ins Cardiaque, Coronarien

N Engl J Med 2017;377:1261-72.

Transfusion en Réanimation

39 % des patients en Réanimation nécessite une transfusion

Results of epidemiologic studies on anemia and blood transfusions in critical care

	ABC Trial [2] (Western Europe)	CRIT Study [3] (USA)	TRICC Investigators [9] (Canada)	North Thames Blood Interest Group [5] (UK)
n	3534	4892	5298	1247
Mean admission hemoglobin (g/dl)	11.3 ± 2.3	11.0 ± 2.4	9.9 ± 2.2	–
Percentage of patients transfused in ICU	37.0%	44.1%	25%	53.4%
Mean transfusions per patient (units)	4.8 ± 5.2	4.6 ± 4.9	4.6 ± 6.7	5.7 ± 5.2
Mean pretransfusion hemoglobin (g/dl)	8.4 ± 1.3	8.6 ± 1.7	8.6 ± 1.3	8.5 ± 1.4
Mean ICU length of stay (days)	4.5	7.4 ± 7.3	4.8 ± 12.6	–
ICU mortality	13.5%	13.0%	22%	21.5%
Hospital mortality	20.2%	17.6%	–	–
Admission APACHE II (mean)	14.8 ± 7.9	19.7 ± 8.2	18 ± 11	18.1 ± 9.1

39,9 %

Data are expressed as mean ± standard deviation. ABC, Anemia and Blood Transfusion in Critical Care; APACHE, Acute Physiology and Chronic Health Evaluation; ICU, intensive care unit; TRICC, Transfusion Requirements in Critical Care.

Critical Care 2004, **8(Suppl 2)**:S1-S8

Transfusion en Réanimation

33 % des patients en Réanimation nécessite une transfusion

Multicenter observational studies of transfusion in general ICU patients

Author	Year study was conducted	Country/region	No. of patients and number of ICUs	Percentage transfused in ICU
Hebert et al. [9]	1993	Canada	5,298 patients in 6 ICUs	25.0
Vincent et al. [3]	1999	Western Europe	3,534 patients in 146 ICUs	37.0
Rao et al. [6]	1999	UK	1,247 patients in 9 ICUs	53.0
Corwin et al. [5]	2000 - 2001	USA	4,892 patients in 284 ICUs	44.0
Walsh et al. [7]	2001	UK (Scotland)	1,023 patients in 10 ICUs	39.5
French et al. [10]	2001	Australia and New Zealand	1,808 patients in 18 ICUs	19.8
Vincent et al. [34]	2002	Western and Eastern Europe	3,147 patients in 198 ICUs	33.0
Westbrook et al. [8]	2008	Australia and New Zealand	5,128 patients in 47 ICUs	14.7

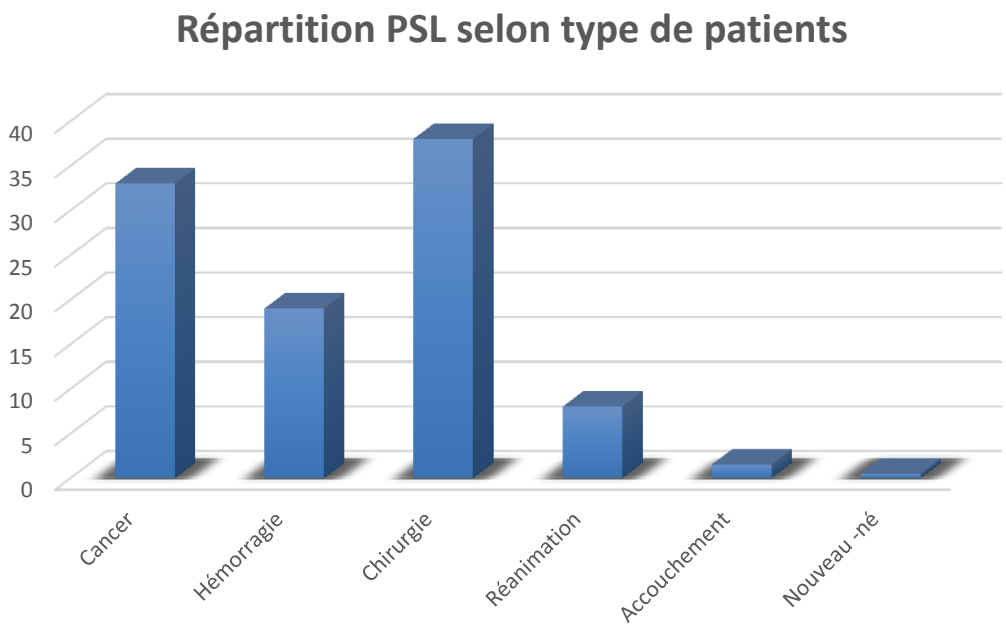
ICU intensive care unit; *NS* not specified; *IQR* interquartile range

33,3 %

Lelubre and Vincent *Annals of Intensive Care* 2011, **1**:43

Transfusion à l'Hôpital

INSTITUT NATIONAL DE LA TRANSFUSION SANGUINE



Transfusion à l'Hôpital

Incidence, Predictors, and Outcomes of Hospital-Acquired Anemia

n=11309

Cohorte rétrospective (Médecine - 6 Hôpitaux) : absence d'anémie admission

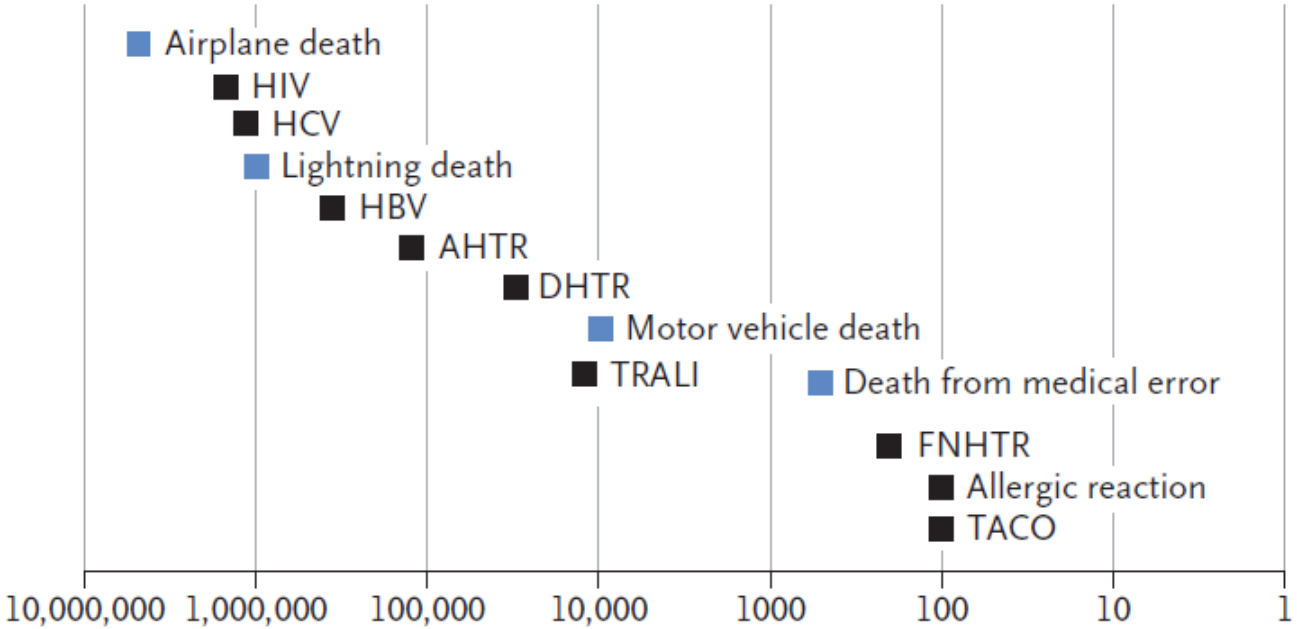
	HAA Severity[a]				
	None	Mild	Moderate	Severe	*P*
N	7563	2445	1142	159	
Age, mean (SD), y	59.6 (17.1)	59.7 (17.5)	63.3 (16.9)	65.3 (16.0)	<0.001
Female, n (%)	4487 (59.3)	1188 (48.6)	948 (83.0)	114 (71.7)	<0.001
Hematocrit on admission, median (IQR)	41 (39-43)	41 (38-42)	38 (37-41)	39 (37-42)	<0.001
Receipt of blood transfusion, n (%)	44 (0.6)	75 (3.1)	136 (11.9)	43 (27.0)	<0.001

6,7 %

Journal of Hospital Medicine 2017;12:317-322.

Transfusion: Quels risques ?

Infectious and Noninfectious Adverse Effects of Red-Cell Transfusions as Compared with Other, Unrelated Risks.



N Engl J Med 2017;377:1261-72.

Transfusion: Quels risques ?

Risque Immunologique > Risque infectieux

Table 1. Transfusion-transmitted viruses. Current testing of blood donors miss these viruses if the donors are in the "window period" when they are infected but do not yet test positive[1–4].

Transfusion-transmitted viruses	Risk per unit transfused
Human immunodeficiency virus	1:1,000,000 to 1:5,000,000
Hepatitis C virus	1:1,100,000 to 1:10,000,000
Hepatitis B virus	1:400,000 to 1:1,200,000

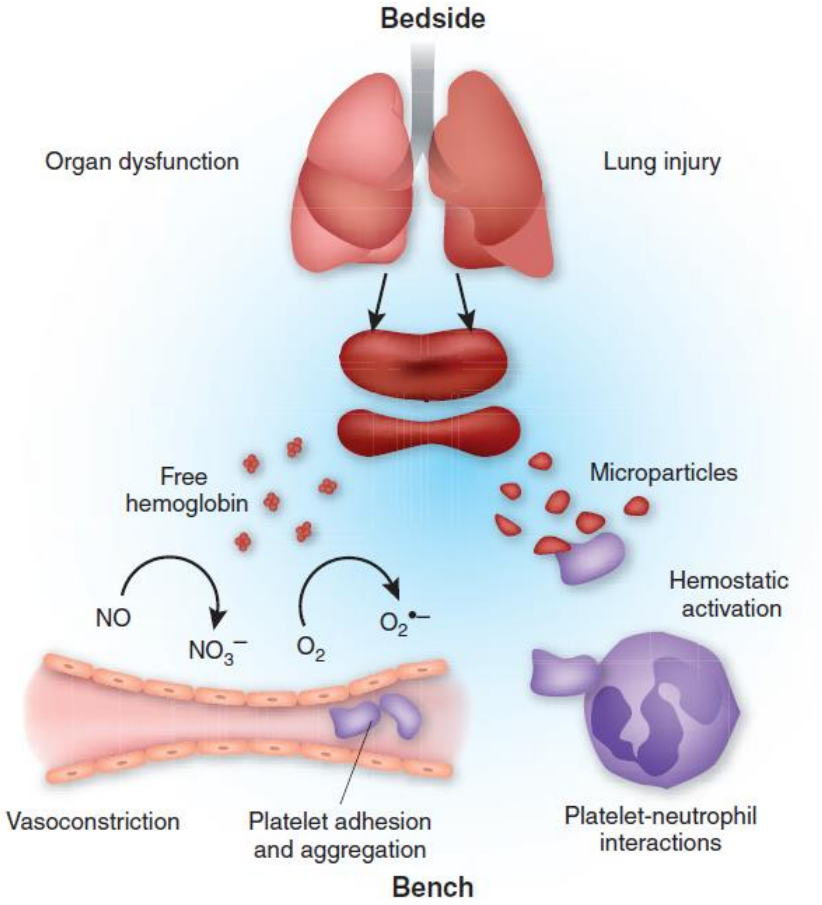
Table 2. Transfusion fatalities reported to the Food and Drug Administration in the United States from fiscal year (FY) 2010 to FY2014[5].

Causes	No. Cases FY2010–FY2014	%
TRALI and possible TRALI	72	41
TACO	38	22
Hemolytic transfusion reaction (non-ABO)	25	14
Microbial infection	15	8
Hemolytic transfusion reaction (ABO)	13	7
Anaphylaxis	10	6
Other*	3	2
TOTAL	176	100

F1000Research 2015, 4(F1000 Faculty Rev):1469

Durée de conservation ?

Une conservation prolongée des CGR altère leur efficacité….



NATURE MEDICINE VOLUME 16 | NUMBER 4 | APRIL 2010

Etude - : 2013

Stratégie Restrictive (≤7 g/dl) vs Stratégie Libérale (≤9 g/dl)

n=889

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JANUARY 3, 2013 VOL. 368 NO. 1

Transfusion Strategies for Acute Upper Gastrointestinal Bleeding

Càndid Villanueva, M.D., Alan Colomo, M.D., Alba Bosch, M.D., Mar Concepción, M.D., Virginia Hernandez-Gea, M.D., Carles Aracil, M.D., Isabel Graupera, M.D., María Poca, M.D., Cristina Alvarez-Urturi, M.D., Jordi Gordillo, M.D., Carlos Guarner-Argente, M.D., Miquel Santaló, M.D., Eduardo Muñiz, M.D., and Carlos Guarner, M.D.

N Engl J Med 2013;368:11-21.

Etude - : 2013

Stratégie Restrictive (≤7 g/dl) vs Stratégie Libérale (≤9 g/dl)

n=889

Hemoglobin Levels, Transfusions, and Cointerventions.

Variable	Restrictive Strategy (N=444)	Liberal Strategy (N=445)	P Value
Hemoglobin level — g/dl			
At admission	9.6.±2.2	9.4±2.4	0.45
Lowest value during hospital stay	7.3±1.4	8.0±1.5	<0.001
At discharge†	9.2±1.2	10.1±1.0	<0.001
At day 45	11.6±1.7	11.7±1.8	0.67
Patients with lowest hemoglobin <7 g/dl — no. (%)	202 (45)	81 (18)	<0.001
Patients with lowest hemoglobin >9 g/dl — no. (%)	55 (12)	67 (15)	0.28
Red-cell transfusion			
Any — no. of patients (%)	219 (49)	384 (86)	<0.001
Units transfused — no.			
Total‡	671	1638	<0.001
Mean/patient	1.5±2.3	3.7±3.8	<0.001
Median	0	3	<0.001
Range	0–19	0–36	
During index bleeding§	1.2±1.8	2.9±2.2	<0.001
Transfusion not adjusted to hemoglobin level — no. of patients (%)¶	35 (8)	12 (3)	0.001
Major protocol violation — no. of patients (%)‖	39 (9)	15 (3)	<0.001

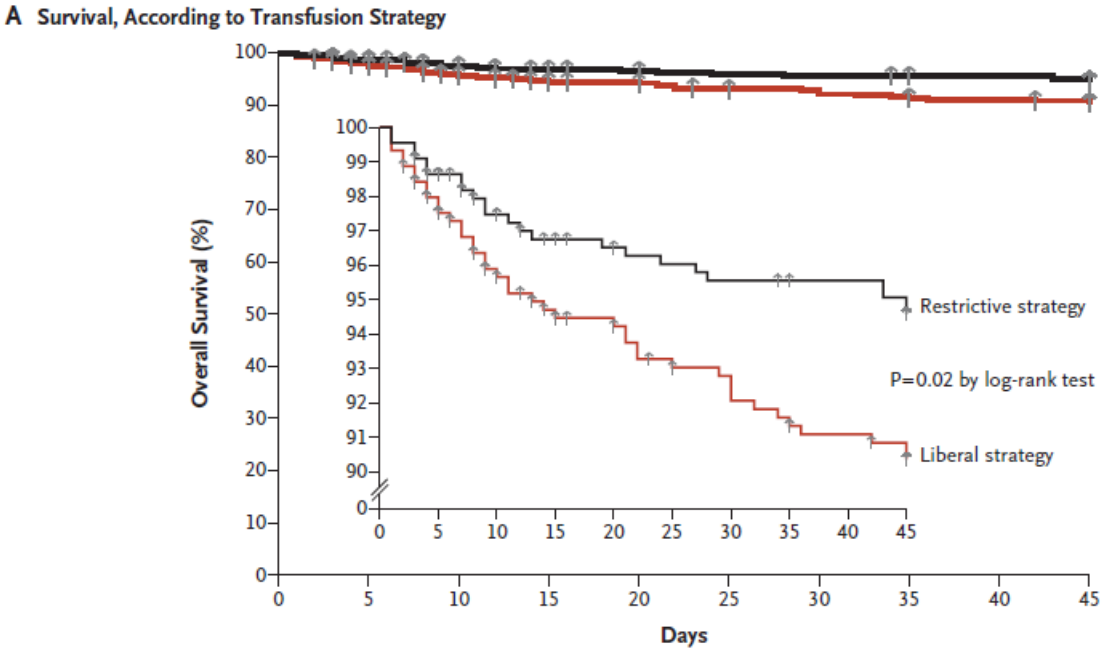
N Engl J Med 2013;368:11-21.

Etude - : 2013

Stratégie Restrictive (≤7 g/dl) vs Stratégie Libérale (≤9 g/dl)

n=889

Rate of Survival, According to Subgroup.



No. at Risk										
Restrictive strategy	444	429	412	404	401	399	397	395	394	392
Liberal strategy	445	428	407	397	393	386	383	378	375	372

N Engl J Med 2013;368:11-21.

Etude - : 2013

Stratégie Restrictive (≤7 g/dl) vs Stratégie Libérale (≤9 g/dl)

n=889

Study Outcomes.

Outcome	Restrictive Strategy (N=444)	Liberal Strategy (N=445)	Hazard Ratio with Restrictive Strategy (95% CI)	P Value
Death from any cause within 45 days — no. (%)	23 (5)	41 (9)	0.55 (0.33–0.92)	0.02
Further bleeding — no. of patients/total no. (%)				
Overall	45/444 (10)	71/445 (16)	0.62 (0.43–0.91)	0.01
Patients with cirrhosis	16/139 (12)	31/138 (22)	0.49 (0.27–0.90)	0.02
Child–Pugh class A or B	12/113 (11)	23/109 (21)	0.53 (0.27–0.94)	0.04
Child–Pugh class C	4/26 (15)	8/29 (28)	0.58 (0.15–1.95)	0.33
Bleeding from esophageal varices	10/93 (11)	21/97 (22)	0.50 (0.23–0.99)	0.05
Rescue therapies				
Balloon tamponade	3/139 (2)	11/138 (8)		0.03
TIPS	6/139 (4)	15/138 (11)		0.04
Patients with bleeding from peptic ulcer	23/228 (10)	33/209 (16)	0.63 (0.37–1.07)	0.09
Rescue therapies				
Second endoscopic therapy	20/228 (9)	26/209 (12)		0.21
Emergency surgery	4/228 (2)	12/209 (6)		0.04
No. of days in hospital	9.6±8.7	11.5±12.8		0.01

N Engl J Med 2013;368:11-21.

Etude - : 2013

Stratégie Restrictive (≤7 g/dl) vs Stratégie Libérale (≤9 g/dl)

n=889

Study Outcomes.

Outcome	Restrictive Strategy (N=444)	Liberal Strategy (N=445)	Hazard Ratio with Restrictive Strategy (95% CI)	P Value
Adverse events — no. (%)†				
Any‡	179 (40)	214 (48)	0.73 (0.56–0.95)	0.02
Transfusion reactions	14 (3)	38 (9)	0.35 (0.19–0.65)	0.001
Fever	12 (3)	16 (4)	0.74 (0.35–1.59)	0.56
Transfusion-associated circulatory overload	2 (<1)	16 (4)	0.06 (0.01–0.45)	0.001
Allergic reactions	1 (<1)	6 (1)	0.16 (0.02–1.37)	0.12
Cardiac complications§	49 (11)	70 (16)	0.64 (0.43–0.97)	0.04
Acute coronary syndrome¶	8 (2)	13 (3)	0.61 (0.25–0.49)	0.27
Pulmonary edema	12 (3)	21 (5)	0.56 (0.27–1.12)	0.07
Pulmonary complications	48 (11)	53 (12)	0.89 (0.59–1.36)	0.67
Acute kidney injury	78 (18)	97 (22)	0.78 (0.56–1.08)	0.13
Stroke or transient ischemic attack	3 (1)	6 (1)	0.49 (0.12–2.01)	0.33
Bacterial infections	119 (27)	135 (30)	0.87 (0.63–1.21)	0.41

N Engl J Med 2013;368:11-21.

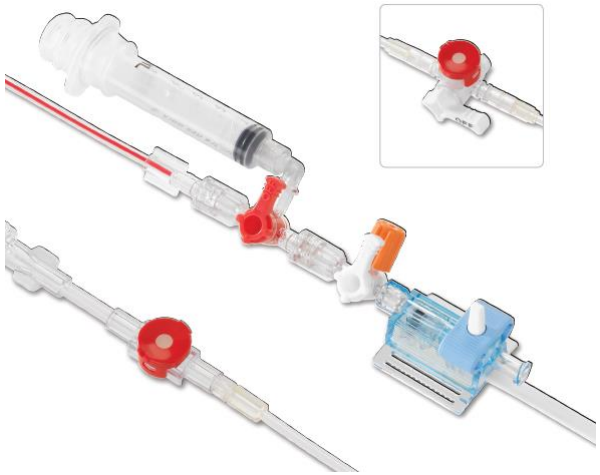
Systèmes d'épargne sanguine. 1

MERITMEDICAL

Safedraw®-P

Dispositifs de capteur à usage unique Meritrans® DTXPlus® pour un prélèvement artériel en toute sécurité

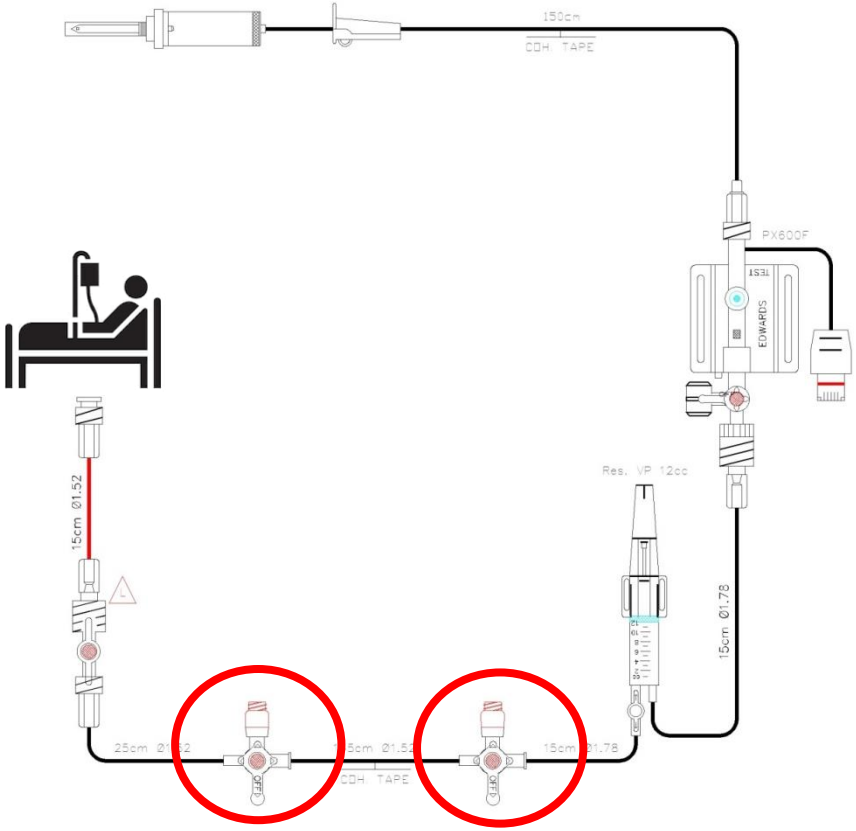
Système de surveillance de la pression et de prélèvement sanguin artériel en circuit fermé



smiths medical

Système clos de prélèvement sanguin HemoDraw® Plus

Systèmes d'épargne sanguine. 2



Proximal Distal

Edwards
LIFESCIENCES

VAMP Plus System

Venous Arterial blood Management Protection

Hôpital Européen
MARSEILLE | L'humain au cœur de nos soins

Fondation AMBROISE PARÉ 1846

Données Cliniques

Mukhopadhyay *et al. Critical Care* 2010, **14**:R7
http://ccforum.com/content/14/1/R7

CRITICAL CARE

RESEARCH Open Access

The use of a blood conservation device to reduce red blood cell transfusion requirements: a before and after study

Amartya Mukhopadhyay*[1], Hwee S Yip[1], Dimple Prabhuswamy[1], Yiong H Chan[2], Jason Phua[1], Tow K Lim[1] and Patricia Leong[3]

American Journal of Infection Control 40 (2012) 530-4

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

ELSEVIER

AJIC American Journal of Infection Control

Major article

Comparison of bacterial contamination of blood conservation system and stopcock system arterial sampling lines used in critically ill patients

Jun Oto MD[a,*], Emiko Nakataki MD[a], Michiko Hata[b], Yumiko Tsunano MD[a], Nao Okuda MD[a], Hideaki Imanaka MD[a], Masaji Nishimura MD[a]

[a] *Emergency and Critical Care Medicine, The University of Tokushima Graduate School, Tokushima, Japan*
[b] *Microbiological Center, The University of Tokushima Graduate School, Tokushima, Japan*

ORIGINAL ARTICLE

Ederlon Rezende[1], Marcus Antonio Ferez[2], João Manoel da Silva Junior[1], Amanda Maria Ribas Rosa de Oliveira[3], Renata Andréa Pietro Pereira Viana[4], Ciro Leite Mendes[5], Diogo de Oliveira Toledo[6], Miguel Costa Ribeiro Neto[4], Tatiane Akemi Setoyama[4]

Closed system for blood sampling and transfusion in critically ill patients

Utilização de sistema fechado para coleta de sangue e necessidade de transfusão em pacientes graves

Anaesth Intensive Care 2003; **31**: 653-657

The Influence of a Blood Conserving Device on Anaemia in Intensive Care Patients

C. M. MACISAAC*, J. J. PRESNEILL†, C. A. BOYCE‡, K. L. BYRON‡, J. F. CADE§
Intensive Care Unit, The Royal Melbourne Hospital, Melbourne, Victoria

VAMP

Données Cliniques. 1

The Influence of a Blood Conserving Device on Anaemia in Intensive Care Patients[1]

C. M. Macisaac, J.J. Presnell , C. A. Boyce, K. L. Byron, J. F. Cade

Australia
2003 - RCT
160 Pts
VAMP vs A-line

21% vs 38%
Pts tranfused

	Control n = 80	VAMP n = 80	P
Male, *n (%)*	47 (59)	49 (61)	0.87*
Age, *median (range), y*	64 (18-92)	64 (17-86)	0.28†
APACHE II, *median (range)*	14.0 (4-33)	15.0 (3-29)	0.68†
Admission Hb, *median (range) g/l*	107 (66-170)	111 (67-170)	0.18†
ICU length of stay, *median (range) day*	3.1 (0.2-30)	2.0 (0.2-54)	0.49†
Arterial catheter duration, *median (range) day*	2.8 (0.1-25)	1.9 (0.0-20)	0.25†
Number of arterial catheters, *median (range) n*	1 (1-3)	1 (1-4)	0.27#
Renal failure requiring, renal replacement therapy, *n (%)*	7 (9)	10 (13)	0.61*
Volume of blood drawn during ICU stay, *median (range), ml*			
«Blank»	62 (5-886)	1 (0-206)	<0.001†
Diagnostic tests	68 (2-801)	62 (0-599)	0.69†
Total	133 (7-1227)	63 (0-787)	0.001†
Discard Volume drawn per ICU day, *median (range) ml*	21 (5-58)	2.0 (0-53)	0.001†
Transfused, *n (%)*	30 (38)	17 (21)	0.04*

*Fisher Exact, †Mann-Whitney, #Chi-square

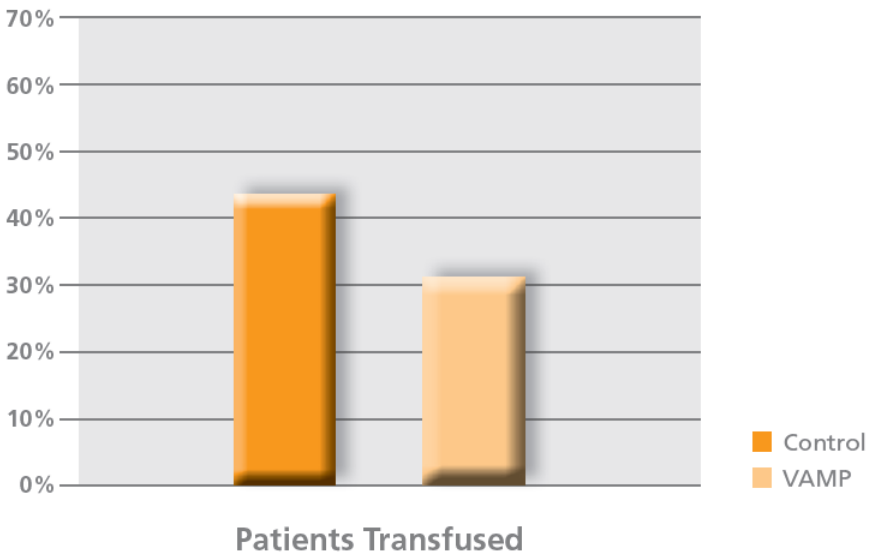
Données Cliniques. 2

Closed System for Blood Sampling and Transfusion in Critically Ill Patients[2]

Ederlon Rezende, Marcus Antonio Ferez, João Manoel da Silva Junior, Amanda Maria Ribas Rosa de Oliveira, Renata Andréa Pietro Pereira Viana, Ciro Leite Mendes, Diogo de Oliveira Toledo, Miguel Costa Ribeiro Neto, Tatiane Akemi Setoyama

Brazil
2010 - RCT
127 Pts
VAMP vs A-line

30% vs 42%
Pts tranfused



Données Cliniques. 3

The Use of a Blood Conservation Device to Reduce Red Blood Cell Transfusion Requirements[3]

Amartya Mukhopadhyay, Hwee S Yip, Dimple Prabhuswamy, Yiong H Chan, Jason Phua, Tow K Lim and Patricia Leong

Singapore
2010 - B&A
250 Pts
VAMP vs A-line

0.07 vs 0.13
pRBC Units

	Control group: without VAMP	Active group: with VAMP	P-value
All patients, *n*	80	170	
PRBC transfusion (unit/patient/day)	0.131	0.068	0.02*
Hb on admission (g/dl)	12.4 ± 2.5	11.58 ± 2.8	0.02
Hb on discharge (g/dl)	10.2 ± 1.8	10.1 ± 2	0.6
Loss of Hb (g/dl)	2.12 ± 2.32	1.44 ± 2.08	0.02

* Adjusted for certain variables (see study)

Données Cliniques. 4

Comparison of Bacterial Contamination of Blood Conservation System and Stopcock System Sampling Lines Used in Critically Ill Patients[4]

Jun Oto, Emiko Nakataki, Michiko Hata, Yumiko Tsunano, Nao Okuda, Hideaki Imanaka, Masali Nishimura

Japan
2012 - RCT
211 Pts
Vamp vs A-line

1.8% vs 8.4%
Contaminations

↓↓↓

Contamination rate of 2 arterial line systems

	VAMP group (n = 109)	Comparator group (n = 107)	P-value
Catheter tip Contamination, n (%)	8 (7.3)	11 (10.3)	.48
1000 Catheter-days (95% CI)	12 (4-20)	22 (9-34)	.14
Fluid contamination, n (%)	2 (1.8)	9 (8.4)	.03
1000 Catheter-days (95% CI)	3 (0-7)	18 (6-29)	.02

CI: confidence interval

Données Cliniques: Synthèse

Anaesthesia and Intensive Care	RBTI Revista Brasileira de Terapia Intensiva	CRITICAL CARE	AJIC American Journal of Infection Control
Australia 2003 - RCT 160 Pts **VAMP vs A-line**	Brazil 2010 - RCT 127 Pts **VAMP vs A-line**	Singapore 2010 - B&A 250 Pts **VAMP vs A-line**	Japan 2012 - RCT 211 Pts **VAMP vs A-line**
21% vs 38% Pts tranfused ↓↓↓	30% vs 42% Pts tranfused ↓↓↓	0.07 vs 0.13 pRBC Units ↓↓↓	1.8% vs 8.4% Contaminations ↓↓↓

Analyse économique. 1

Diminution de 10 % du nombre de transfusion

JORF n°0298 du 24 décembre 2015 page 23927
texte n° 54

Arrêté du 22 décembre 2015 modifiant l'arrêté du 9 mars 2010 relatif au tarif de cession des produits sanguins labiles

Sang humain total (unité adulte, unité enfant et unité pédiatrique)	114,74
Concentré de globules rouges humains homologues (unité adulte, unité enfant et unité pédiatrique)	189,77
Concentré de globules rouges humains homologues déleucocyté (unité adulte, unité enfant et unité pédiatrique)	189,77
Concentré unitaire de granulocytes d'aphérèse	556,21
Mélange de concentrés de plaquettes standard :	
— concentration minimale de 1×10^{11} plaquettes par poche	77,44
— puis par tranche supplémentaire d'unité thérapeutique de $0,5 \times 10^{11}$	38,72
Concentré de plaquettes d'aphérèse :	
— concentration minimale de 2×10^{11} plaquettes par poche	224,57

80 CGR × 189,77 = 15 181,66 € HT

Analyse économique. 2

Hypothèse d'une consommation annuelle de 1500 systèmes VAMP

Surcout vs set TruWave™

1500 × 8,16 = 12 240 € HT

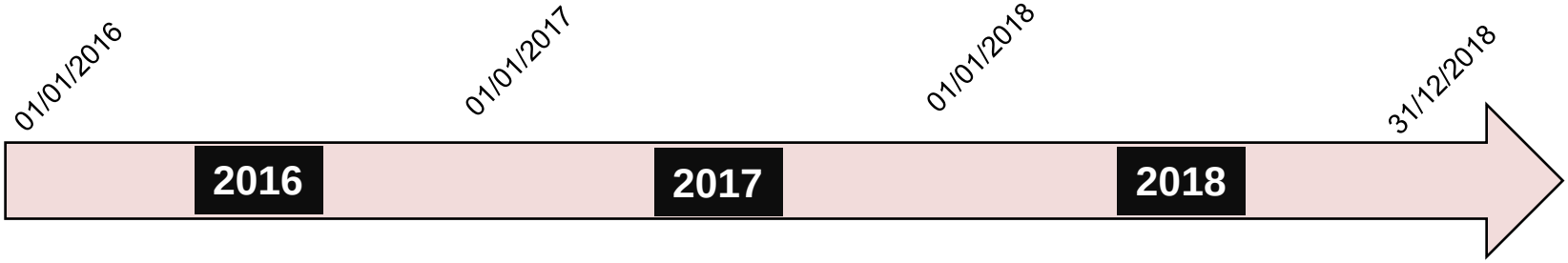
Gain sur transfusion CGR

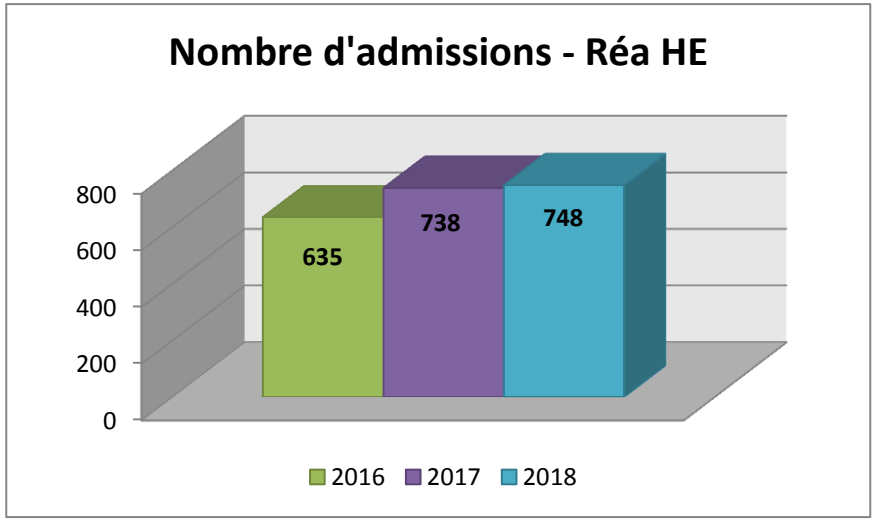
Economie minimale attendu

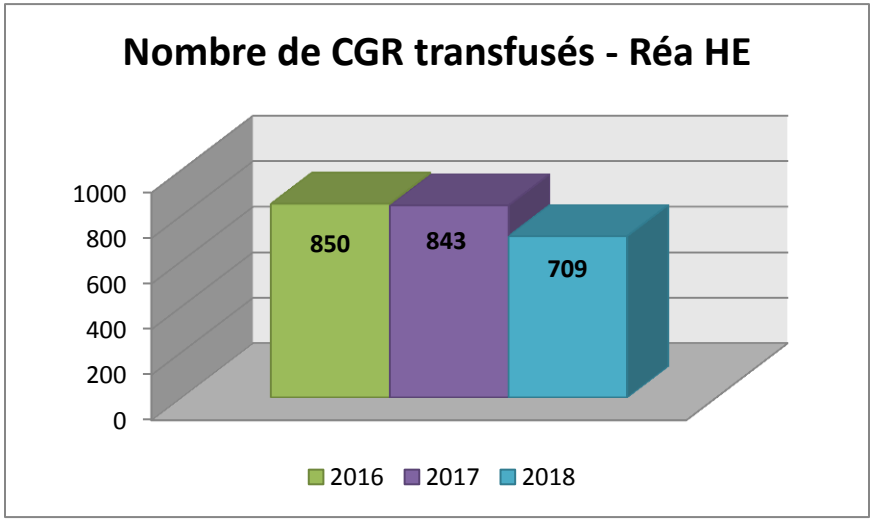
15 181,66 – 12 240 = 2 941,66 € HT

Expérience Locale: Réa - HE

Analyse de la consommation de CGR sur 3 ans : 2016 => 2018

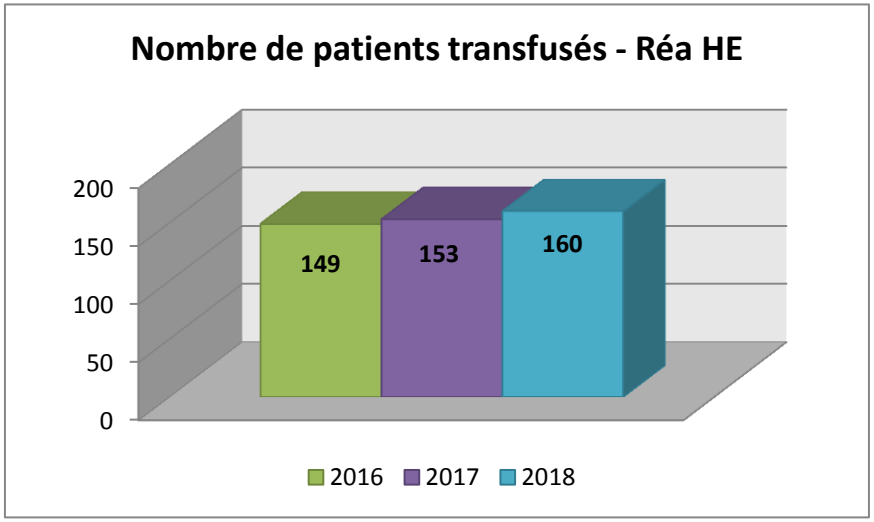


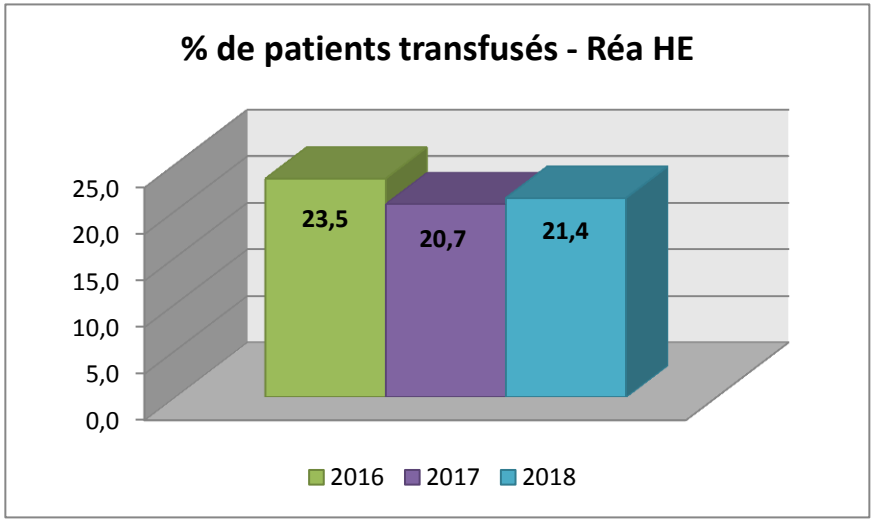




Transfusion en Réanimation - HE

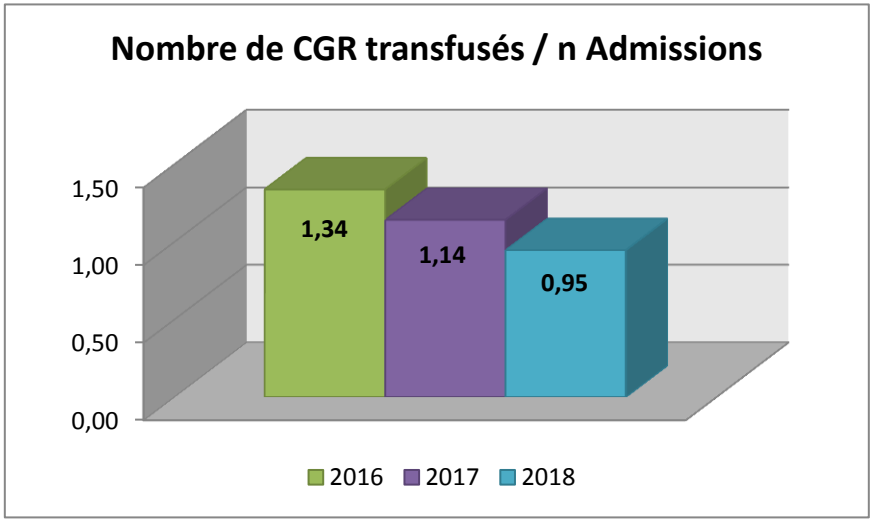
Réanimation Polyvalente de l'Hôpital Européen Marseille…

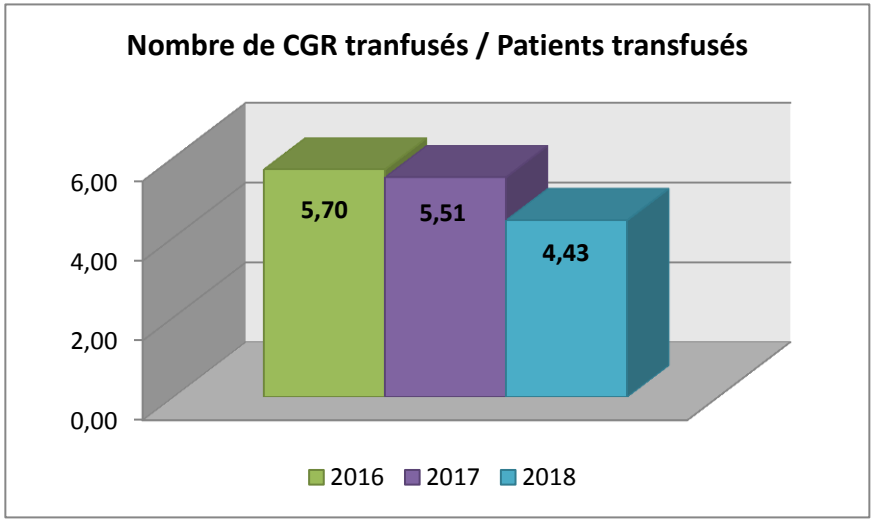




Transfusion en Réanimation - HE

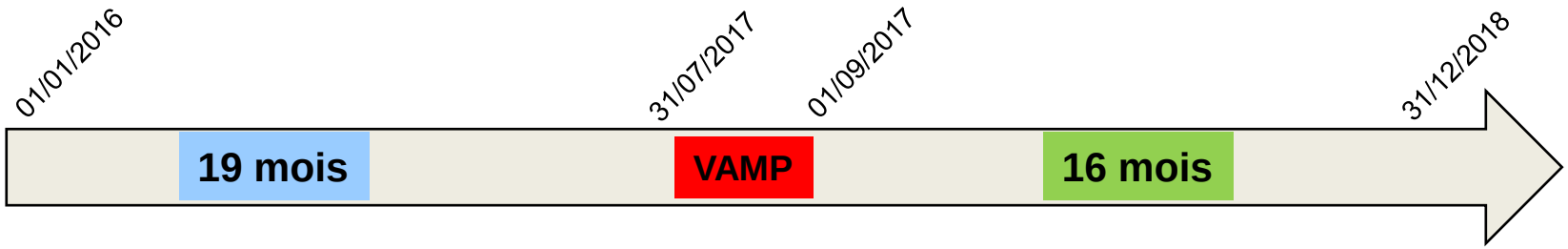
Réanimation Polyvalente de l'Hôpital Européen Marseille…

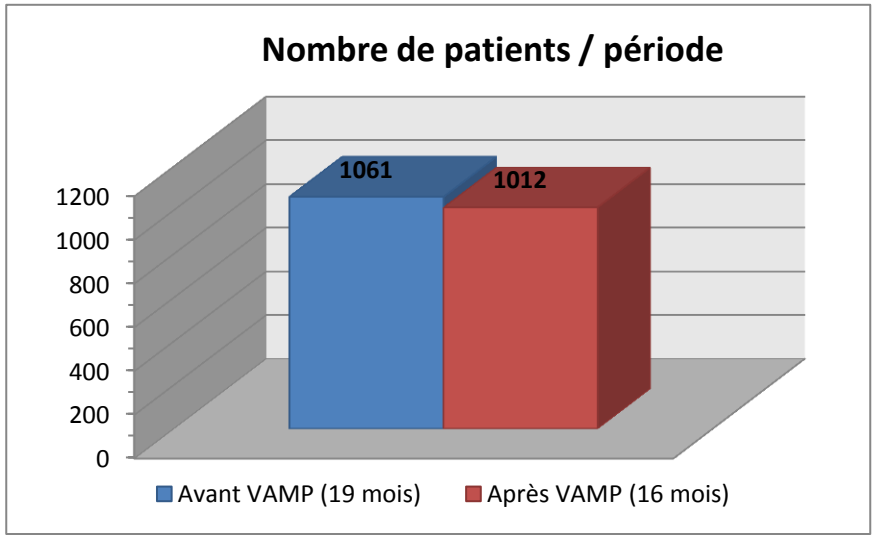


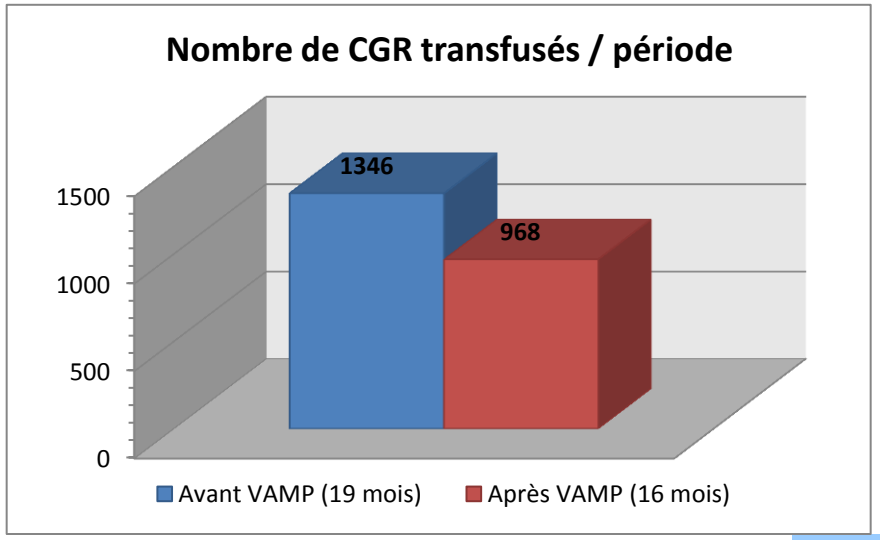


Etude Avant – Après : Réa HE

Comparaison d'une période sans système VAMP versus avec VAMP



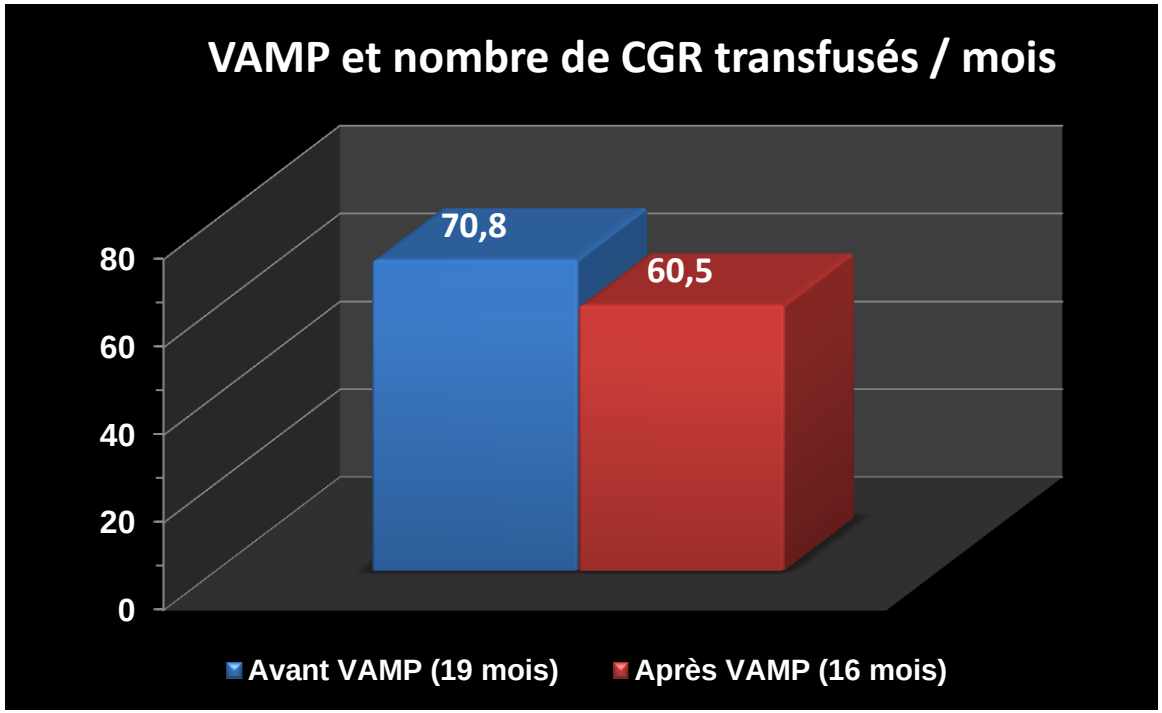




VAMP

Etude Avant – Après : Réa HE

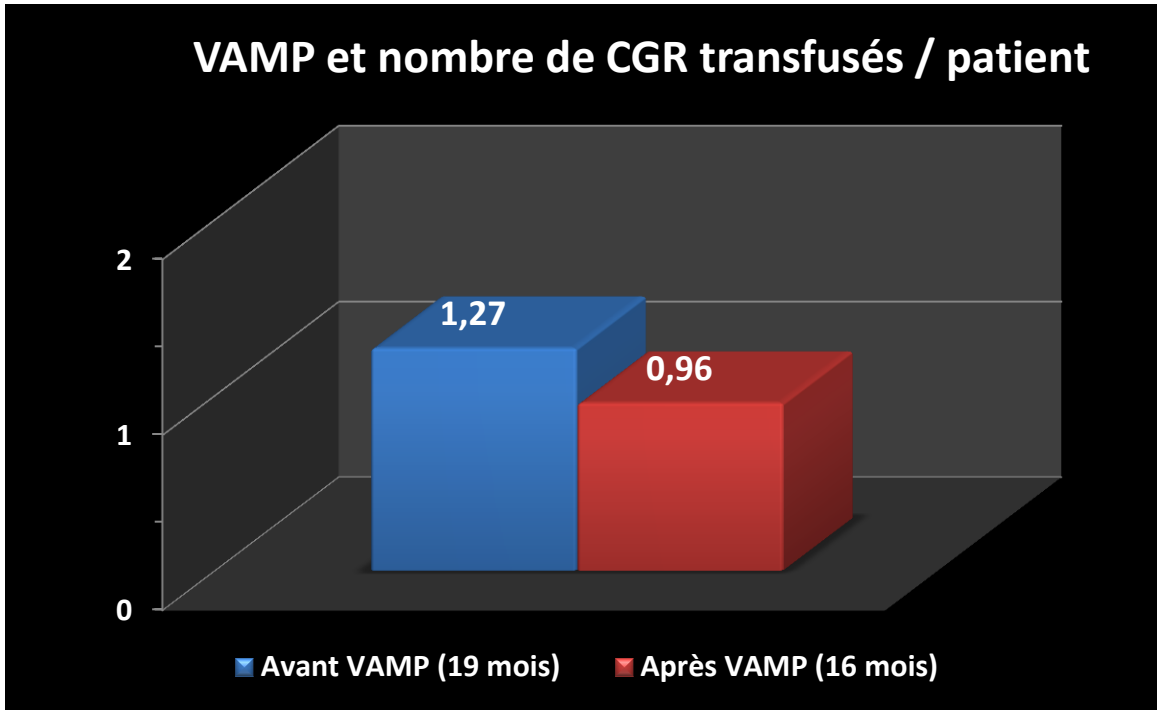
Comparaison d'une période sans système VAMP versus avec VAMP



Réduction de 15%

Etude Avant – Après : Réa HE

Comparaison d'une période sans système VAMP versus avec VAMP



1 CGR épargné tous les 3 patients admis

Conclusion

- Transfusion CGR: fréquent en Réanimation (20-25 %).
- Rôle important des prélèvements sanguins.
- Système d'épargne sanguine => épargne le volume de la purge ! (≈20 ml/j).
- Preuves cliniques concordantes…
- Réduction de la consommation CGR (10 – 15 %).
- Analyse économique => favorable.
- Gain individuel à l'échelle du patient.