

**Qualità ed appropriatezza
Better and Faster**



SAVE THE DATE

MILANO, ENTERPRISE HOTEL

**V CONGRESSO NAZIONALE
ORTHOPEA**

Timing
trasfusionale: il
trigger trasfusionale
può essere dato da
un solo numero?

Dottor Giovanni Albano
Direttore Dipartimento Anestesia e Terapia Intensiva
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Bergamo



Trigger QUANTITATIVO: la ricerca della soglia di Hb



... IL CONTESTO ...

Entità' di anemizzazione prevista

Ch.protesica in fase demolitiva o ch cardiaca

Onset dell'anemizzazione

Anemia acuta vs cronica, chirurgia con grandi perdite in poco tempo

Contesto clinico

Politrauma, sepsi grave/shock settico, ischemia cardiaca, grave insufficienza respiratoria ipossica

Riserva del paziente

Età (?), malattie ematologiche con disfunzione della serie rossa/Hb, insufficienza renale cronica, BPCO

Durante tecniche di circolazione extracorporea

Emodiluizione, priming, necessità di mantenere buon volume effettivo circolante

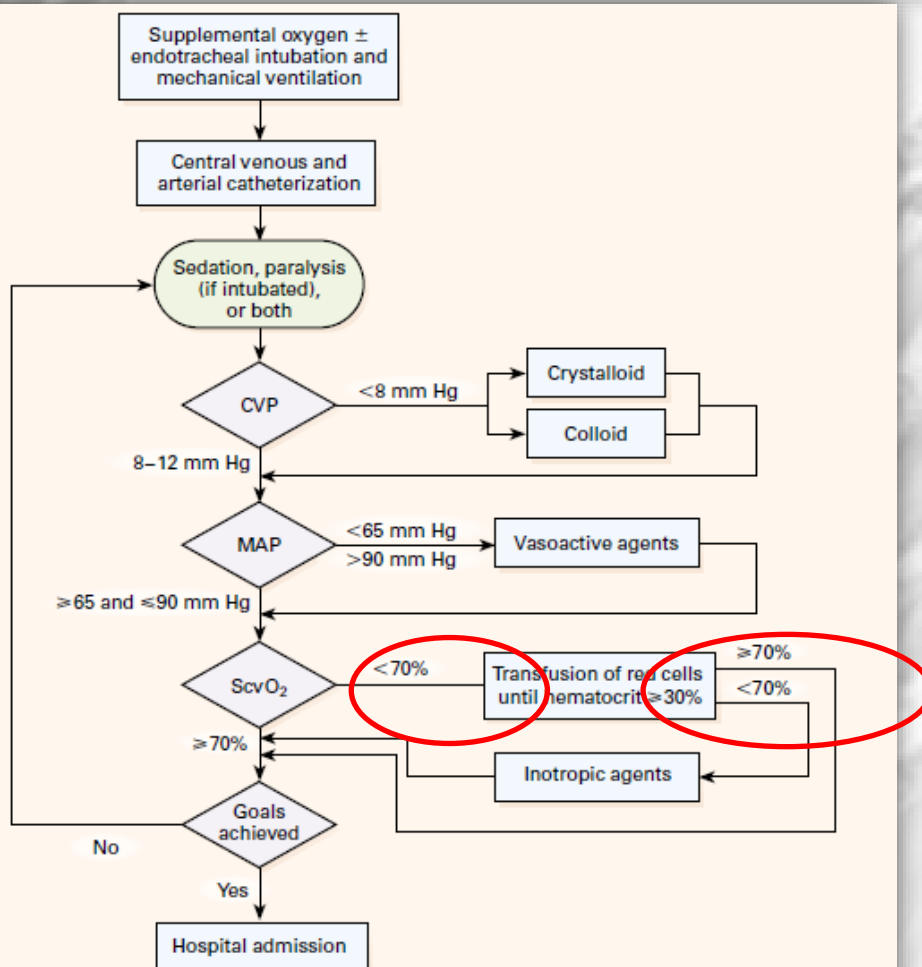
EARLY GOAL-DIRECTED THERAPY IN THE TREATMENT OF SEVERE SEPSIS AND SEPTIC SHOCK

EMANUEL RIVERS, M.D., M.P.H., BRYANT NGUYEN, M.D., SUZANNE HAVSTAD, M.A., JULIE RESSLER, B.S.,
ALEXANDRIA MUZZIN, B.S., BERNHARD KNOBLICH, M.D., EDWARD PETERSON, PH.D., AND MICHAEL TOMLANOVICH, M.D.,
FOR THE EARLY GOAL-DIRECTED THERAPY COLLABORATIVE GROUP*

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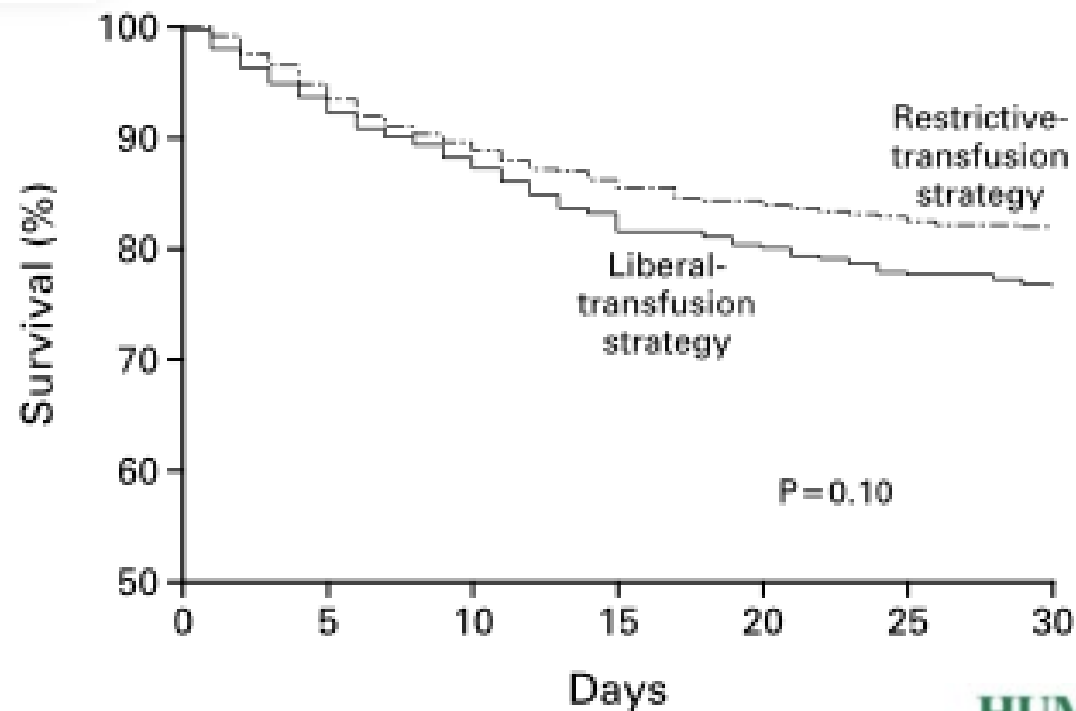
NUMBER 6



A MULTICENTER, RANDOMIZED, CONTROLLED CLINICAL TRIAL OF TRANSFUSION REQUIREMENTS IN CRITICAL CARE

PAUL C. HÉBERT, M.D., GEORGE WELLS, Ph.D., MORRIS A. BLAJCHMAN, M.D., JOHN MARSHALL, M.D.,
CLAUDIO MARTIN, M.D., GIUSEPPE PAGLIARELLO, M.D., MARTIN TWEEDDALE, M.D., Ph.D., IRWIN SCHWEITZER, M.Sc.,
ELIZABETH YETISIR, M.Sc., AND THE TRANSFUSION REQUIREMENTS IN CRITICAL CARE INVESTIGATORS
FOR THE CANADIAN CRITICAL CARE TRIALS GROUP*

All Patients

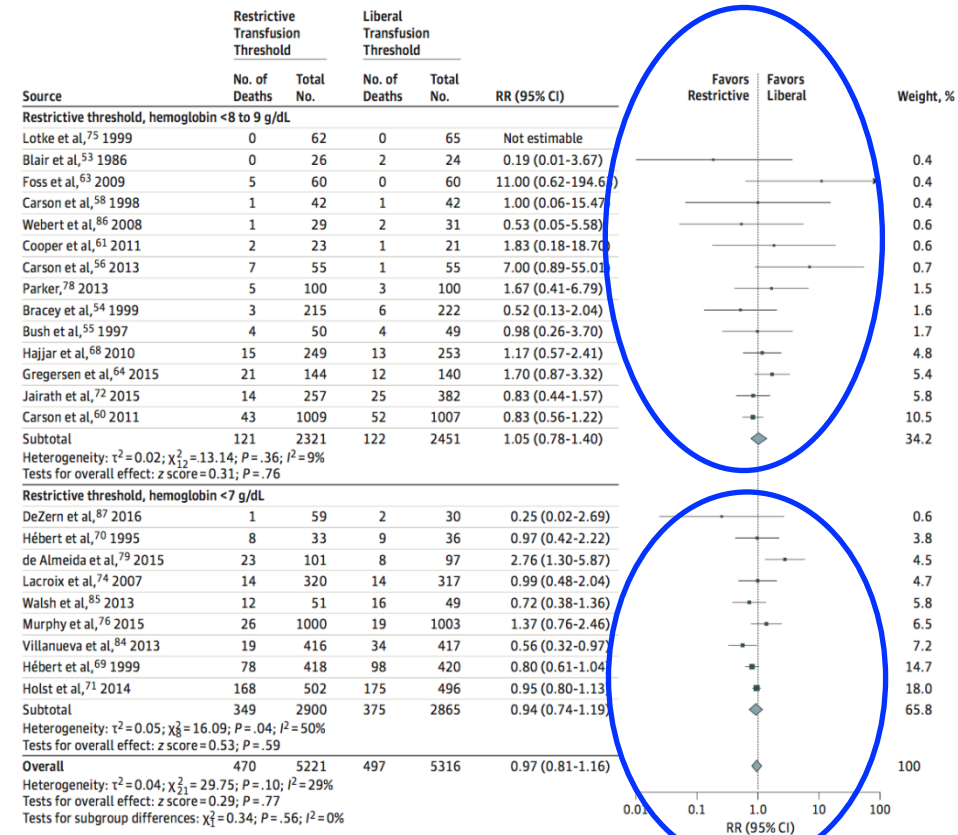


Clinical Practice Guidelines From the AABB Red Blood Cell Transfusion Thresholds and Storage

Jeffrey L. Carson, MD; Gordon Guyatt, MD; Nancy M. Heddle, MSc; Brenda J. Grossman, MD, MPH; Claudia S. Cohn, MD, PhD; Mark K. Fung, MD, PhD; Terry Gernsheimer, MD; John B. Holcomb, MD; Lewis J. Kaplan, MD; Louis M. Katz, MD; Nikki Peterson, BA; Glenn Ramsey, MD; Sunil V. Rao, MD; John D. Roback, MD, PhD; Aryeh Shander, MD; Aaron A. R. Tobian, MD, PhD

Practice Guideline JAMA 2016 Nov 15;316(19):2025-2035.
doi: 10.1001/jama.2016.9185.

Figure 1. Comparison of 30-Day Mortality Using Restrictive vs Liberal Hemoglobin Transfusion Thresholds in Randomized Clinical Trials



The size of the data markers indicates the weight of the trial; RR, relative risk. Trials published after 2012 have been published since the prior AABB transfusion guidelines.

Clinical Practice Guidelines From the AABB Red Blood Cell Transfusion Thresholds and Storage

Recommendations

First Recommendation

The AABB recommends a restrictive RBC transfusion threshold in which the transfusion is not indicated until the hemoglobin level is 7 g/dL for hospitalized adult patients who are hemodynamically stable, including critically ill patients, rather than a liberal threshold when the hemoglobin level is 10 g/dL (strong recommendation, moderate quality evidence). For patients undergoing orthopedic surgery or cardiac surgery and those with preexisting cardiovascular disease, the AABB recommends a restrictive RBC transfusion threshold (hemoglobin level of 8 g/dL; strong recommendation, moderate quality evidence). The restrictive hemoglobin transfusion threshold of 7 g/dL is likely comparable with 8 g/dL, but RCT evidence is not available for all patient categories. These recommendations apply to all but the following conditions for which the evidence is insufficient for any recommendation: acute coronary syndrome, severe thrombocytopenia (patients treated for hematological or oncological disorders who at risk of bleeding), and chronic transfusion-dependent anemia.

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Clinical Practice Guidelines From the AABB

Red Blood Cell Transfusion Thresholds and Storage

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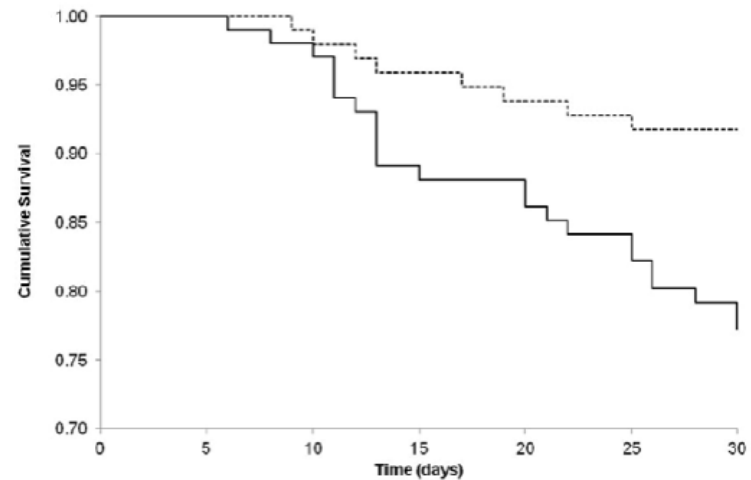
Queste raccomandazioni non si applicano a pazienti con patologia
coronarica acuta...

Transfusion Requirements in Surgical Oncology Patients

A Prospective, Randomized Controlled Trial

Juliano Pinheiro de Almeida, M.D., Jean-Louis Vincent, M.D., Ph.D.,

Critical Care (London, England), 01 Jan 2013, 17(Suppl 2):P364-P364



-----Liberal	97	96	96	93	91	89	89
————Restrictive	101	100	91	89	87	83	79

Fig. 2. Kaplan-Meier curves showing the probability of 30-day survival in patients randomized to a restrictive strategy of erythrocyte transfusion (transfusion when hemoglobin concentration <7 g/dl) and those randomized to a liberal strategy (transfusion when hemoglobin concentration <9 g/dl). The *P* value was calculated with the use of the log-rank test.

Transfusion Requirements in Surgical Oncology Patients

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Another possible explanation for the different finding is that patients with cancer receiving restrictive transfusions may be more susceptible to altered oxygen delivery and impaired tissue oxygenation during the postoperative period, leading to higher rates of complications and death. Jhanji *et al.*²² reported that patients having major abdominal surgery who had impaired microvascular flow after surgery experienced a higher rate of postoperative complications than did patients with normal microvascular flow (measured with sublingual capillaroscopy). Abnormalities in micro-

Should Transfusion Trigger Thresholds Differ for Critical Care Versus Perioperative Patients? A Meta-Analysis of Randomized Trials

Matthew A. Chong, MD¹; Rohin Krishnan, BSc¹; Davy Cheng, MD, FRCPC¹;
Janet Martin, PharmD, MSc(HTA)^{1,2}

Conclusions: The safety of restrictive transfusion strategies likely differs for critically ill patients versus perioperative patients. Further trials investigating transfusion strategies in the perioperative setting are necessary. (*Crit Care Med* 2018; 46:252–263)

INAPPROPRIATEZZA

Intraoperative transfusion practices in Europe

J. Meier^{1,*}, D. Filipescu², S. Kozek-Langenecker³, J. Llau Pitarch⁴, S. Mallett⁵,
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Clinical Practice

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LIMITAZIONI

L'uso delle trasfusioni di emoglobina può essere considerato un surrogato imperfetto del **delivery di ossigeno**

Oxygenating the microcirculation: the perspective from blood transfusion and blood storage

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Research

Near-infrared spectroscopy technique to evaluate the effects of red blood cell transfusion on tissue oxygenation

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Critical Care 2009, **13**(Suppl 5):S11 (doi:10.1186/cc8009)

JAMA | Special Communication

Patient Blood Management Recommendations From the 2018 Frankfurt Consensus Conference

Markus M. Mueller, MD; Hans Van Remoortel, PhD; Patrick Meybohm, MD, PhD; Kari Aranko, MD, PhD;
Cécile Aubron, MD, PhD; Reinhard Burger, PhD; Jeffrey L. Carson, MD, PhD; Klaus Cichutek, PhD;
Emmy De Buck, PhD; Dana Devine, PhD; Dean Fergusson, PhD; Gilles Folléa, MD, PhD; Craig French, MB, BS;
Kathrine P. Frey, MD; Richard Gammon, MD; Jerrold H. Levy, MD; Michael F. Murphy, MD, MBBS; Yves Ozier, MD;
Katerina Pavenski, MD; Cynthia So-Osman, MD, PhD; Pierre Tiberghien, MD, PhD; Jimmy Volmink, DPhil;
Jonathan H. Waters, MD; Erica M. Wood, MB, BS; Erhard Seifried, MD, PhD; for the ICC PBM Frankfurt 2018 Group

Preoperative Anemia

PICO 1—Adverse Events: In patients undergoing elective surgery [population], is preoperative anemia [intervention/risk factor] a risk factor for adverse clinical or economic outcome [outcomes], compared with no preoperative anemia [comparison]?

PICO 2—Definition: In patients undergoing elective surgery [population], the question “Should a specific hemoglobin cutoff [index test] vs another hemoglobin cutoff [comparator test] be used to diagnose preoperative anemia [outcome]?” was not answered because of lack in evidence.

PICO 3—Management: In patients with preoperative anemia undergoing elective surgery [population], is the use of red blood cell transfusion or iron supplementation and/or erythrocyte-stimulating agents [intervention] effective to improve clinical and economic outcomes [outcomes], compared with no intervention, placebo, or standard of care [comparison]?

Implementation of Patient Blood Management (PBM) Programs

PICO 15—Effectiveness of PBM Implementation: Is a PBM program [intervention] effective to improve clinical and economic outcomes [outcomes], compared with no PBM program [comparison]?

PICO 16—PBM Promotional Tools: Behavioral Interventions: Is a specific behavioral intervention to promote the implementation of a PBM program [intervention] more effective to improve clinical and economic outcomes [outcomes], compared with no/another behavioral intervention [comparison]?

PICO 17—PBM Promotional Tools: Decision Support Systems: Is a specific decision support system to promote the implementation of a PBM program [intervention] more effective to improve clinical and economic outcomes [outcomes], compared with no intervention or another decision support system/behavioral intervention [comparison]?

Red Blood Cell (RBC) Transfusion Thresholds

PICO 4—Adult Intensive Care Patients: In critically ill but clinically stable adult intensive care patients [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 5—Orthopaedic and Noncardiac Surgery: In elderly high-risk (cardiovascular) patients undergoing orthopaedic or noncardiac surgery [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 6—Acute Gastrointestinal Bleeding: In patients with acute gastrointestinal bleeding [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 7—Coronary Heart Disease: In patients with symptomatic coronary heart disease [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 8—Septic Shock: In patients with septic shock [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 9—Cardiac Surgery: In patients undergoing cardiac surgery [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 10—Adult Hematologic Patients: In adult hematologic patients [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 11—Adult Patients With Solid Tumors: In adult patients with solid tumors [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 12—Acute Central Nervous System Injury: In patients with acute central nervous system injury [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 13—Cerebral Perfusion Disorders: In patients with cerebral perfusion disorders [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

PICO 14—Acute Bleeding: In patients with acute bleeding [population], is the use of a restrictive transfusion threshold [intervention] effective to reduce mortality and improve other clinical outcomes [outcomes], compared with a liberal transfusion threshold [comparison]?

The evidence for RBC transfusion support in patients with acute bleeding of unspecified origin (PICO 14) was limited to 1 small RCT including 22 trauma patients, published in 1956.¹⁰² Because of the absence of available evidence, the panel was not able to formulate any recommendation about restrictive vs liberal RBC transfusion strategies in this setting. However, the panel opinion was that hemoglobin concentration alone should not be used to determine the need for RBC transfusion in patients with acute bleeding (ie, major hemorrhage). The panel recommended that clinicians use existing protocols or guidelines for massive transfusion/major hemorrhage to guide treatment decisions.¹⁰³

Emoglobina e trasfusione



MORTALITA'

INFEZIONI

**RICOVERO
PROLUNGATO**

**INSUFFICIENZA
RENALE**

TRALI

ISCHEMIA



$$\dot{V}O_2 = \dot{Q} * (CaO_2 - C\bar{v}O_2)$$

Rapporto DO_2/VO_2 Ottimizzare il Delivery



$$DO_2 = CaO_2 \times CO$$

$$DO_2 = ((1.34 \times SaO_2 \times [Hb]) + paO_2 \times 0,003) \times FC \times SV$$

TRIGGER TRASFUSIONALI

Idealmente il trigger alla trasfusione dovrebbe essere l'inadeguatezza dell'ossigenazione tissutale e non l'adeguatezza del delivery di O₂

L'intervento necessario solo se
l'ossigenazione ai tessuti
non è sufficiente rispetto alle loro esigenze

The clinical utility of an index of global oxygenation for guiding red blood cell transfusion in cardiac surgery.

Orlov D¹, O'Farrell R, McCluskey SA, Carroll J, Poonawala H, Hozhabri S, Karkouti K.

TABLE 3. Hb concentrations and O₂ERs

	Transfusion episodes (n = 62)*		p Value
	Baseline O ₂ ER >30% (n = 27)	Baseline O ₂ ER ≤ 30% (n = 35)	
Hb concentration (g/L)			
Before transfusion	78.1 ± 7.6 (27)	78.3 ± 16.7 (35)	NS
After transfusion			
15 min	87.0 ± 8.3 (20)	88.5 ± 22.3 (30)	NS
2 hr	86.8 ± 8.94 (19)	87.5 ± 19.6 (32)	NS
Change from baseline			
15 min	+9.24 ± 11.7 (20)	+10.8 ± 9.3 (30)	NS
2 hr	+9.51 ± 12.4 (19)	+9.46 ± 9.4 (32)	NS
O ₂ ER (%)			
Before transfusion	39.8 ± 9.0 (27)	23.1 ± 4.9 (35)	<0.001
After transfusion			
15 min	33.4 ± 10.2 (20)	23.9 ± 7.8 (26)	<0.001
2 hr	33.3 ± 9.1 (17)	24.7 ± 8.2 (30)	0.001
Change from baseline			
15 min	-5.2 ± 7.8 (20)	+0.7 ± 5.8 (26)	0.004
2 hr	-3.8 ± 8.0 (17)	+1.4 ± 7.0 (30)	0.02

* Data are reported as mean ± SD. Data were not available for all measures; the number of episodes used for each analysis is shown in parentheses. NS = not significant.

✓ Integrare con la clinica

- SINTOMI: dispnea, angina, ipoperfusione periferica, ipotensione arteriosa, tachicardia, confusione

✓ Monitoraggio adeguato

- PA/FC
- SpO₂
- Monitoraggio metabolico
- SvO₂, SvcO₂
- ER0₂
- Hb in continuo



✓ Hb resta un indicatore di benzina



Ma quanto consumiamo dipende da tante variabili ...



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