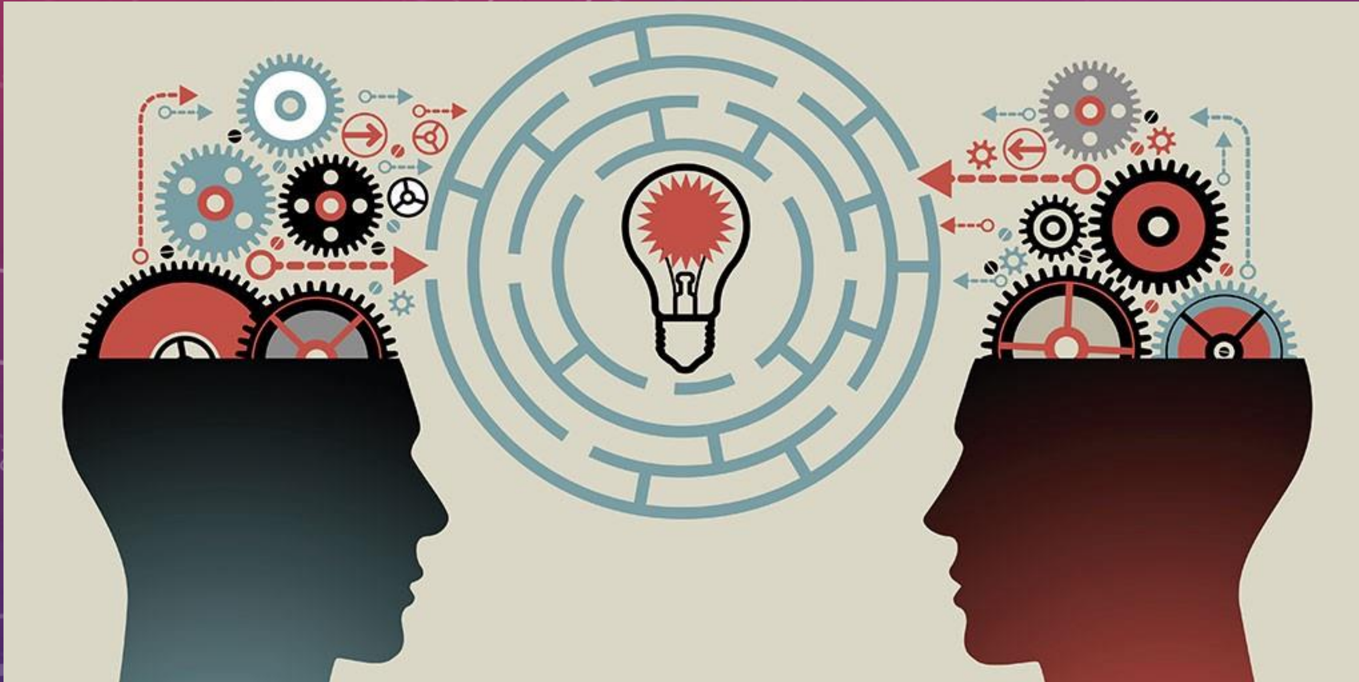
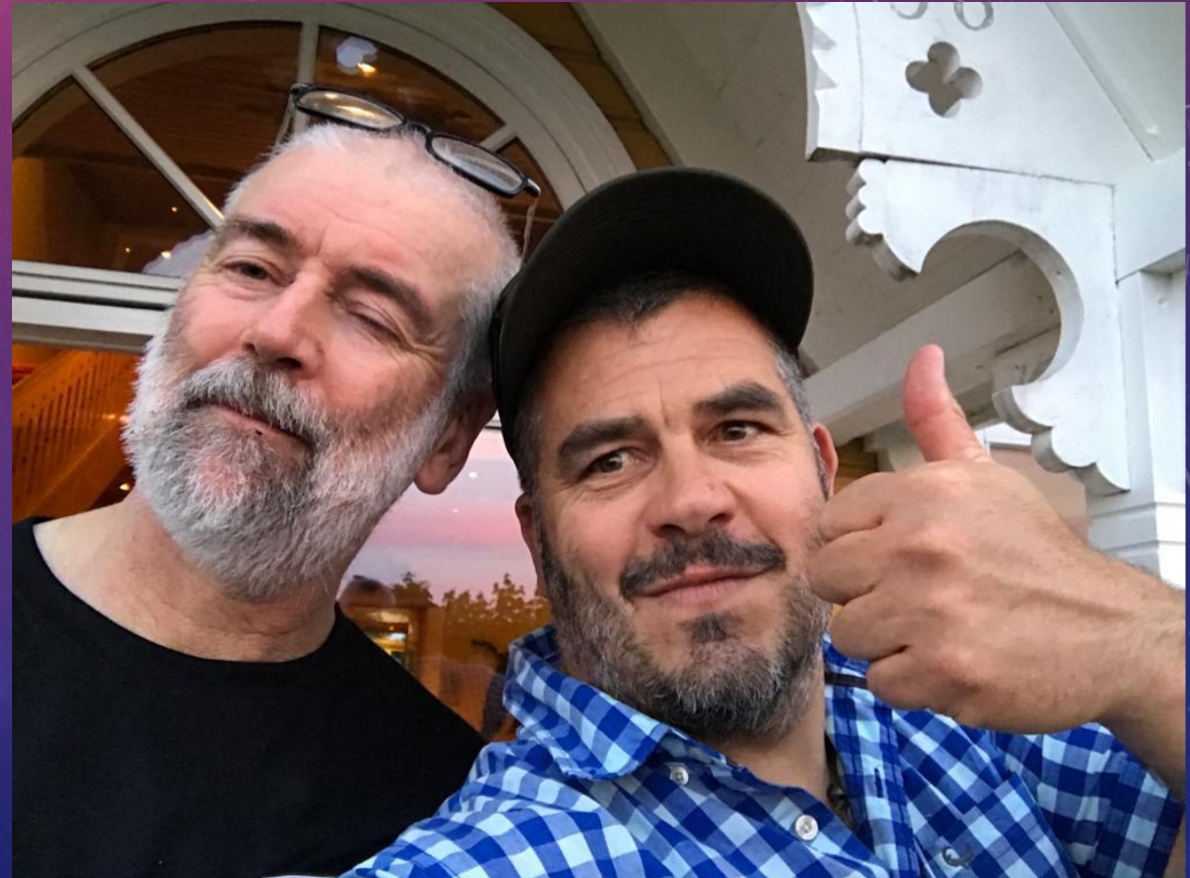
CRITICAL CLINICAL THINKING IN HEMORRHAGIC SHOCK



PAT THOMPSON

ACKNOWLEDGEMENTS

- THOR Network
- No Conflicts of Interest
- Opinions expressed here are my own



WHAT TO DO ?

FOLLOW THE GUIDELINE !

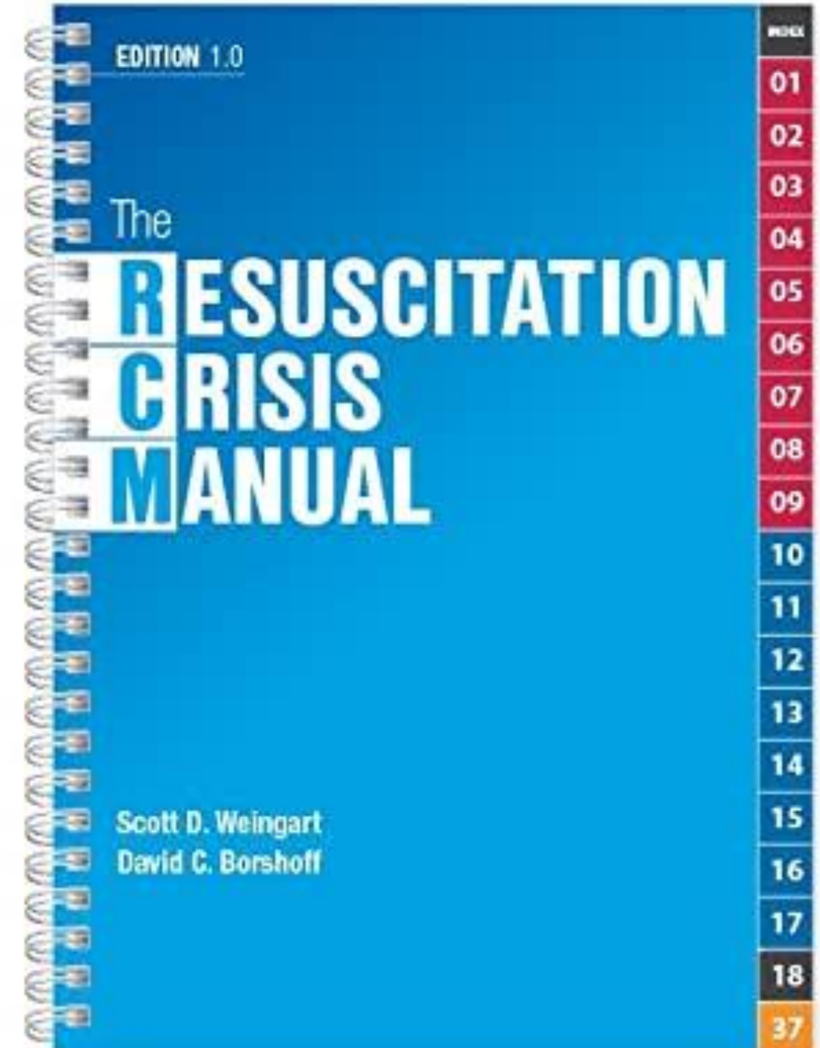
Research | Open Access | Published: 27 March 2019

The European guideline on management of major bleeding and coagulopathy following trauma: fifth edition

Donat R. Spahn, Bertil Bouillon, Vl
Radko Komadina, Marc Maegele, (
Vincent & Rolf Rossaint

Critical Care **23**, Article number:

189k Accesses | **497** Citations



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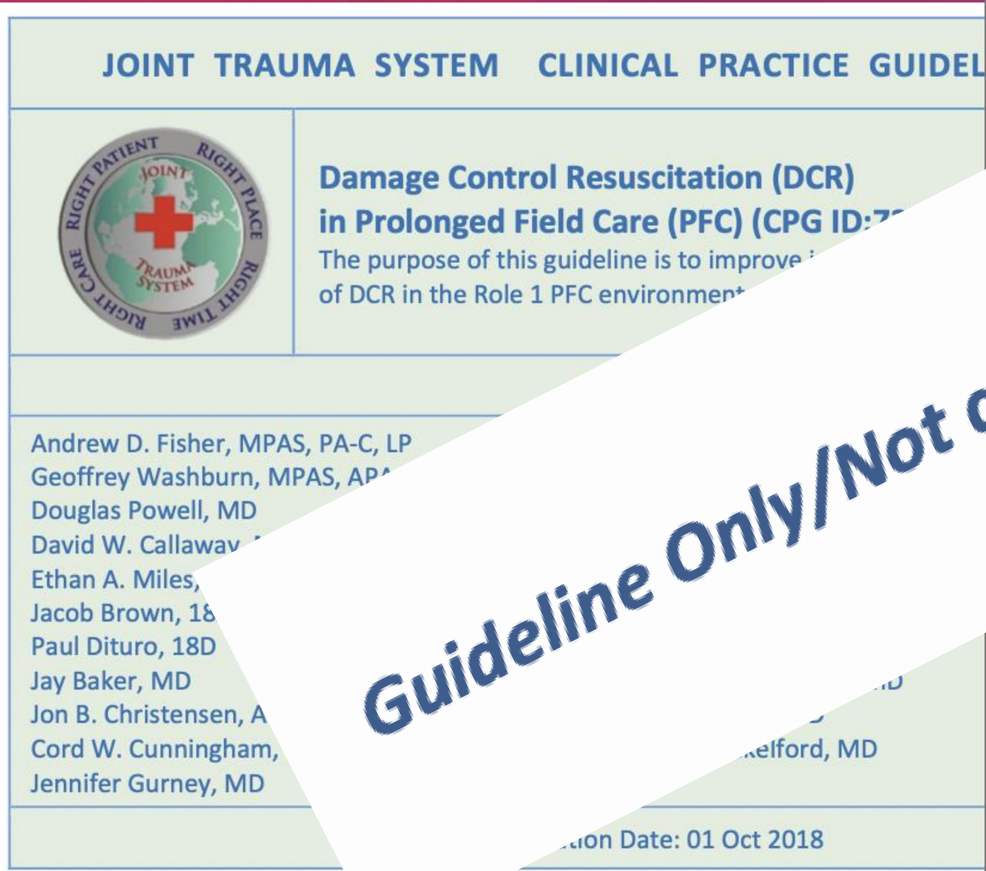
Major trauma: assessment and initial management

NICE guideline [NG39]   Published: 17 February 2016

JTS CPG RDCR



Damage Control Resuscitation in Prolonged Field Care

INTRODUCTION

Early recognition and intervention for life-threatening hemorrhage are essenti priorities are to control life-threatening hemorrhage and maintain vital transfusion.[1]

Experience with fresh whole blood (FWB) resuscitation Command[2–4] led to a revolutionary change in res (DCR).[5] As DCR became the accepted stand majority of potentially preventable ba launched a campaign to bring a

Efforts to prevent de whole blood (W use of c her

of DCR in the Role 1[11] PFC (TCCC) and Joint Trauma ayed or not available, evidence-based ions may provide the best option in a endations are presented in a "minimum, better, address a spectrum of Role 1 situations and available with "minimum" clinical standards still applicable in

esurgical phase of resuscitation have been termed remote damage control important to distinguish between RDCR and DCR, because capabilities are different hospital settings.

GNIZING PATIENTS WHO NEED (R)DCR

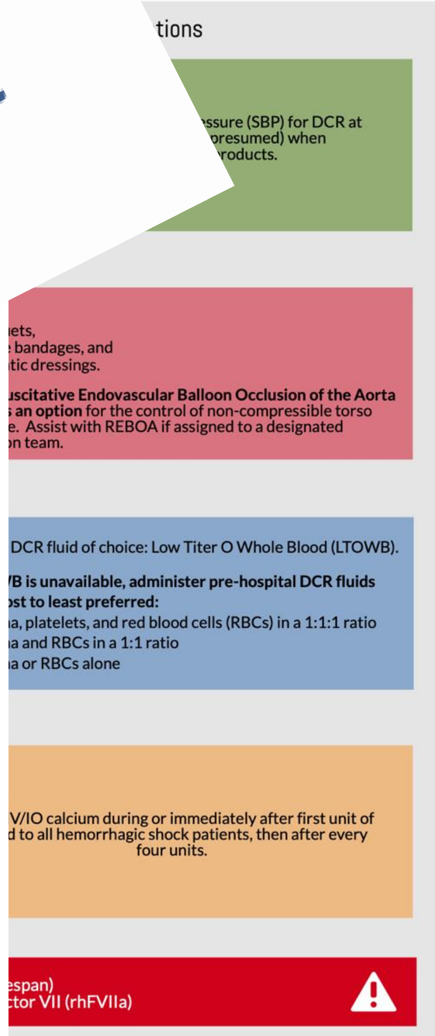
GOAL

Recognize patients with traumatic hemorrhage who will benefit from implementing DCR early to decrease mortality.

Initial Survey:

Recognize hemorrhagic shock based on rapid examination and recognition of severe injury pattern.

- Injury pattern consistent with massive hemorrhage:



WHAT TO DO ?

BESAUSE YOU ***WILL***

FIGHT HOW YOU TRAINED

CLINICAL JUDGEMENT

PEER Model

Critical thinking

REASON

IN MODERN TIMES

THE LANCET

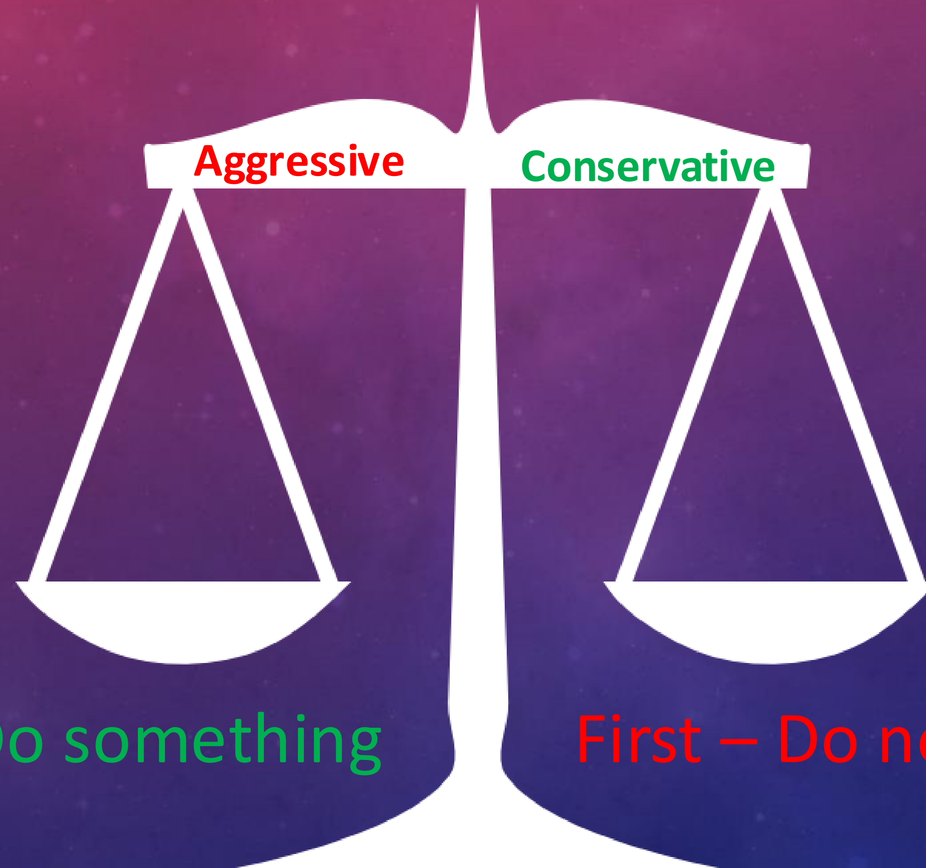
CORRESPONDENCE | VOLUME 391, ISSUE 10122, P736, FEBRUARY 24, 2018

Hydroxyethyl starch solutions and patient harm

BIAS - IATROGENIC BLINDNESS

THE 2 GOLDEN RULES OF MEDICINE

Clinical judgement



Risk of Pathology

Risk of Procedure

Do something

First – Do no harm

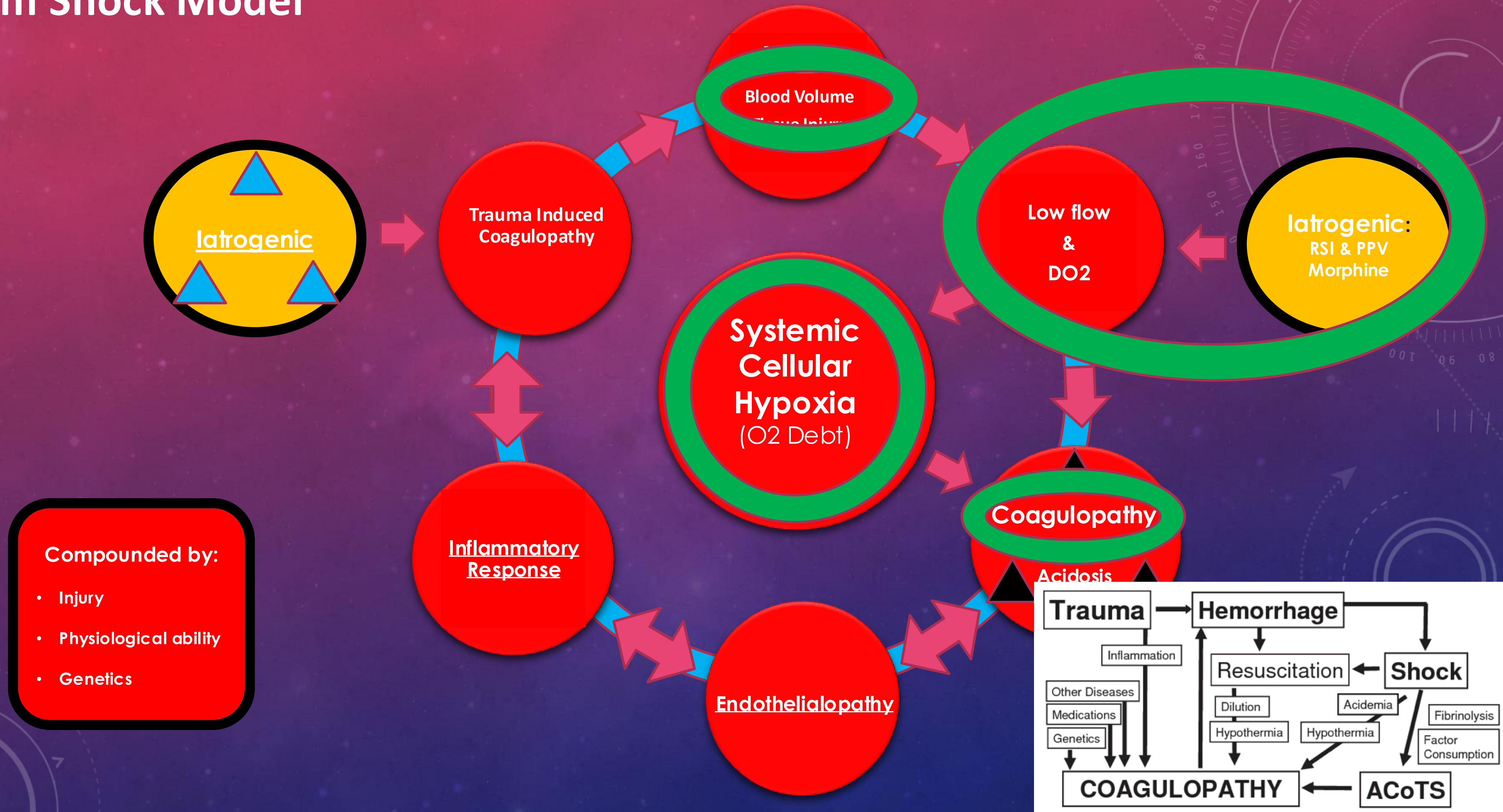
PREVENTING IATROGENIC HARM

The greater the possibility of harm
the more conservative the approach

Know - watch - & offset the risks

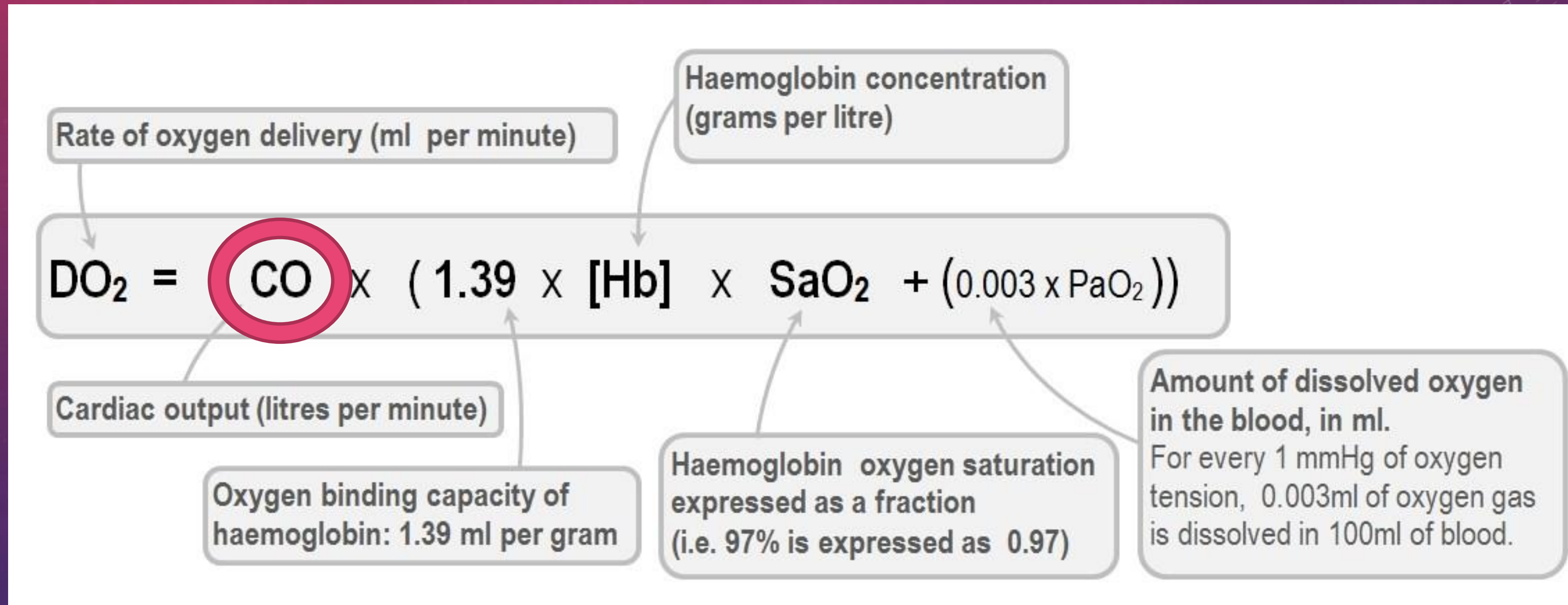
EVIDENCE

Hem Shock Model



SHOCK DEF: DO2 ≠ VO2 – SYSTEMIC HYPOXIA

DO2 Equation



DO2

DO2

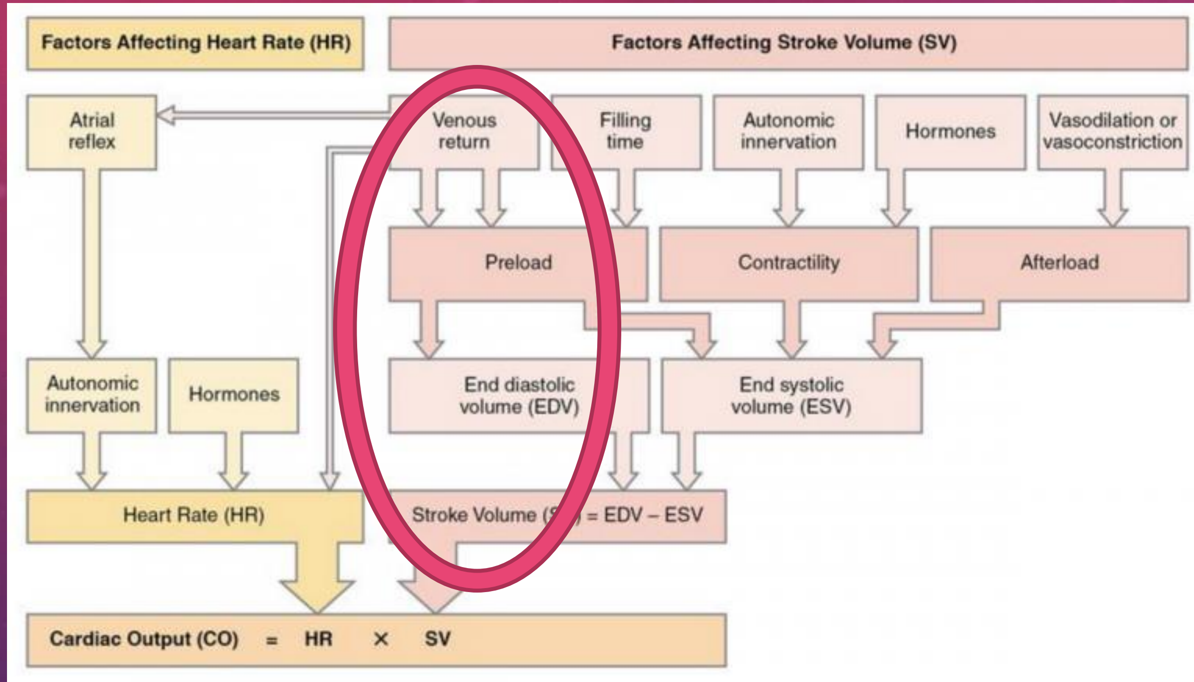
Oxygen delivery = cardiac output × arterial oxygen content

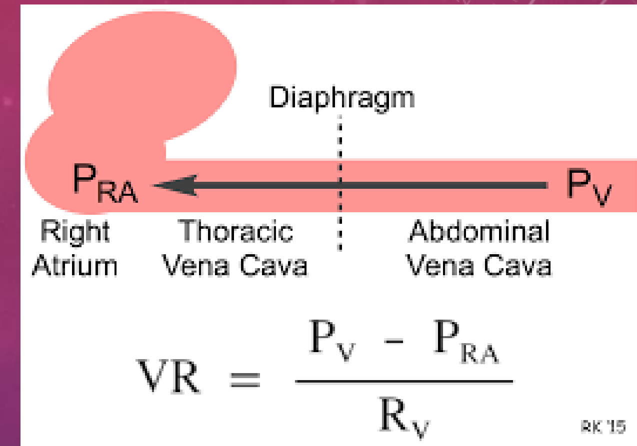
DO2

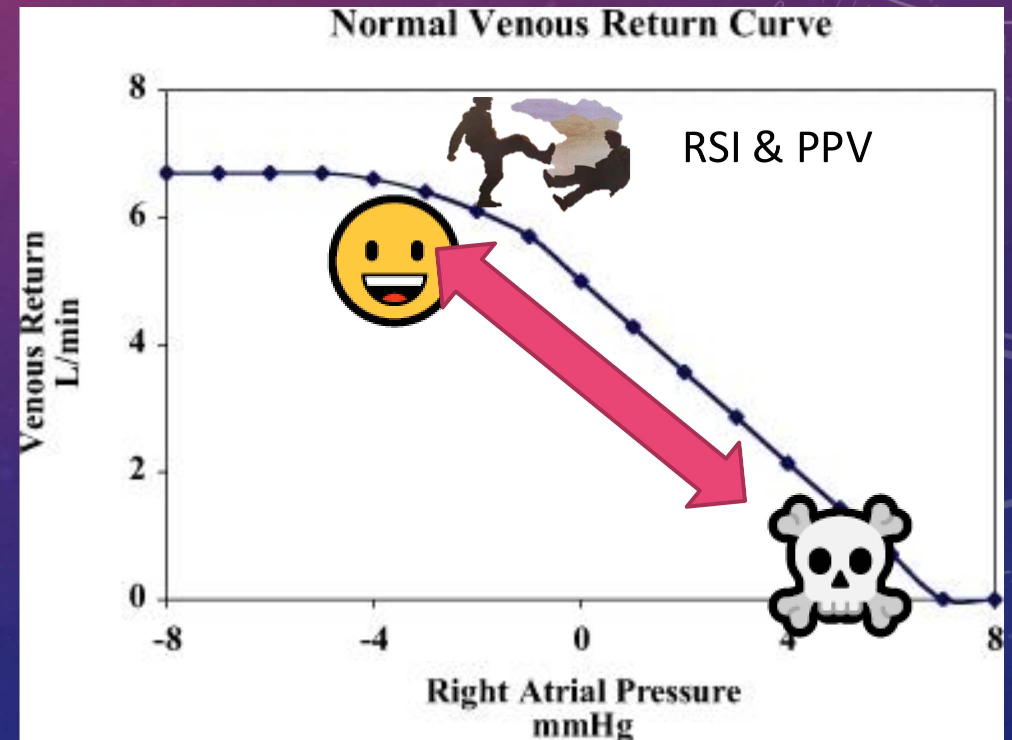
Volume pumped

Oxygen load

COMPONENTS OF CO







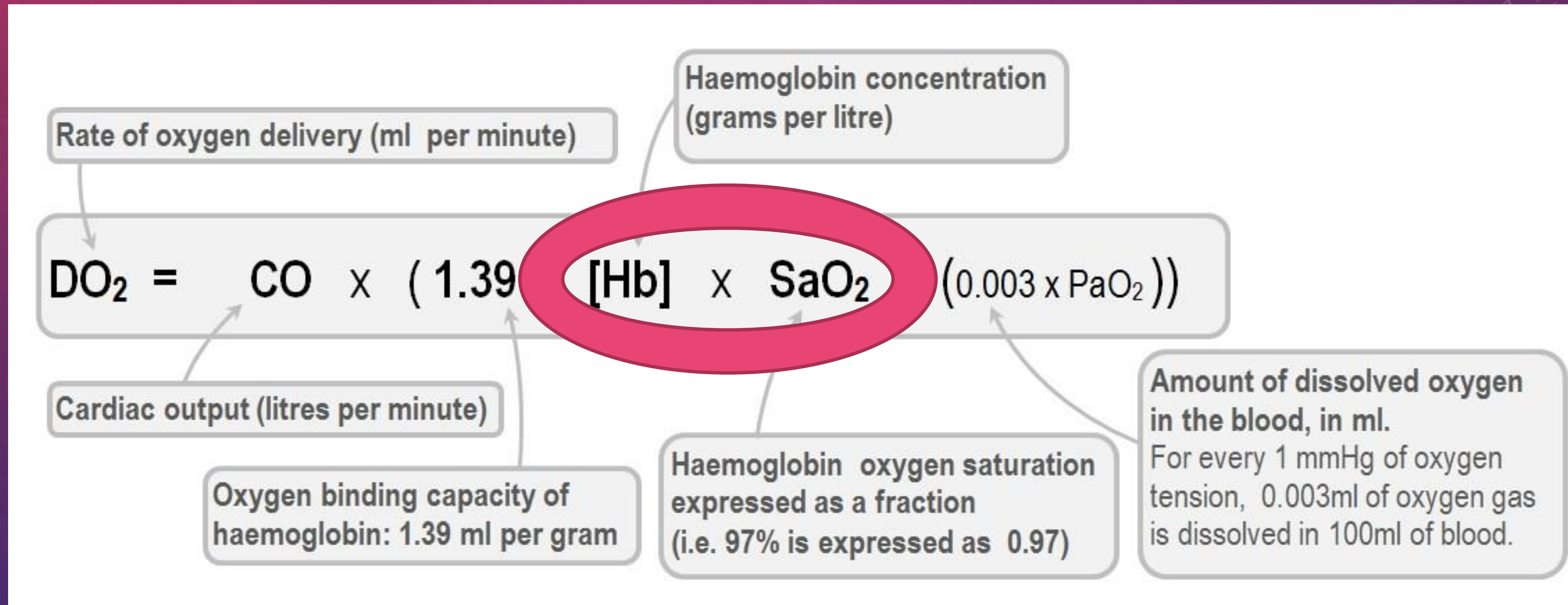
HEMODYNAMIC RESUSCITATION

FLUID DYNAMICS

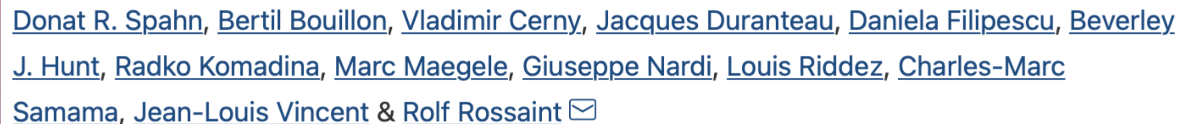
Volume
Respiratory pump
Musculovenous pump
Venous resistance

OXYGEN DYNAMICS

DO2 Equation



HEMOGLOBIN


Research | Open Access | Published: 27 March 2019

The European guideline on management of major bleeding and coagulopathy following trauma: fifth edition

Donat R. Spahn, Bertil Bouillon, Vladimir Cerny, Jacques Duranteau, Daniela Filipescu, Beverley J. Hunt, Radko Komadina, Marc Maegele, Giuseppe Nardi, Louis Riddez, Charles-Marc Samama, Jean-Louis Vincent & Rolf Rossaint

Critical Care 23, Article number: 98 (2019) | Cite this article

190k Accesses | 498 Citations | 458 Altmetric | Metrics

Recommendation 16

We recommend a target Hb of 70 to 90 g/L. (Grade 1C)

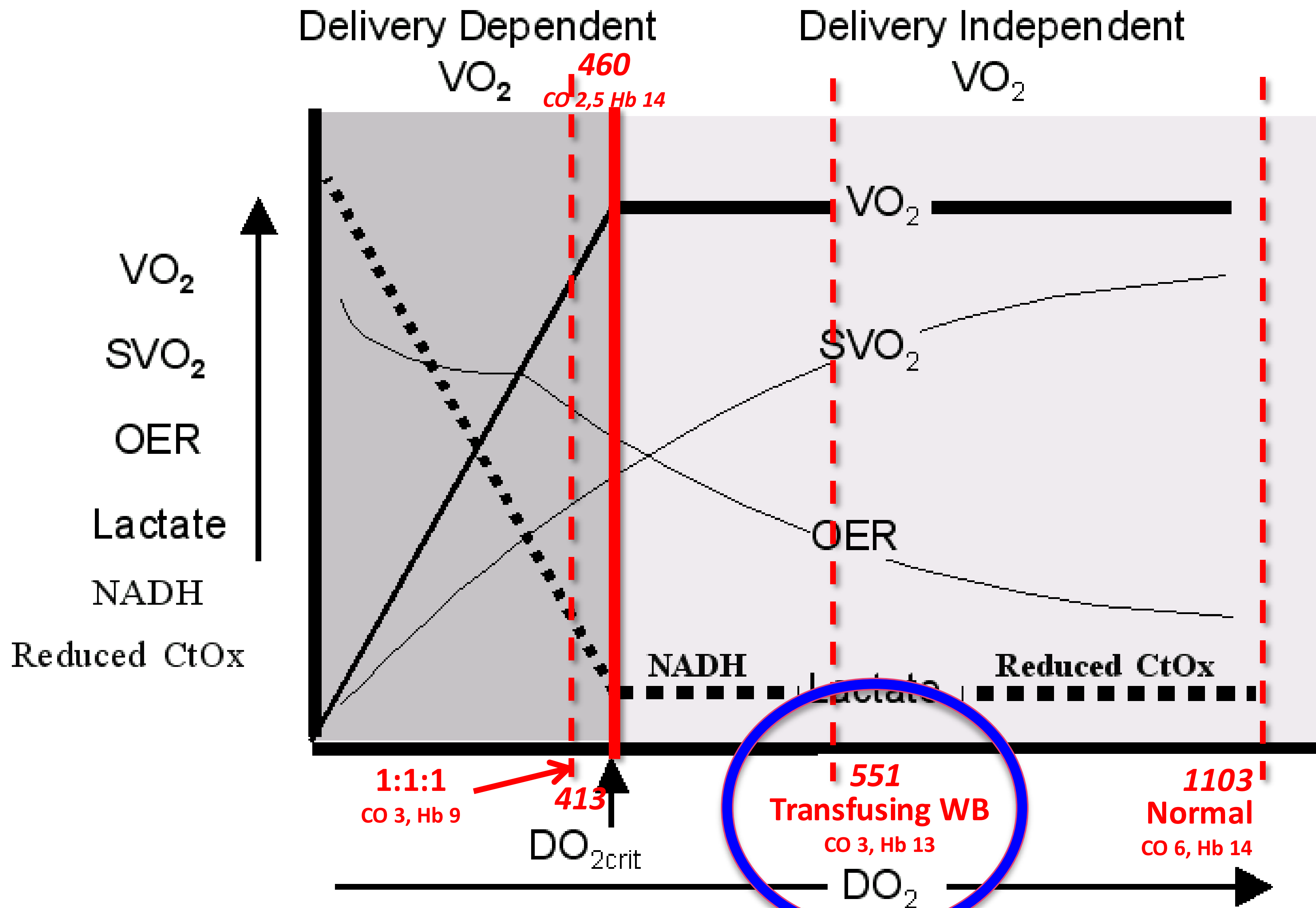
Table

Anemia Severity Classification

Grade	Hb level (g/dL)	Description
1	10 - lower limit of normal	Mild
2	8 - <10	Moderate
3	6.5 - <8	Severe
4	Life threatening	Life threatening
5	Death	Death

TABLE 1. Essential differences between transfusion with whole blood and 1 : 1 : 1 ratio

	500 ml whole blood	660 mL (1 FFP : 1 PRBC : 1 PLT)
Hematocrit	↑ 38% to 50%	↑ 29%
Platelets (UI/mL)	150.000 to 400.000 full activity	88.000
Coagulation factors	100% activity	65% activity
Others	–	Presence of anticoagulants



Delivery Dependent
VO_2
Delivery Independent
VO_2
460
CO 2,5 Hb 14
VO_2
SVO_2
OER
Lactate
NADH
Reduced CtOx
VO_2
SVO_2
OER
NADH
Lactate
Reduced CtOx
1:1:1
CO 3, Hb 9
413
DO_{2crit}
551
Transfusing WB
CO 3, Hb 13
DO_2
1103
Normal
CO 6, Hb 14

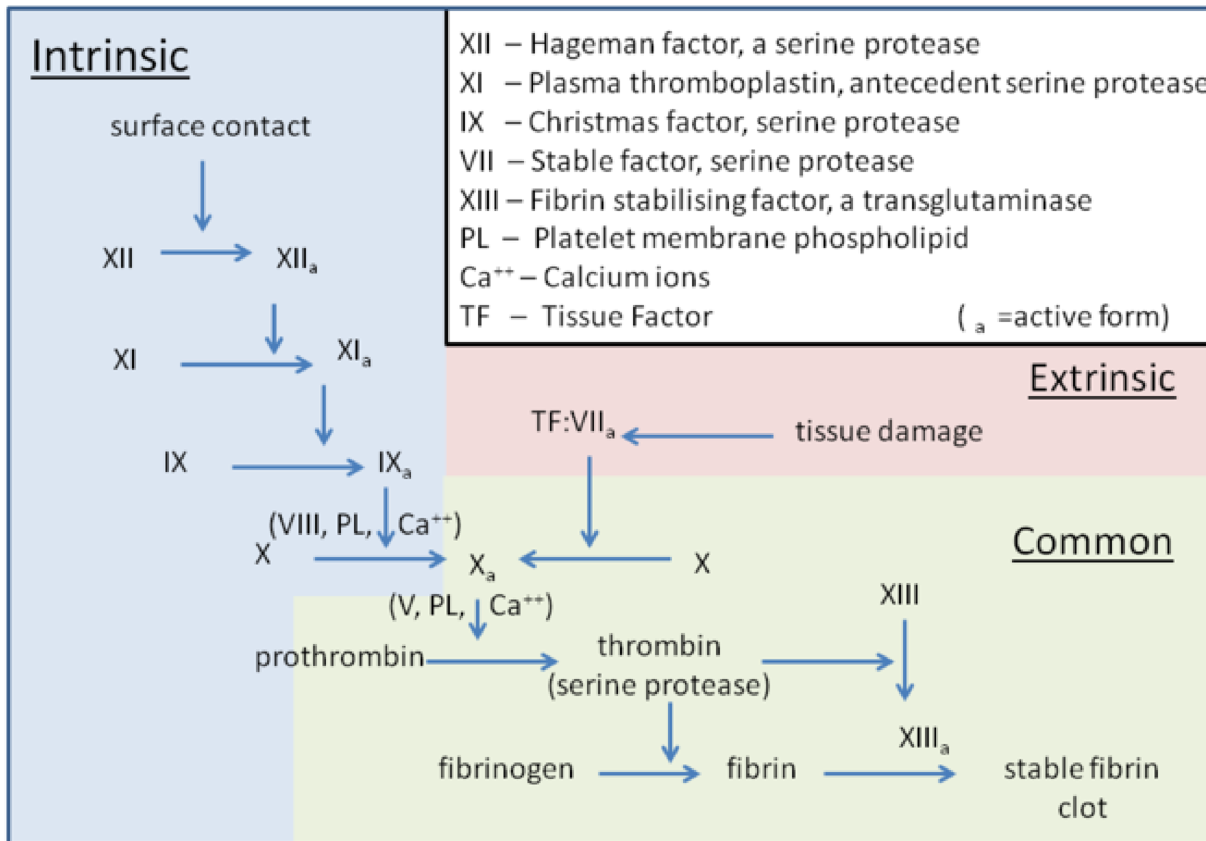
COAGULATION DYNAMICS

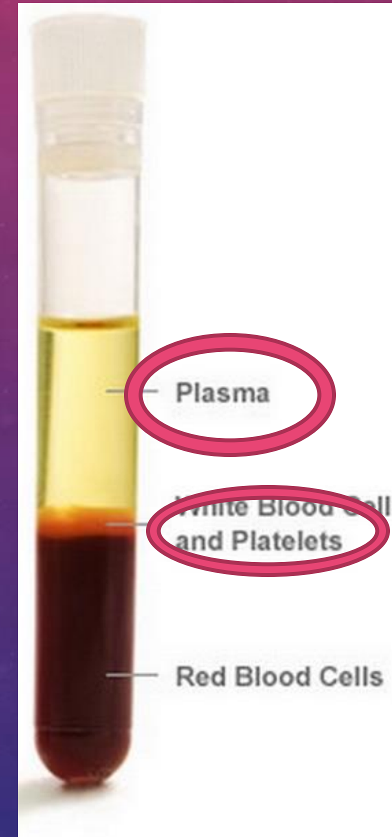
- Clotting cascade activation – Thrombin generation
- Endothelium activation – Glycocalyx shedding
- Hyperfibrinolysis (Subclinical v Clinical) Sever hypoxia
- Fibrinogen consumption
- Platelet dysfunction (Activate / consumed / depleted)

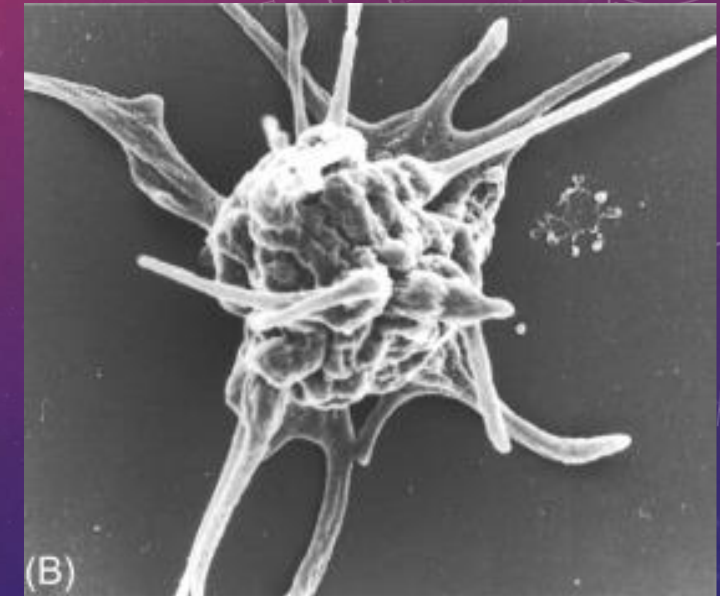
Acute Traumatic Coagulopathy

~Hypoxia & Tissue Injury Driven

COAGULATION







HEMOSTATIC RESUSCITATION

TREATMENT OF HEMORRHAGIC SH

STOP BLEEDING

Fluid Dynamics

O2 Dynamics

Clotting Dynamics

Balanced Transfusion

LTOWB

Transplanting in functioning tissue

TRANSFUSION RISK

Evidently Cochrane

Sharing health evidence you can trust

"Teapots and unicorns: absence of evidence is not evidence of absence"

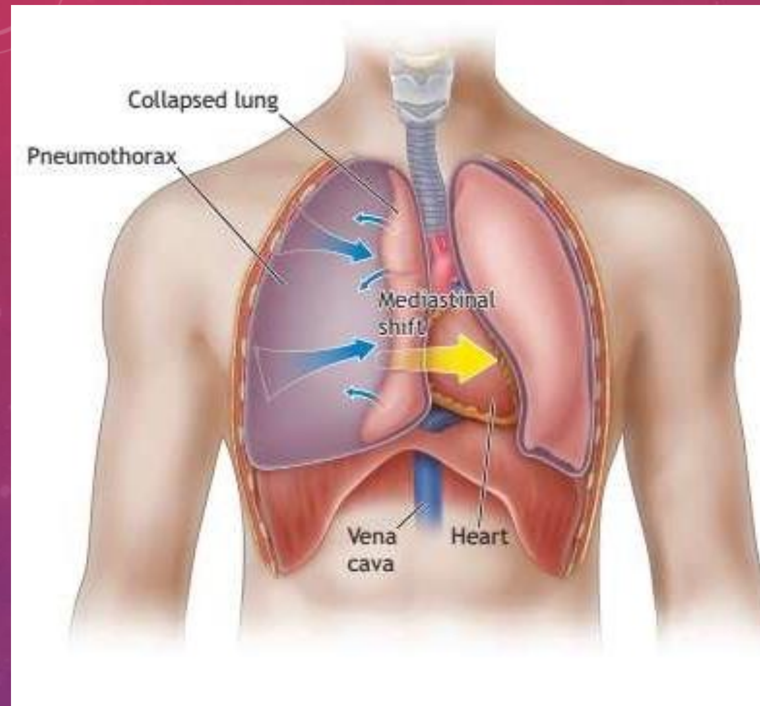
Take-home points

- It is pretty much impossible to prove a negative - that is, that something doesn't exist.
- Beware bold statements that something is ineffective or is no different to another treatment.
- There are many reasons why evidence may be unreliable.

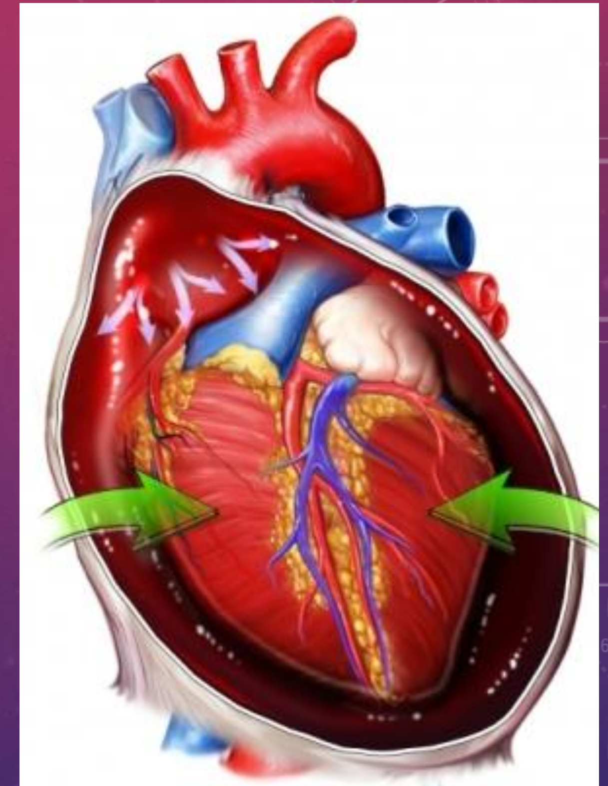
Ware L. "Teapots and unicorns: absence of evidence is not evidence of absence". Evidently Cochrane blog, 29 May 2020. https://www.evidentlycochrane.net/teapots-and-unicorns-absence-of-evidence-is-not-evidence-of-absence

Evidence of the absence of harm

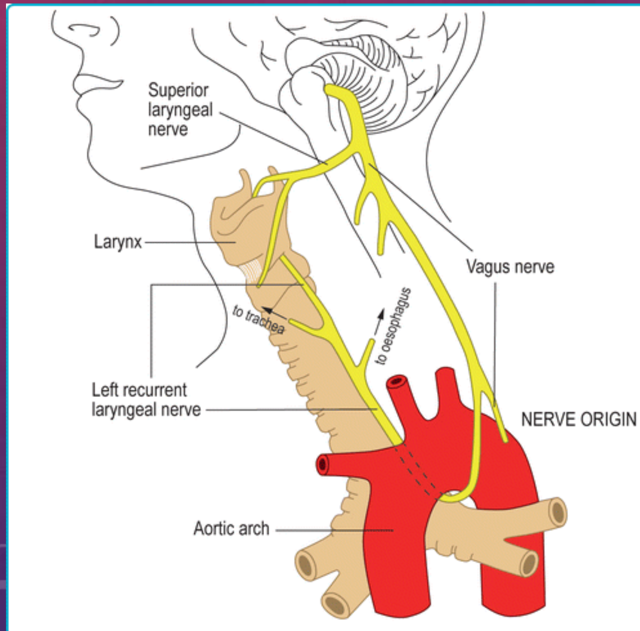
HEM SHOCK IMPOSTERS



Tension Pneumothorax



Cardiac Tamponade



Vasovagal Reaction

Isolated TBI

TENSION PNEUMOTHORAX

1. Continues the aggressive approach to suspecting and treating tension pneumothorax based on mechanism of injury and respiratory distress that TCCC has advocated for in the past, as opposed to waiting until shock develops as a result of the tension pneumothorax before treating. The new wording does, however, emphasize that shock and cardiac arrest may ensue if the tension pneumothorax is not treated promptly.

PS Injury

FIGURE 3 *Clinical photograph from a civilian trauma c... showing multiple needle decompressions in both the ante... the lateral locations. Note that two of the needles in the ... have been inserted at locations medial to the midclavicul...*

5. Respiration/Breathing

a. Assess for tension pneumothorax and treat, as necessary.

- Suspect a tension pneumothorax and treat when a casualty has significant torso trauma or primary blast injury and one or more of the following:
  - Severe or progressive respiratory distress
  - Severe or progressive tachypnea
  - Absent or markedly decreased breath sounds on one side of the chest
  - Hemoglobin oxygen saturation < 90% on pulse oximetry
  - Shock
  - Traumatic cardiac arrest without obviously fatal wounds

❖ If not treated promptly, tension pneumothorax may progress from respiratory distress to shock and traumatic cardiac arrest.

Guidelines Change 17-02

b, MD, Stacy Shackelford, MD, Harold
erson, NREMT-P, Jeff Cain, MD,
nningham, MD, Warren Dorlac,
, MD, John Gandy, MD, Elon
MD, Theodore Harcke, MD, Don
MD, Bijan Kheirabadi, MD, Russ
Matthew Martin, MD, Edward
MD, Travis Polk, MD, Kyle Remick,
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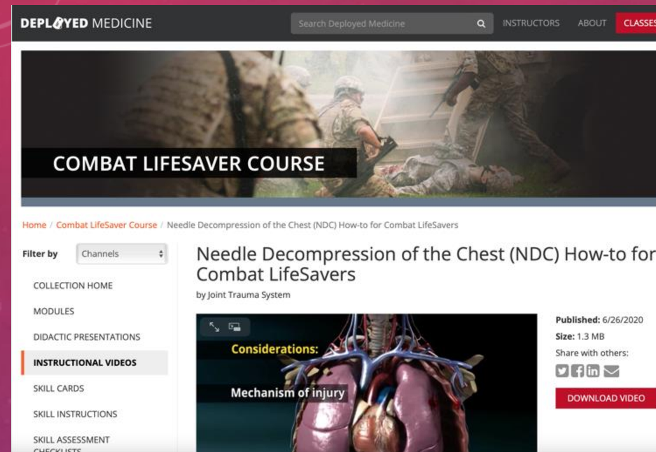
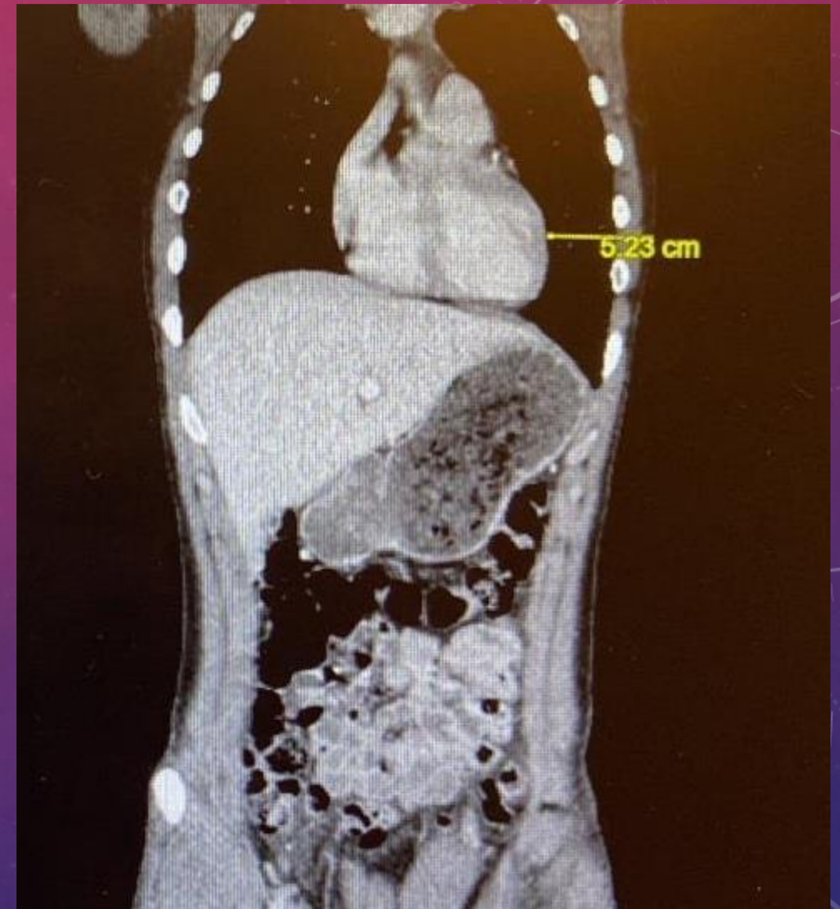
afren, MD, Scott Zietlow, MD.

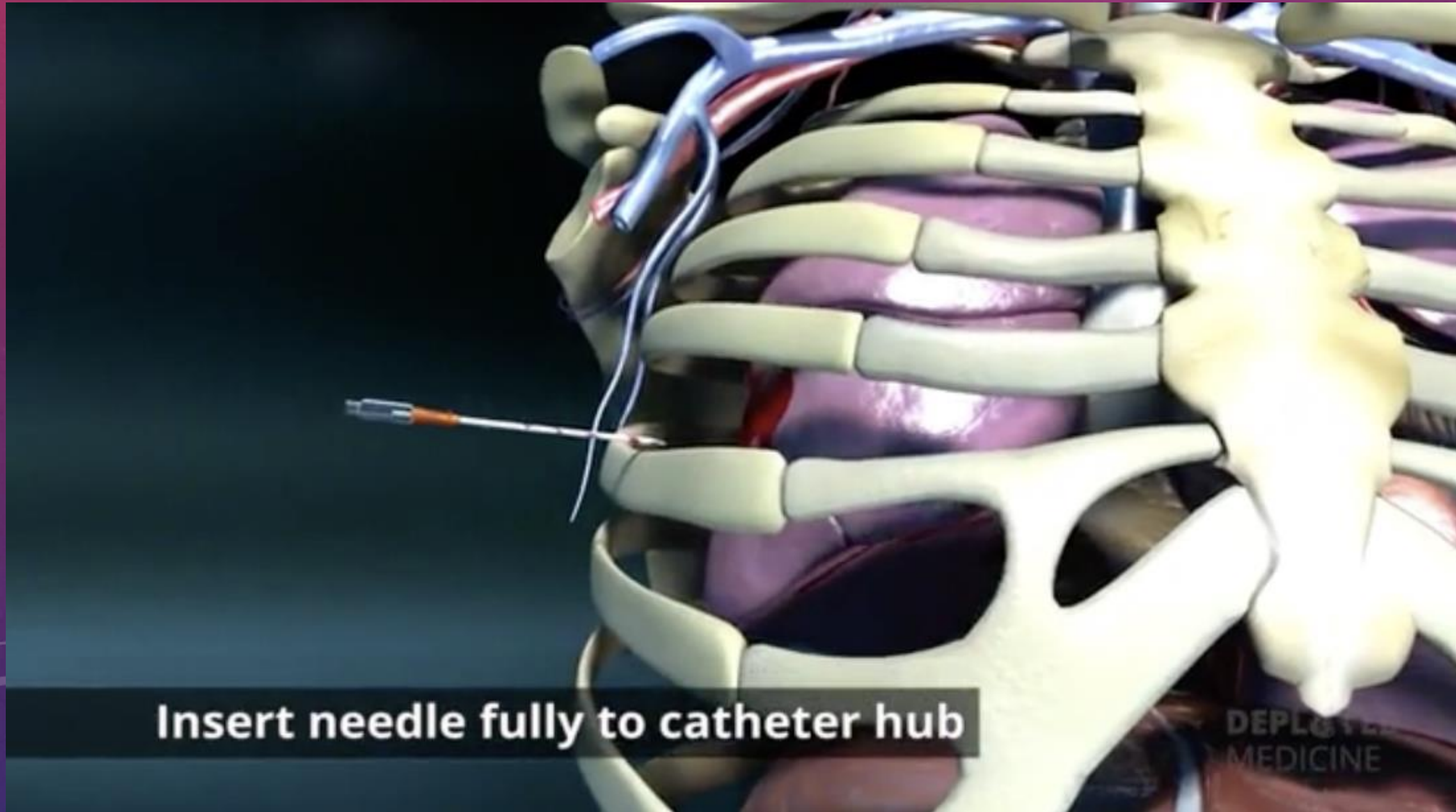
dicine

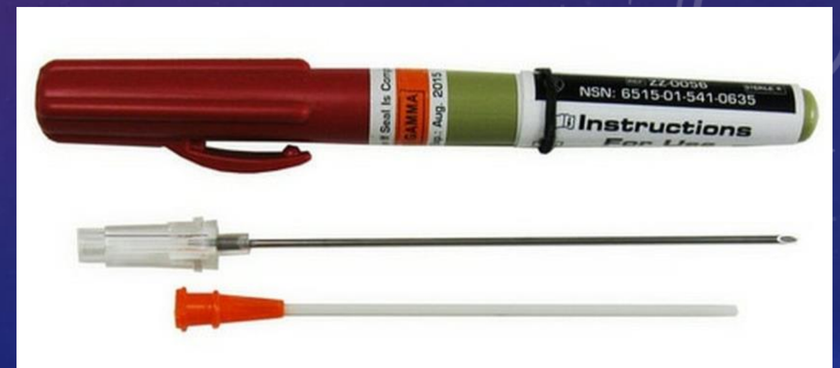
Volume 18, Edition 2.

TCCC TEACHING









EVIDENCE

POOR EVIDENCE

BMJ. 2003 Dec 20; 327(7429): 1459–1461.
doi: 10.1136/bmj.327.7429.1459

Parachute use to prevent death and major trauma
systematic review of randomised controlled trial

Gordon C S Smith, professor[1] and Jill P Pell, consultant[2]

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Parachute use to prevent death and major t
randomized controlled trial

BMJ 2018 ; 363 doi: https://doi.org/10.1136/bmj.k5094
Cite this as: BMJ 2018;363:k5094

Medicines (Basel). 2018 Apr 25;5(2):40. doi: 10.3390/medicines5020040.

Rationalism, Empiricism, and Evidence-Based Medicine: A Call for a New Galenic Synthesis

William M Webb [1]

Affiliations + expand

PMID: 29693563 PMCID: PMC6023440 DOI: 10.3390/medicines5020040

Free PMC article

Abstract

Thirty years after the rise of the evidence-based medicine (EBM) movement, formal training in philosophy remains poorly represented among medical students and their educators. In this paper, I argue that EBM’s reception in this context has resulted in a privileging of empiricism over rationalism in clinical reasoning with unintended consequences for medical practice. After a limited review of the history of medical epistemology, I argue that a solution to this problem can be found in the method of the 2nd-century Roman physician Galen, who brought empiricism and rationalism together in a synthesis anticipating the scientific method. Next, I review several of the problems that have been identified as resulting from a staunch commitment to empiricism in medical practice. Finally, I conclude that greater epistemological awareness in the medical community would precipitate a Galenic shift toward a more epistemically balanced, scientific approach to clinical research.

Keywords: Galen; empiricism; epistemology; evidence-based medicine; medical education; rationalism.

EXPERIENCE

IN TRAINING

- **Know risks**
- **Know how to avoid risks**
- **Know right**
- **Know wrong**
- **Actions on wrong**

EXPERIENCE
ENVIRONMENTAL COMPLEXITY

Increasing Environmental Complexity

Decreasing technical and cognitive complexity

CLINICAL JUDGEMENT – CRITICAL THINKING

QUESTIONS

Don’t be blind to the iatrogenic pathology of your interventions