x congresso nazionale

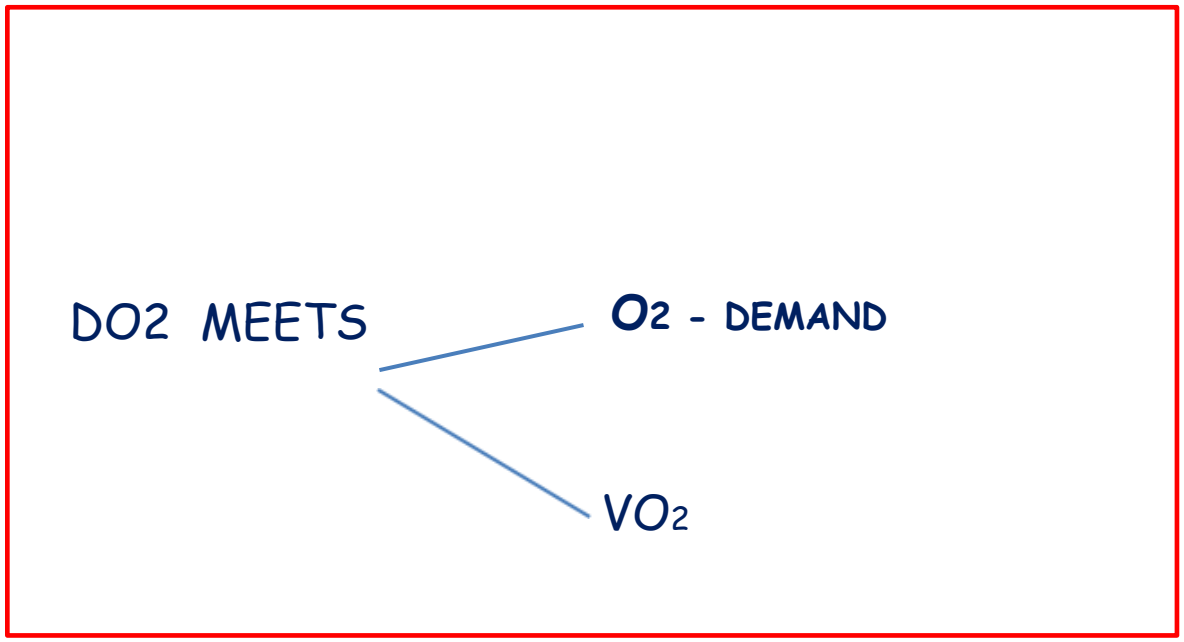
simeu

NAPOLI 18-20 NOVEMBRE 2016

Il soggetto ipoperfuso
monitoraggio metabolico

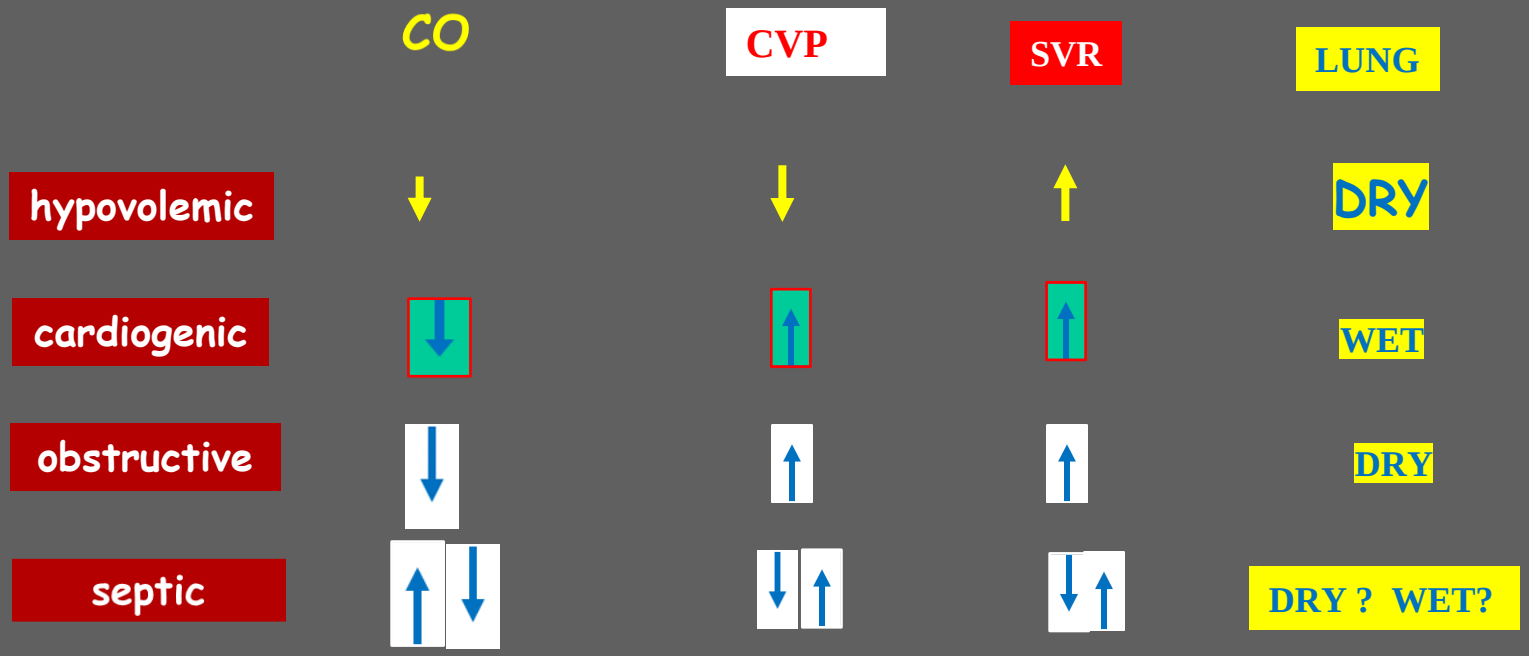
Fernando Schiraldi

PERFUSION IS ADEQUATE WHEN……



(DO2 = CO X CaO2)

SHOCK

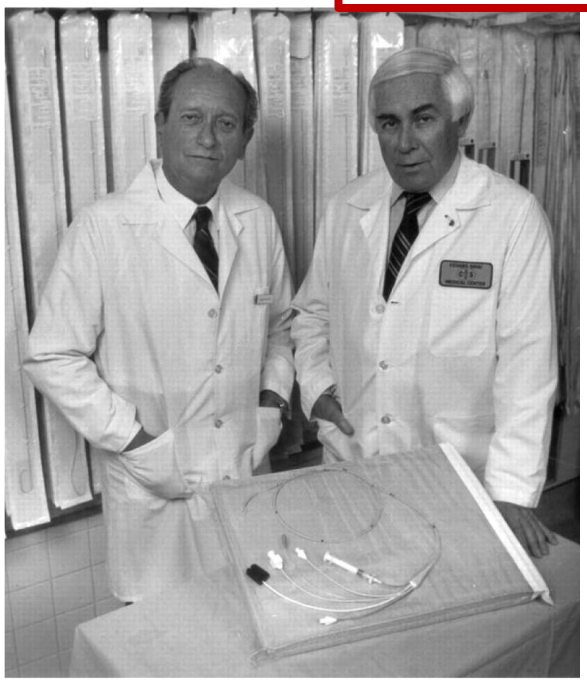


WITH '*INADEQUATE*' PERFUSION

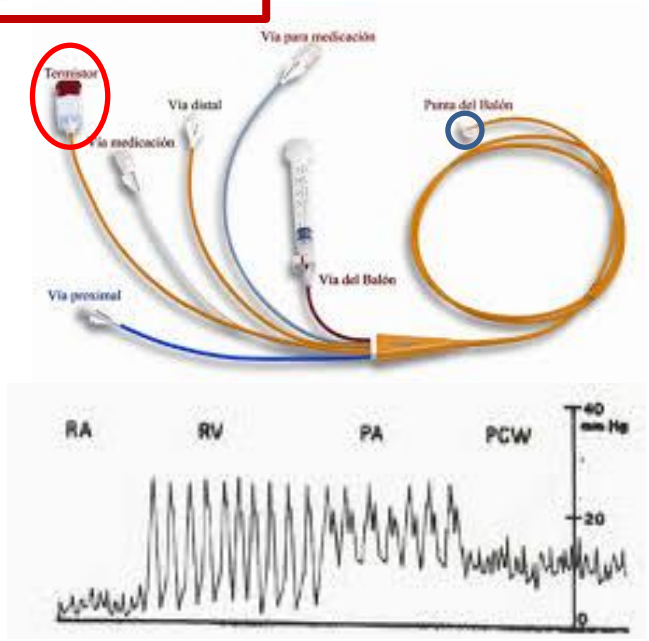
CATHETERIZATION OF THE HEART IN MAN WITH USE OF A FLOW-DIRECTED BALLOON-TIPPED CATHETER*

H. J. C. SWAN, M.B., PH.D., F.R.C.P., WILLIAM GANZ, M.D., C.SC., JAMES FORRESTER, M.D., HAROLD MARCUS, M.D., GEORGE DIAMOND, M.D., AND DAVID CHONETTE

ADEQUACY ??????



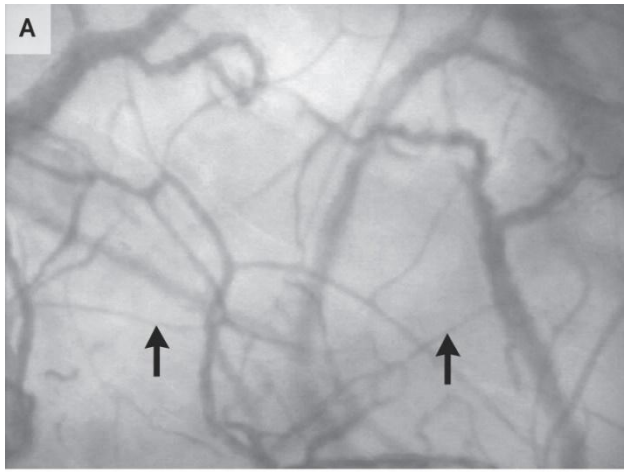
William Ganz and H.J.C. Swan

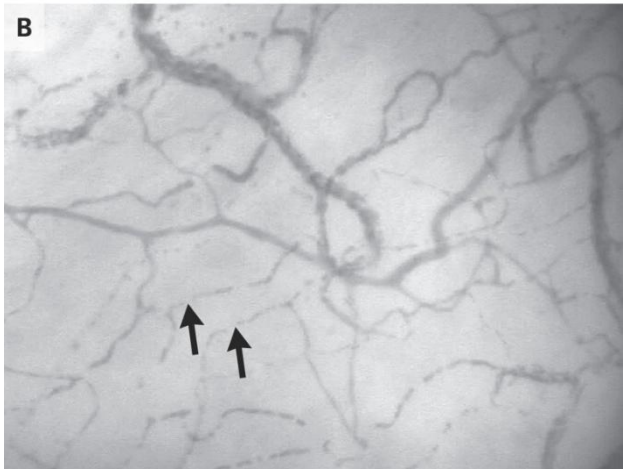


N Engl J Med 1970

New insights into the pathophysiology of cardiogenic shock: the role of the microcirculation

Jesse F. Ashruf[a,b], Hajo A. Bruining[c], and Can Ince[a]





COCC 2013

MICRO vs MACRO

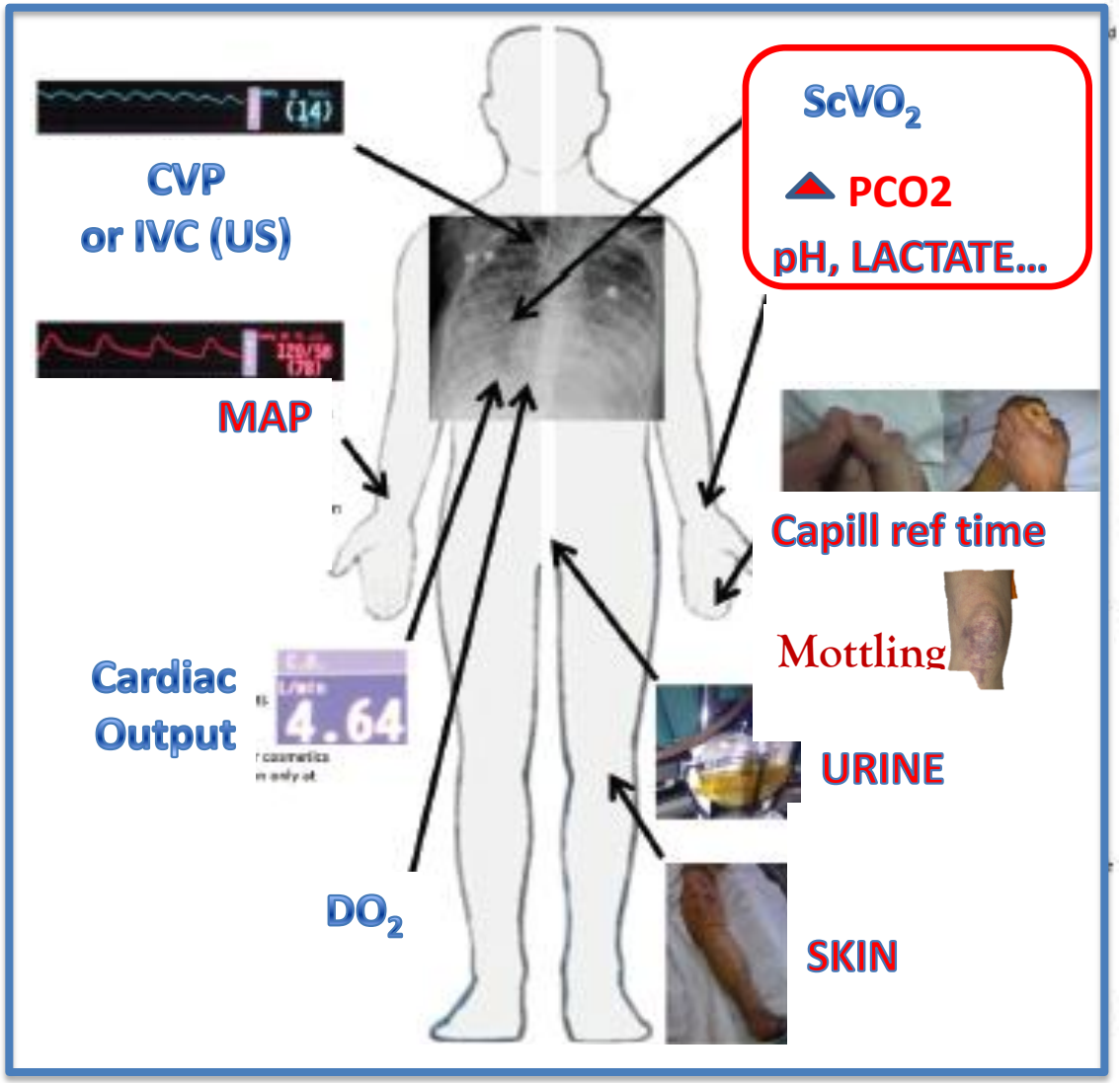
- BGA
  - pH
  - O2-derived news
  - Lactate
  - The dark side

a quick look at the "OCCULT HYPOPERFUSION "

HEAD TO TOE

GCS
HR
RR
BP
T

plus



Dunser MW, Crit Care 2013

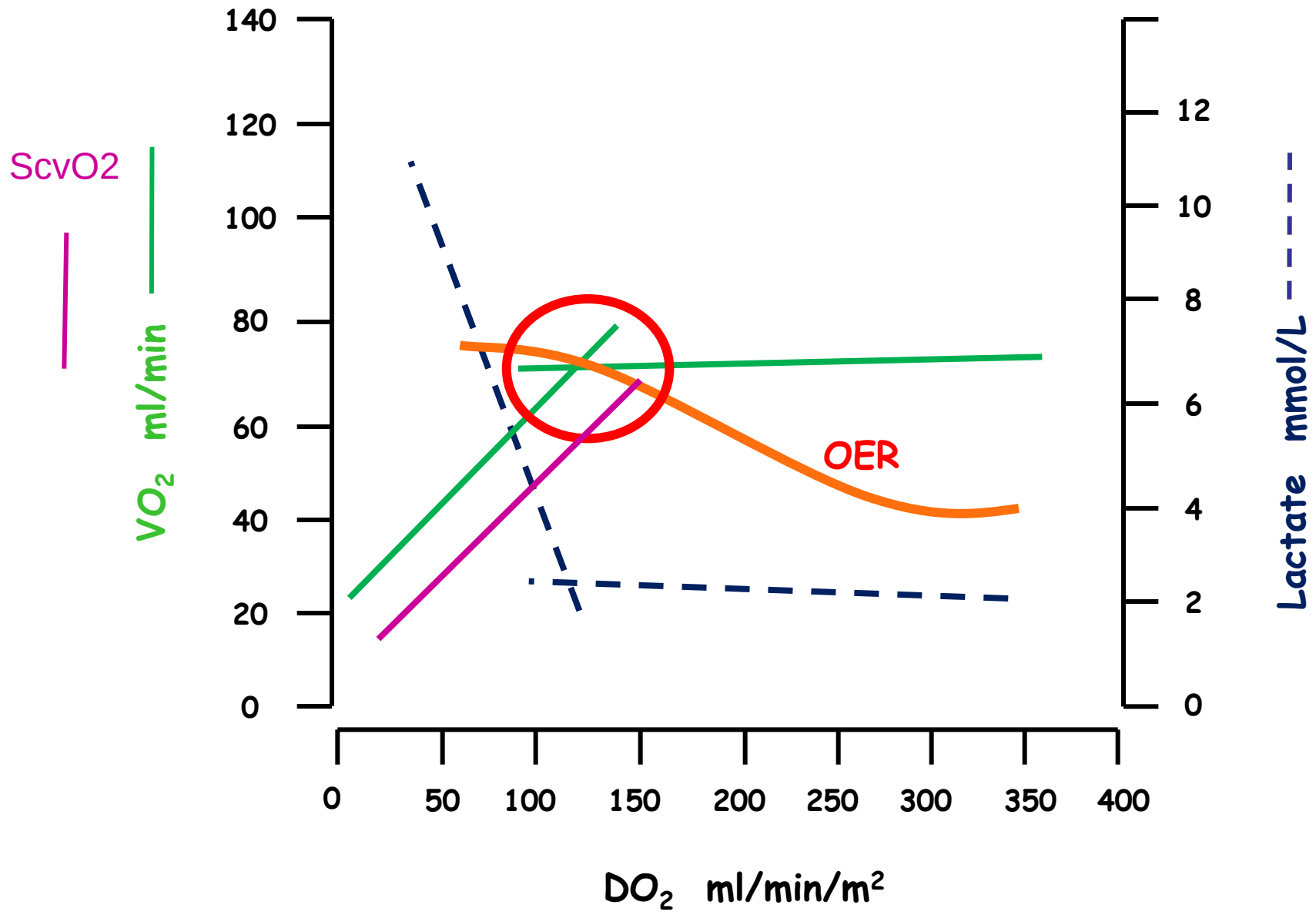
Arterial BGA

pH	PCO_2	HCO_3

⇑ pH — Resp Alk, Met Alk — } early

⇓ pH — ↑AG Met Acid, Mix Acid — } late

The O2-Derived Parameters



Research

Open Access

Incidence of low central venous oxygen saturation during unplanned admissions in a multidisciplinary intensive care unit: an observational study

Hendrik Bracht, Matthias Hänggi, Barbara Jeker, Ninja Wegmüller, Francesca Porta, David Tüller, Jukka Takala and Stephan M Jakob

Department of Intensive Care Medicine, University Hospital Bern, University of Bern, Freiburgstrasse, CH-3010 Bern, Switzerland

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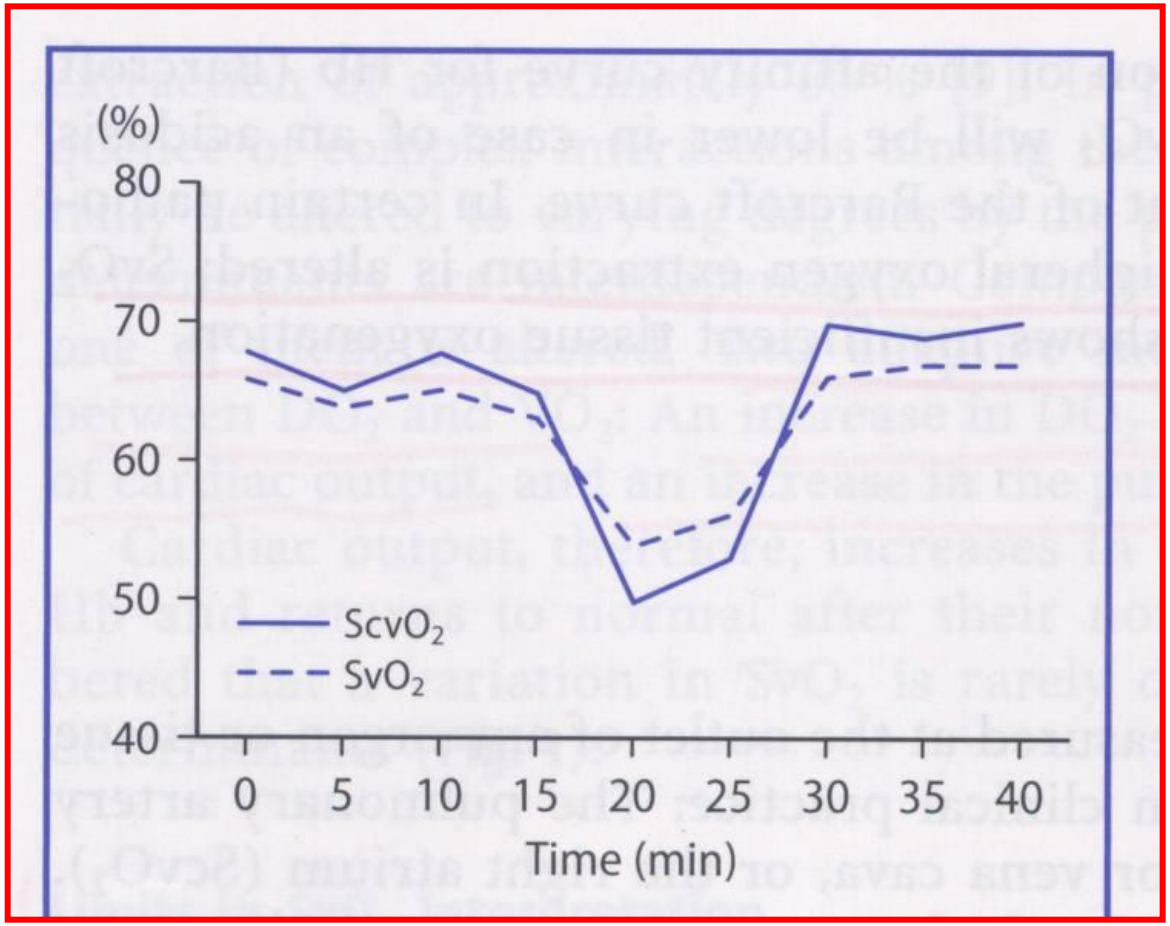
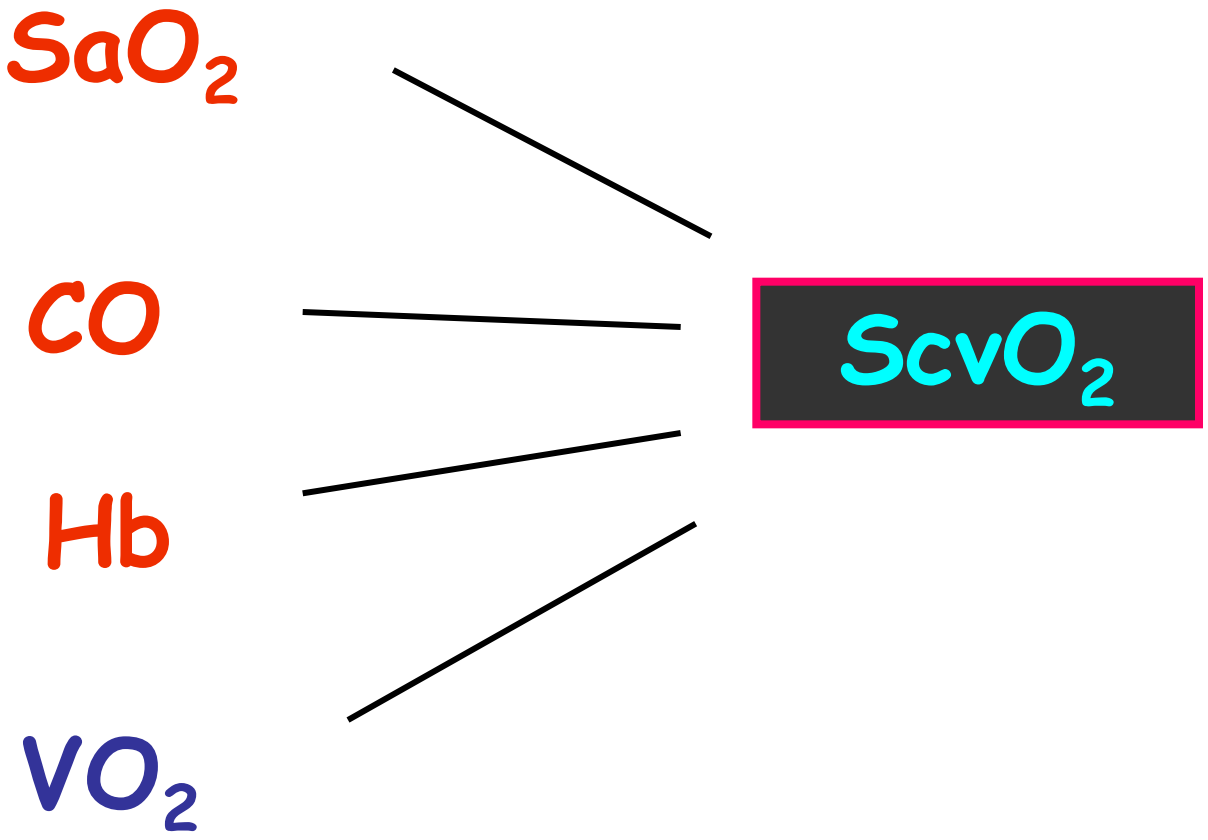
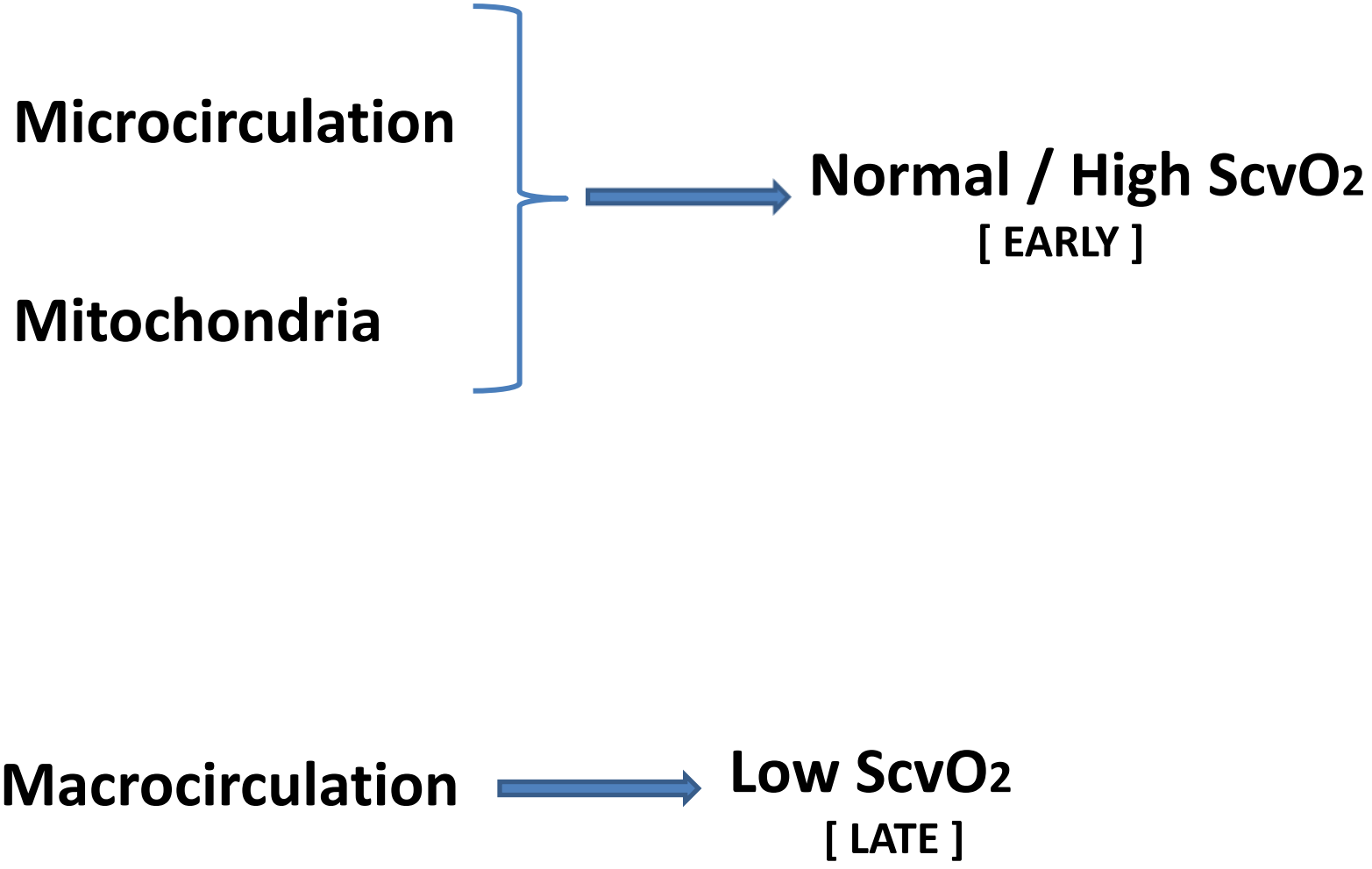
Received: 19 May 2006 Revisions requested: 17 Jul 2006 Revisions received: 16 Nov 2006 Accepted: 9 Jan 2007 Published: 9 Jan 2007

Critical Care 2007, 11:R2 (doi:10.1186/cc5144)

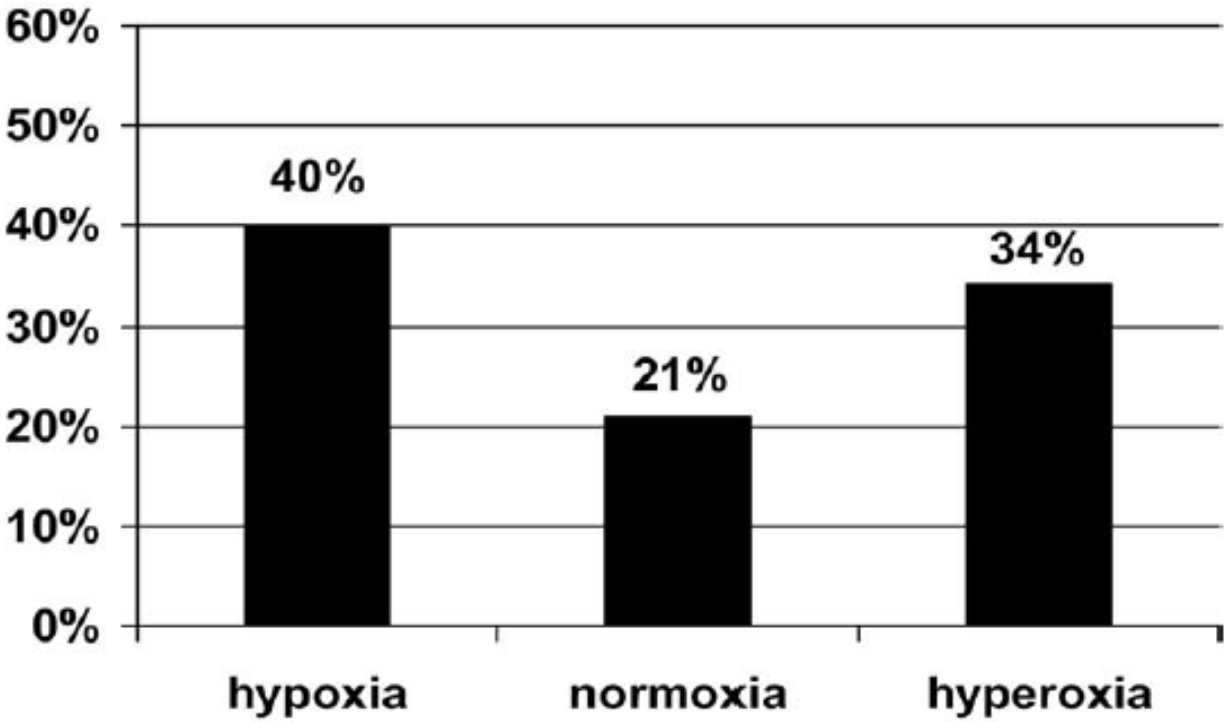



SaO_2
CO
Hb
VO_2
$ScvO_2$


Microcirculation
Mitochondria
Normal / High ScvO2
[EARLY]
Macrocirculation
Low ScvO2
[LATE]

Multicenter Study of Central Venous Oxygen Saturation ($ScvO_2$) as a Predictor of Mortality in Patients With Sepsis

Jennifer V. Pope, MD
Alan E. Jones, MD
David F. Gaieski, MD
Ryan C. Arnold, MD
Stephen Trzeciak, MD,
Nathan I. Shapiro, MD



Ann Emerg Med. 2010;55:40-46

Intensive Care Med (2007) 33:1967–1971
DOI 10.1007/s00134-007-0788-7

ORIGINAL

E. J. O. Kompanje
T. C. Jansen
B. van der Hoven
J. Bakker

The first demonstration of lactic acid in human blood in shock by Johann Joseph Scherer (1814–1869) in January 1843

Chemische und mikroskopische

Untersuchungen

zur Pathologie

angestellt an den

Kliniken des Julius-Hospitales zu Würzburg,

von

Dr. Joh. Jos. Scherer,
Professor extraordinarius der medizinischen Fakultät.

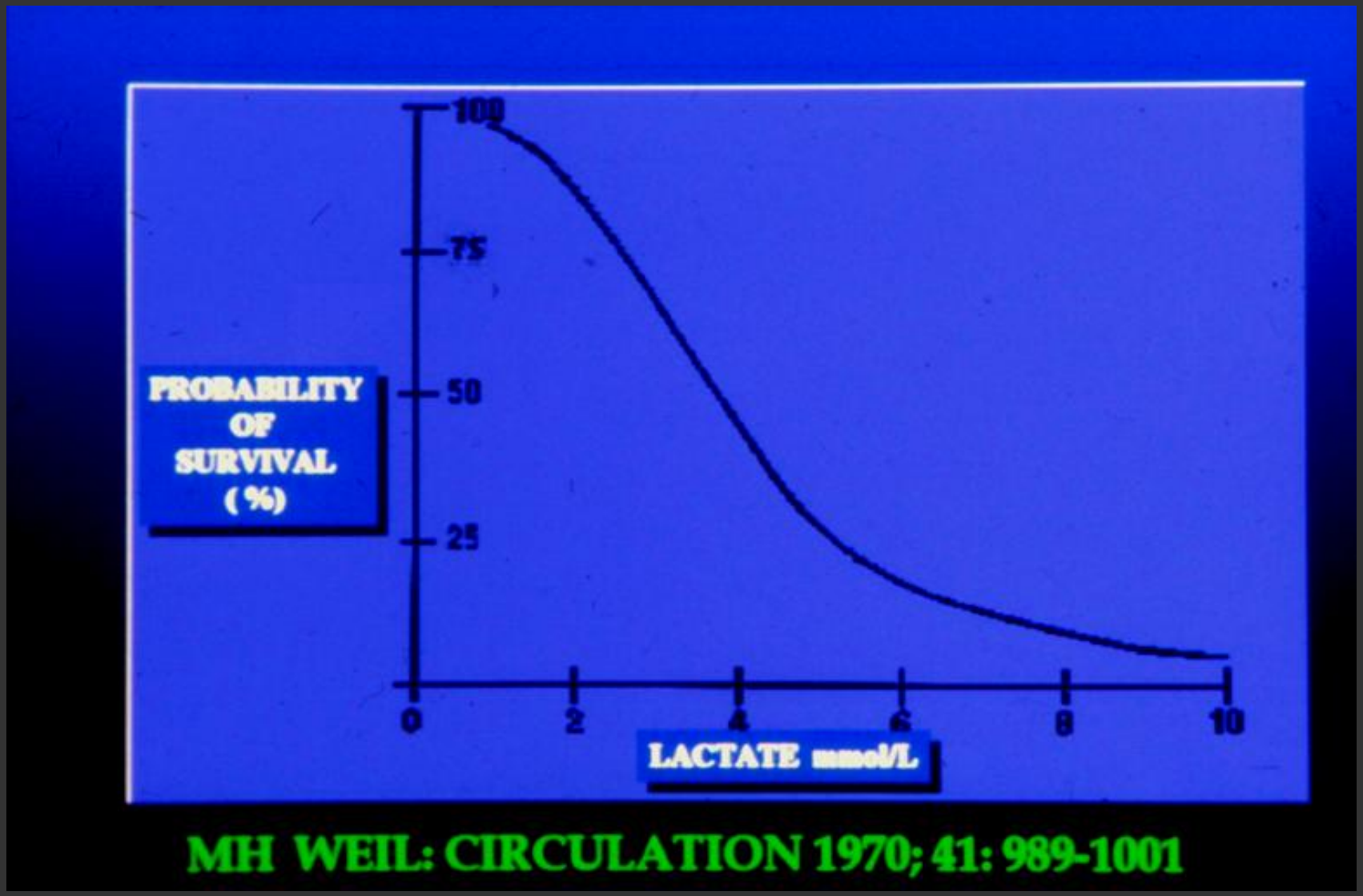
Heidelberg,
Akadem. Verlagshandlung von C. F. Winter.
1843.

"instantaneous" LACTATE CONCENTRATION

PRODUCTION

vs

LIVER & KIDNEY METABOLISM

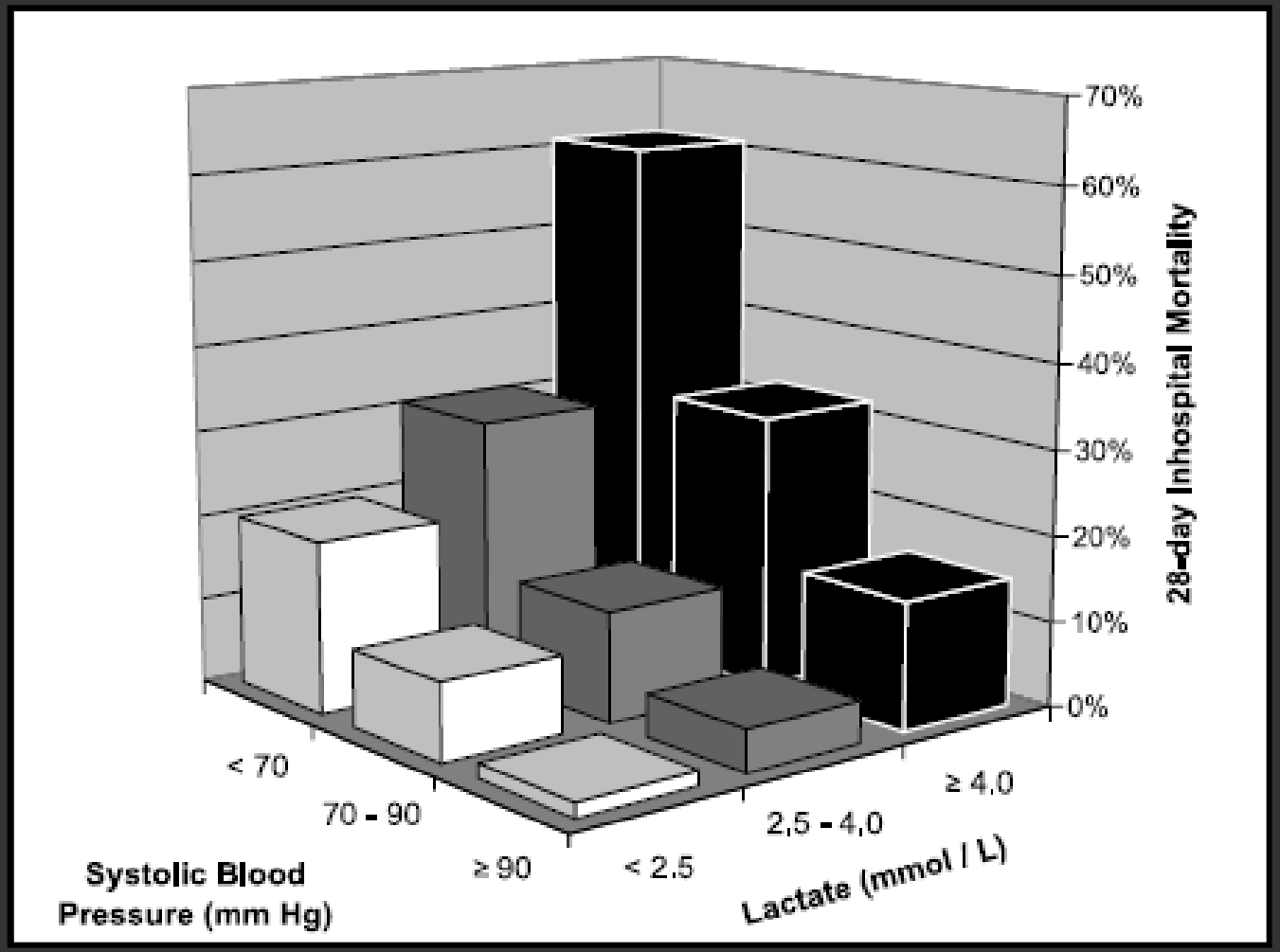

100
75
50
25
PROBABILITY OF SURVIVAL (%)
0
2
4
6
8
10
LACTATE mmol/L
MH WEIL: CIRCULATION 1970; 41: 989-1001

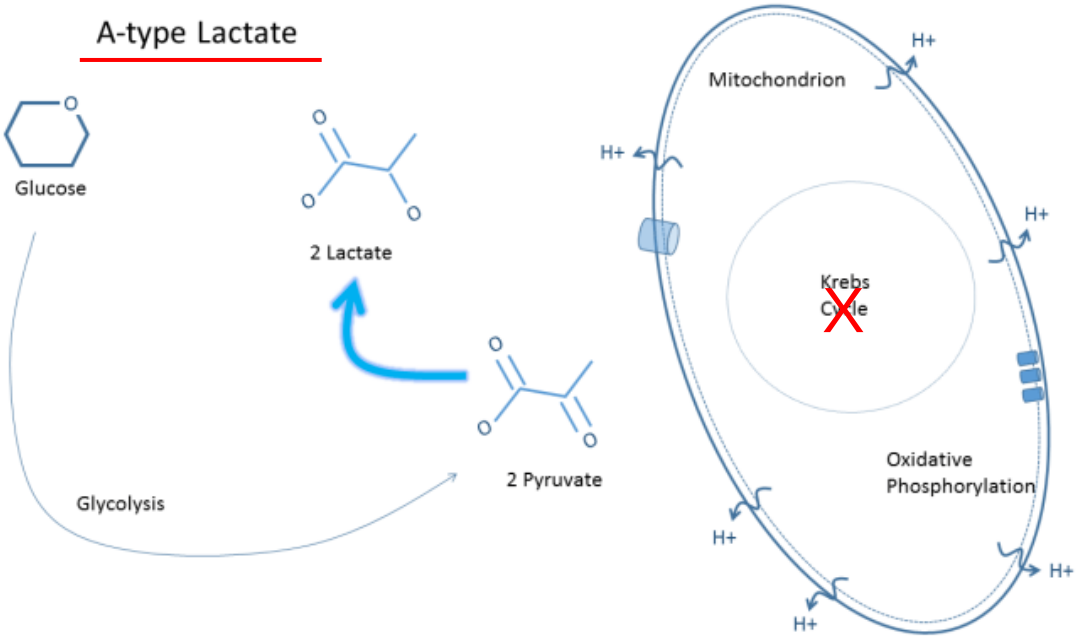
Intensive Care Med (2007) 33:1892–1899
DOI 10.1007/s00134-007-0680-5

ORIGINAL

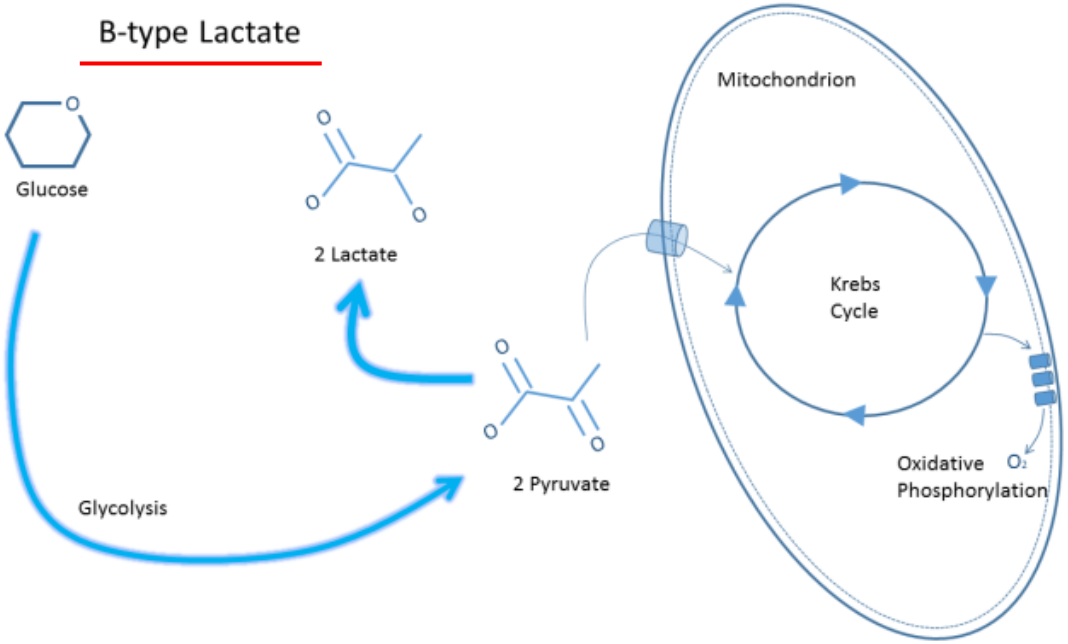
Michael D. Howell
Michael Donnino
Peter Clardy
Daniel Talmor
Nathan I. Shapiro

Occult hypoperfusion and mortality in patients with suspected infection

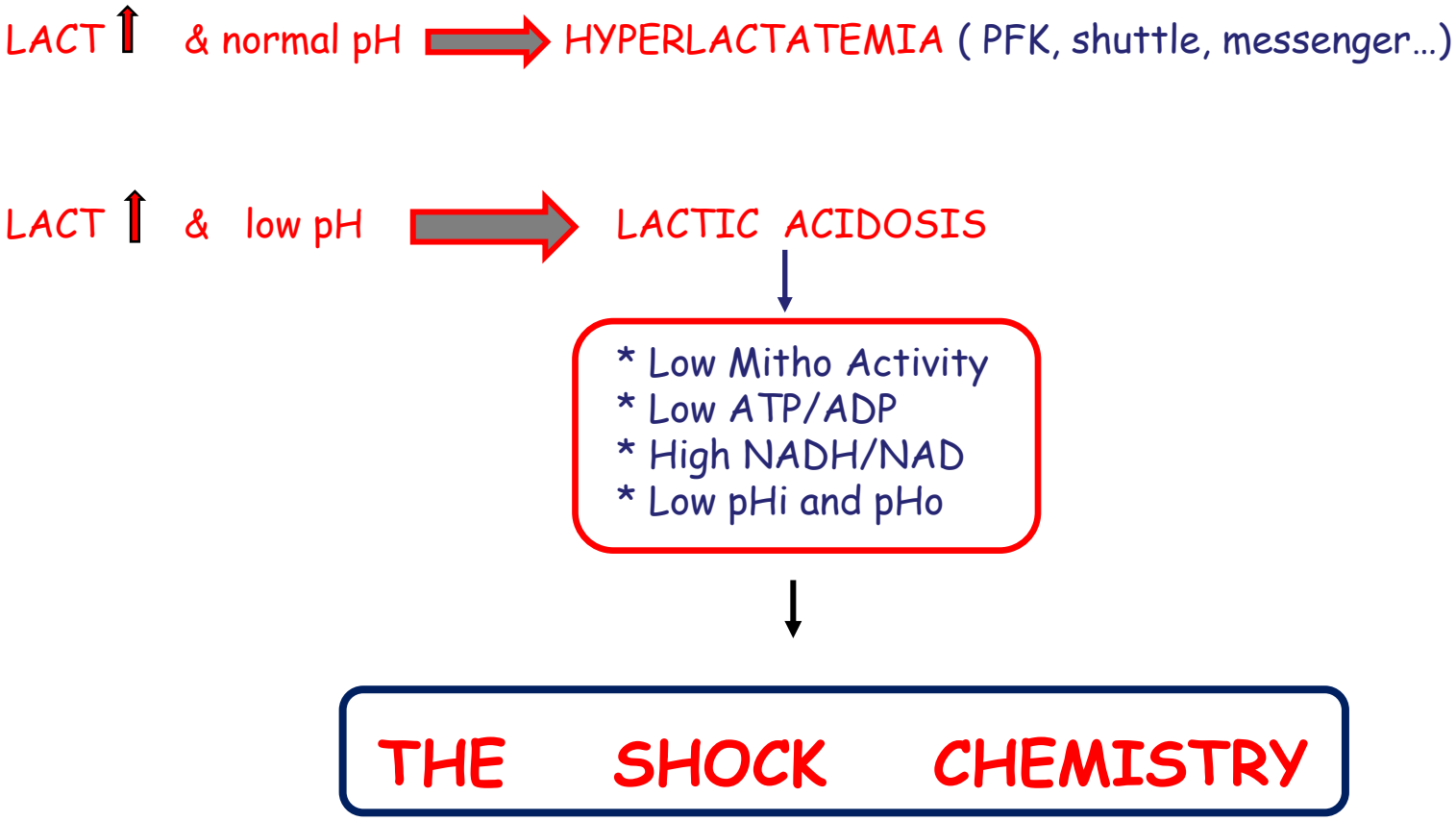




LACT/PYR>10



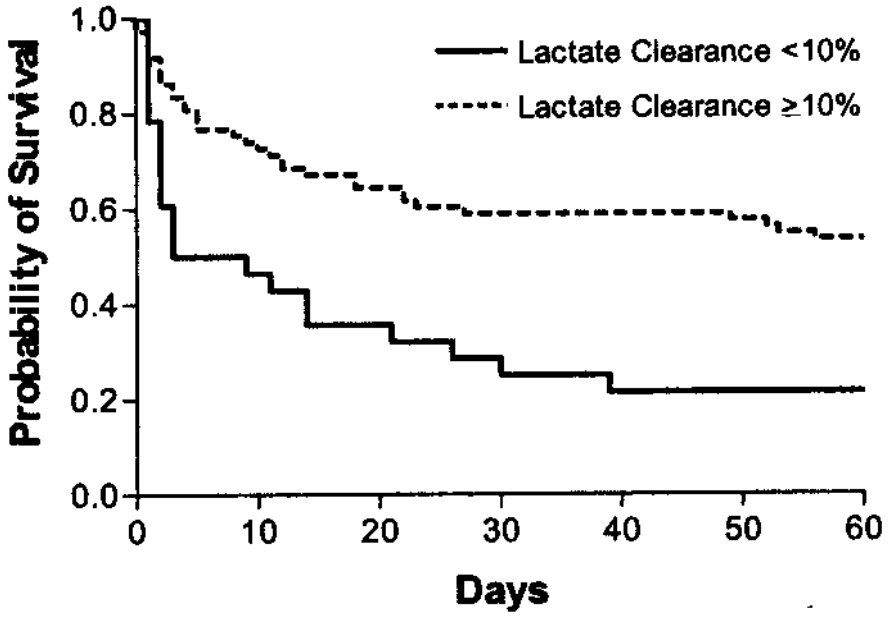
LACT/PYR<10


LACT
& normal pH
HYPERLACTATEMIA (PFK, shuttle, messenger…)
LACT
& low pH
LACTIC ACIDOSIS
* Low Mitho Activity
* Low ATP/ADP
* High NADH/NAD
* Low pHi and pHo
THE SHOCK CHEMISTRY

"LACTIME" ?

EARLY LACTATE CLEARANCE IS ASSOCIATED WITH IMPROVED OUTCOME

$$\frac{\text{Lactate start} - \text{Lactate 6 H}}{\text{Lactate start}} \times 100$$



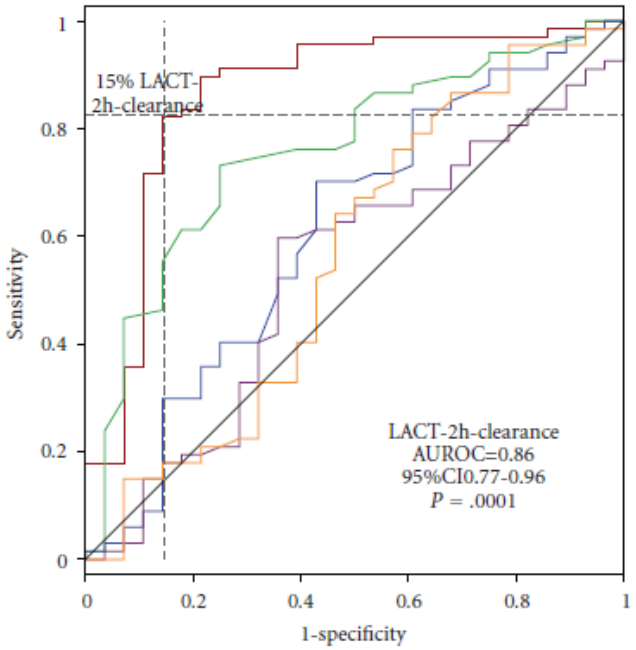
NGUYEN HB, RIVERS EP (2004) CCM 32;8:1637-42

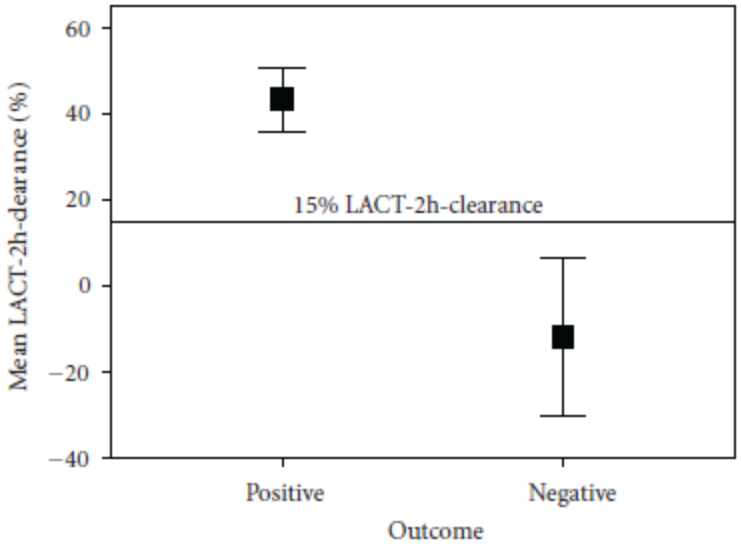
Hindawi Publishing Corporation
Critical Care Research and Practice
Volume 2010, Article ID 917053, 6 pages
doi:10.1155/2010/917053

Research Article

Two-Hour Lactate Clearance Predicts Negative Outcome in Patients with Cardiorespiratory Insufficiency

Sean Scott,[1] Vittorio Antonaglia,[2] Giovanna Guiotto,[3] Fiorella Paladino,[3] and Fernando Schiraldi[3]





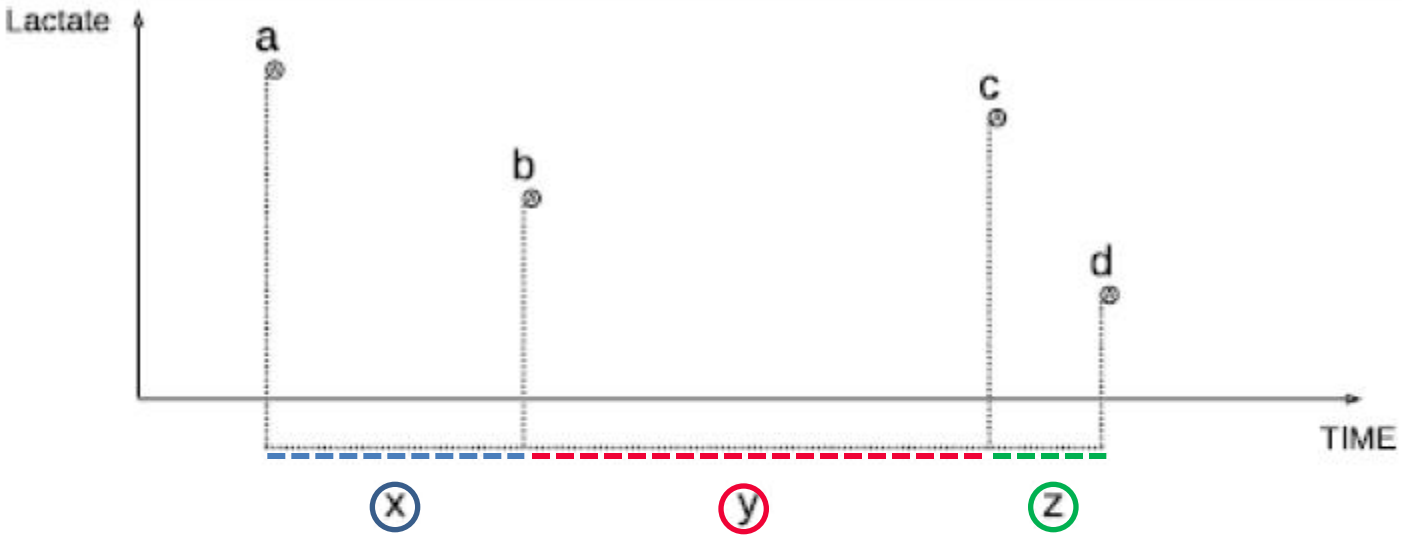
Nichol *et al. Critical Care* 2011, **15**:R242
http://ccforum.com/content/15/5/R242

CRITICAL CARE

RESEARCH Open Access

Dynamic lactate indices as predictors of outcome in critically ill patients

Alistair Nichol[1,3], Michael Bailey[1], Moritoki Egi[2], Ville Pettila[1], Craig French[5,4], Edward Stachowski[6], Michael C Reade[4], David James Cooper[1,3] and Rinaldo Bellomo[1,4,7*]



36673 lact in 24 h
5041 pts

Time weighted average = x((a+b)/2))+y((b+c)/2)+z((c+d/2)) / (x+y+z)

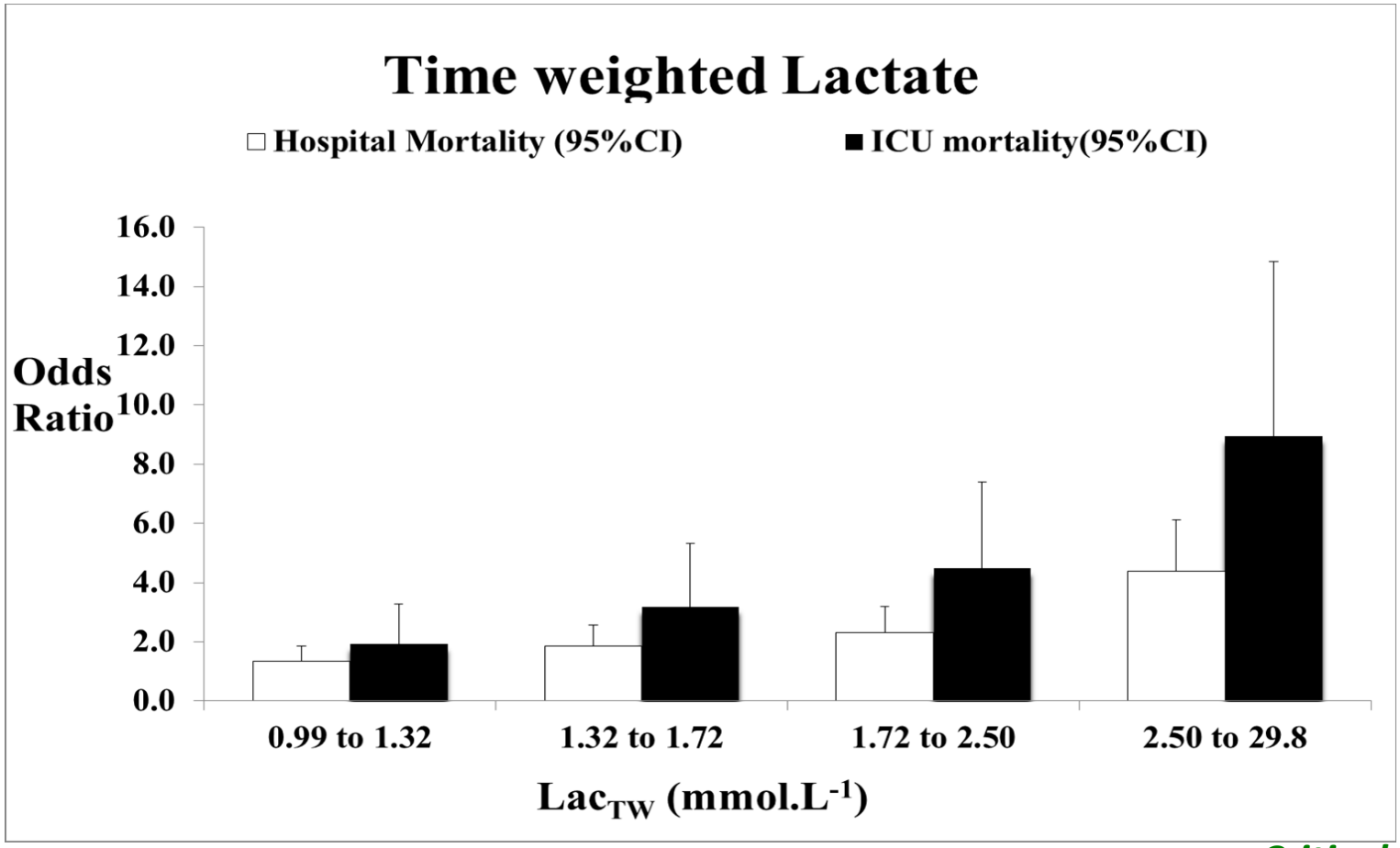
Figure 1 Diagram describing the calculation of time weighted lactate (Lac_{TW}).

RESEARCH Open Access

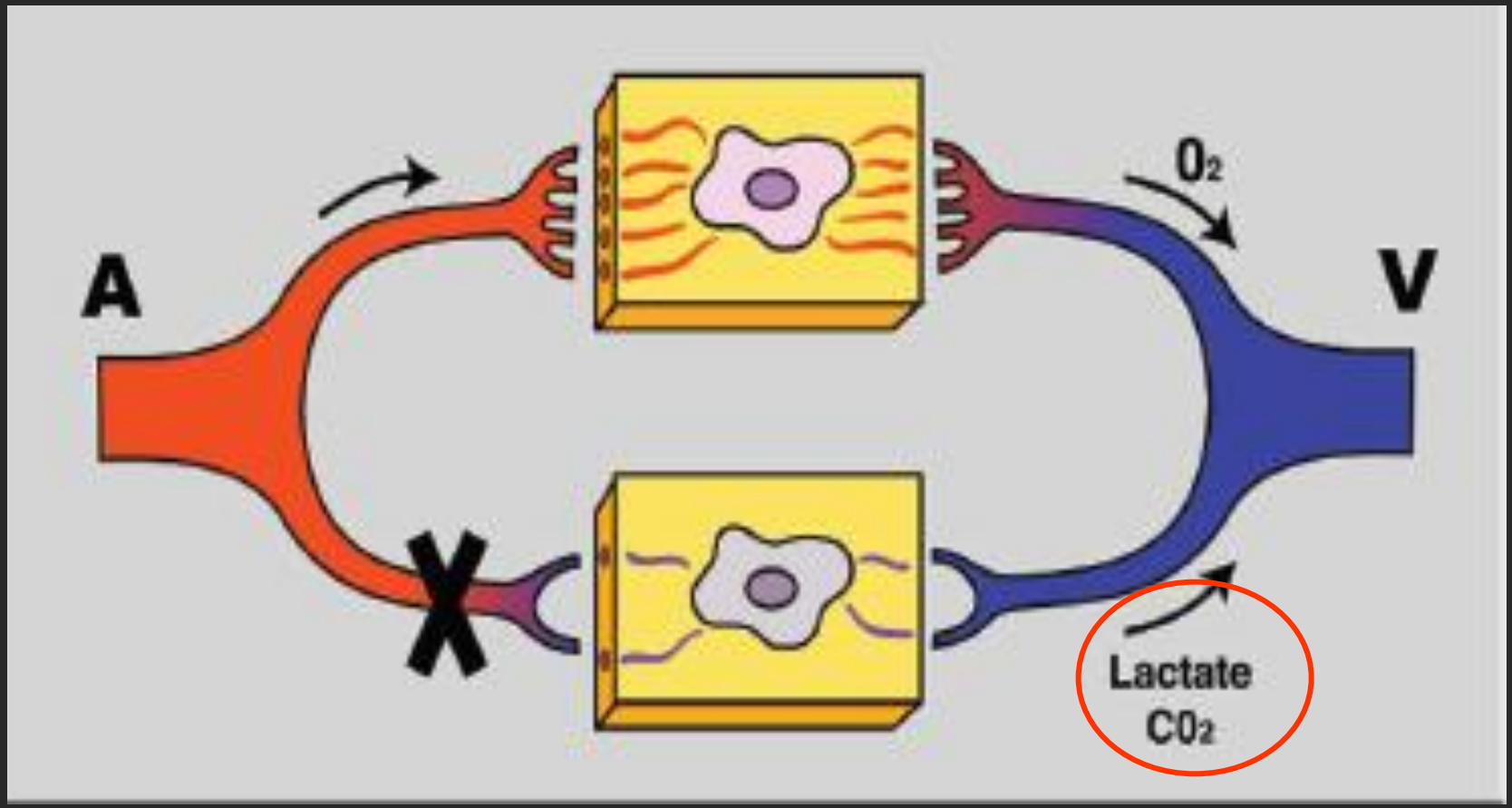
Dynamic lactate indices as predictors of outcome in critically ill patients

CRITICAL CARE

Alistair Nichol[1,3], Michael Bailey[1], Moritoki Egi[2], Ville Pettila[1], Craig French[5,4], Edward Stachowski[6], Michael C Reade[4], David James Cooper[1,3] and Rinaldo Bellomo[1,4,7*]

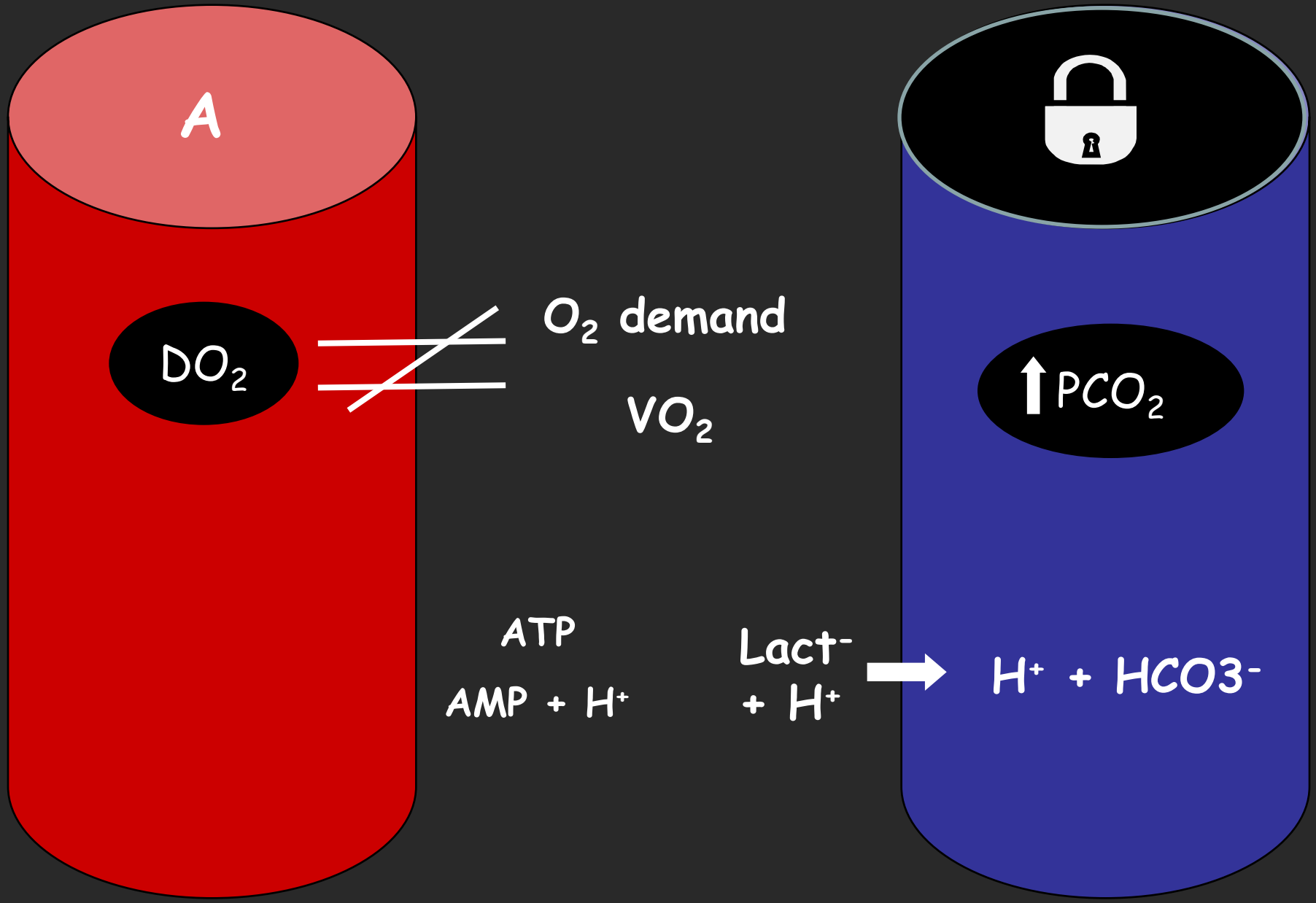


Critical Care 2011



Krogh Am J Phys 1919

The CO_2 Δ & 'DYSOXIA'



"VENOUS METABOLIC ACIDOSIS" (↑↑ $P_{cv}CO_2$)

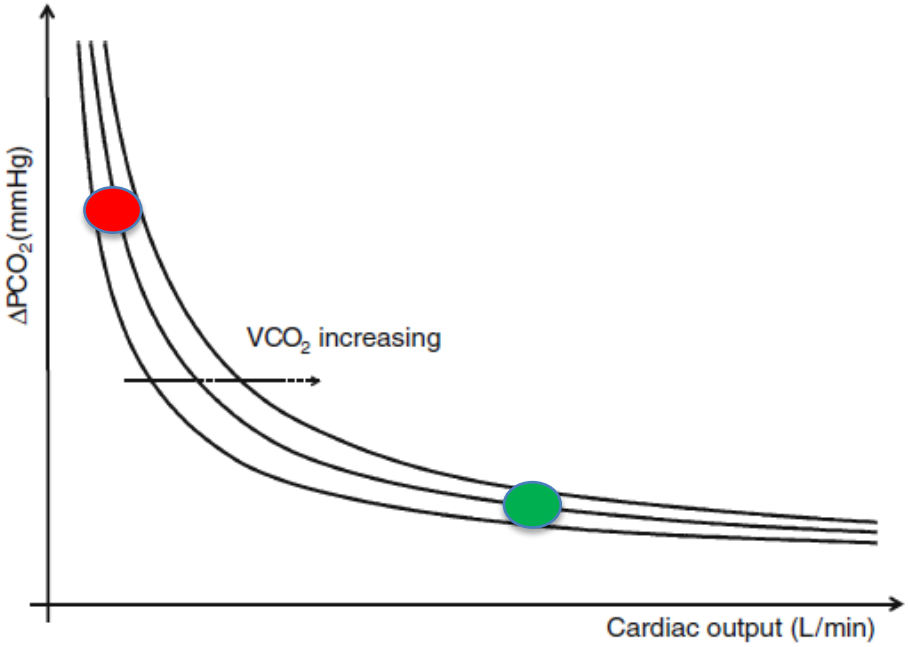
Arieff,Weil, Adroguè,Pinsky…….

…..the dark side

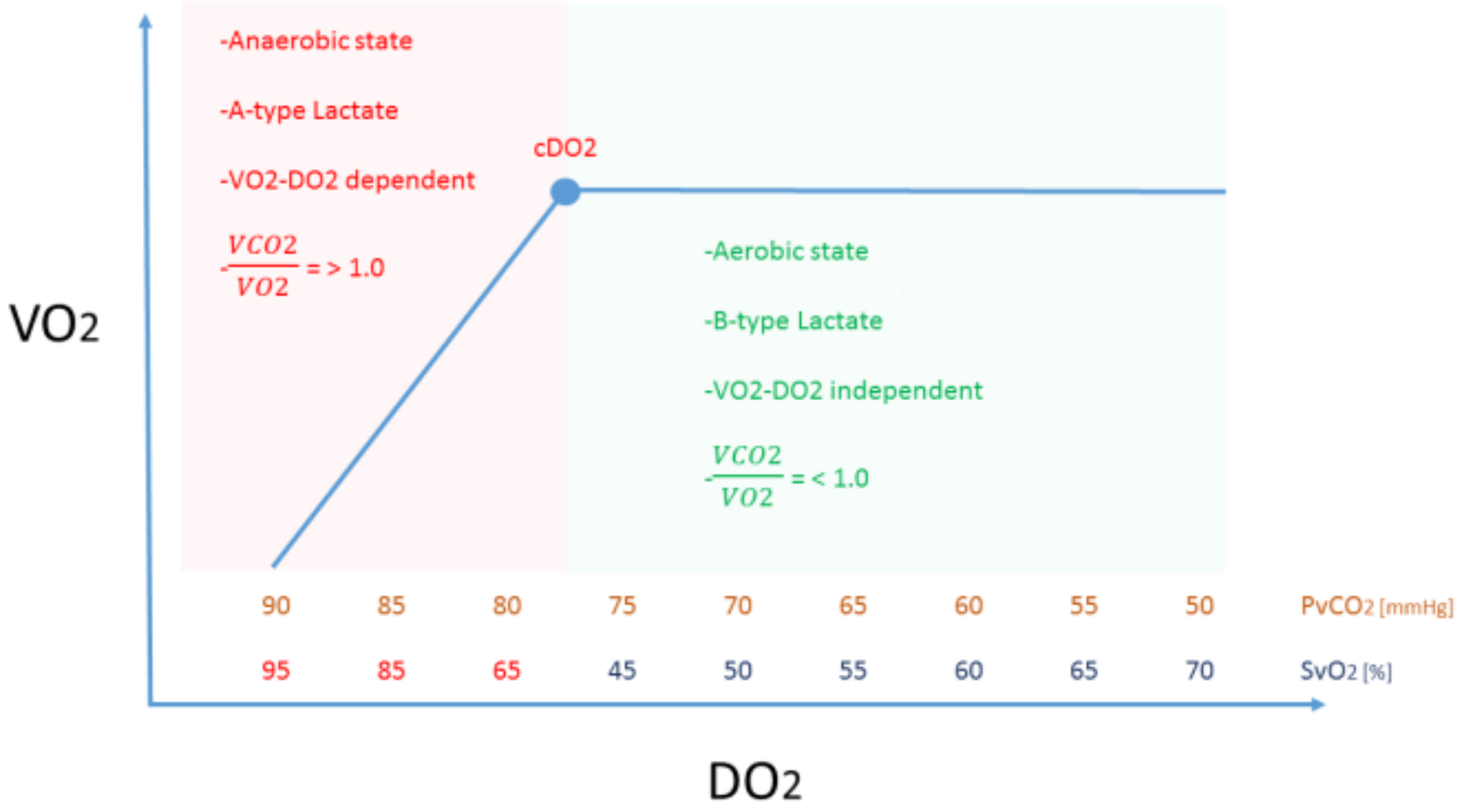
INVITED REVIEW

Hemodynamic management of cardiovascular failure by using PCO_2 venous-arterial difference

Martin Dres · Xavier Monnet · Jean-Louis Teboul



J Clin Monit Comput 2012

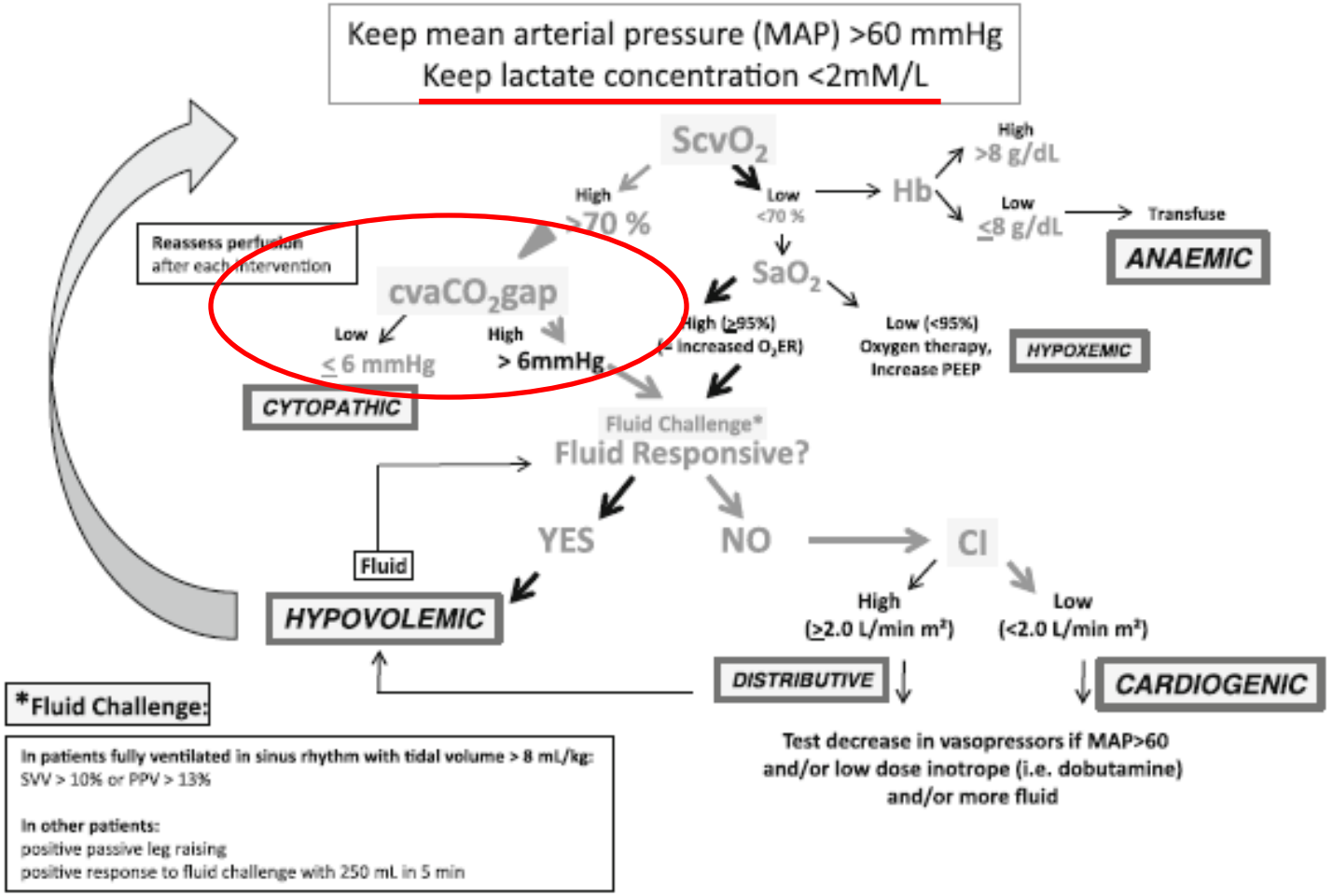

-Anaerobic state
-A-type Lactate
-VO2-DO2 dependent
$-\frac{VCO2}{VO2}$ = > 1.0
cDO2
-Aerobic state
-B-type Lactate
-VO2-DO2 independent
$-\frac{VCO2}{VO2}$ = < 1.0
VO2
DO2
90 85 80 75 70 65 60 55 50 PvCO2 [mmHg]
95 85 65 45 50 55 60 65 70 SvO2 [%]

Intensive Care Med (2013) 39:1653–1655
DOI 10.1007/s00134-013-2998-5

EDITORIAL

B. Vallet
M. R. Pinsky
M. Cecconi

Resuscitation of patients with septic shock: please "mind the gap"!



$$\frac{VO_2}{DO_2} \div ScvO_2$$

If low = O2 debt

$$\frac{O_2\ Demand}{DO_2}$$

+ low pH = lactic acidosis

$$\frac{VCO_2}{flow} \div \Delta_{va}PCO2$$

+ low pH = tissue acidosis

↓micro-flow ÷ $\Delta_{ta}PCO2$ = the future…?

$$\frac{\Delta_{va}\ PCO2}{\Delta_{av}O2\ Content}$$

: next ?????

KEY POINTS

- Head to Toe
- Filling
- Vascular Tone
- US (EF, Diastole, Obstructions, LW, IVCC)
- ***The 'inside' Machinery (V-A BGA, LAC, ScvO2)***
- Microcirculation