EGDT
lactate

Prof. Jan Bakker MD, PhD

Chair dept Intensive Care Adults

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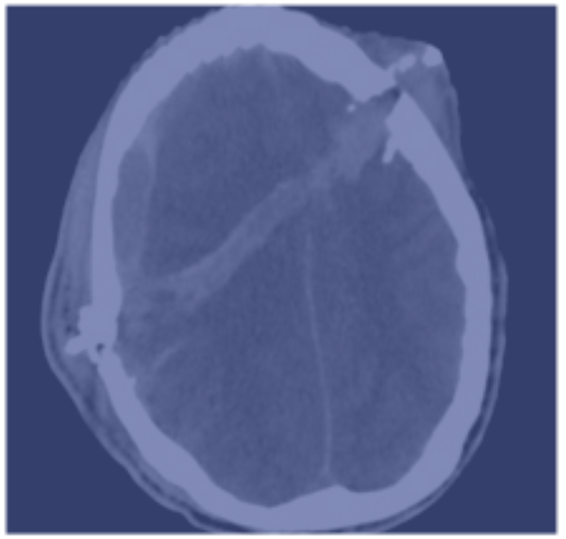
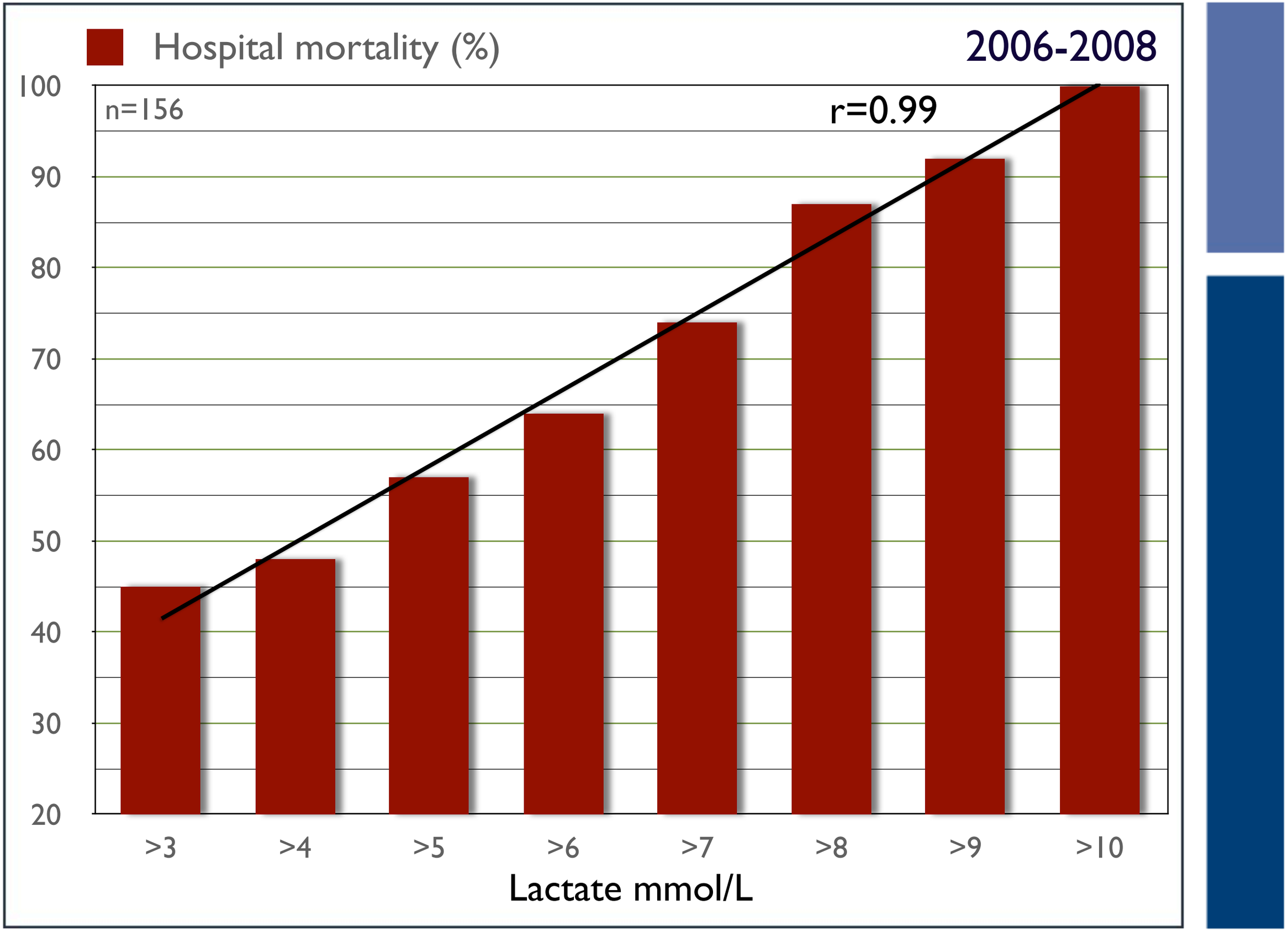
www.intensivecare.me



Erasmus MC
University Medical Center Rotterdam


Hospital mortality (%)
2006-2008
n=156
r=0.99
100
90
80
70
60
50
40
30
20
>3
>4
>5
>6
>7
>8
>9
>10
Lactate mmol/L

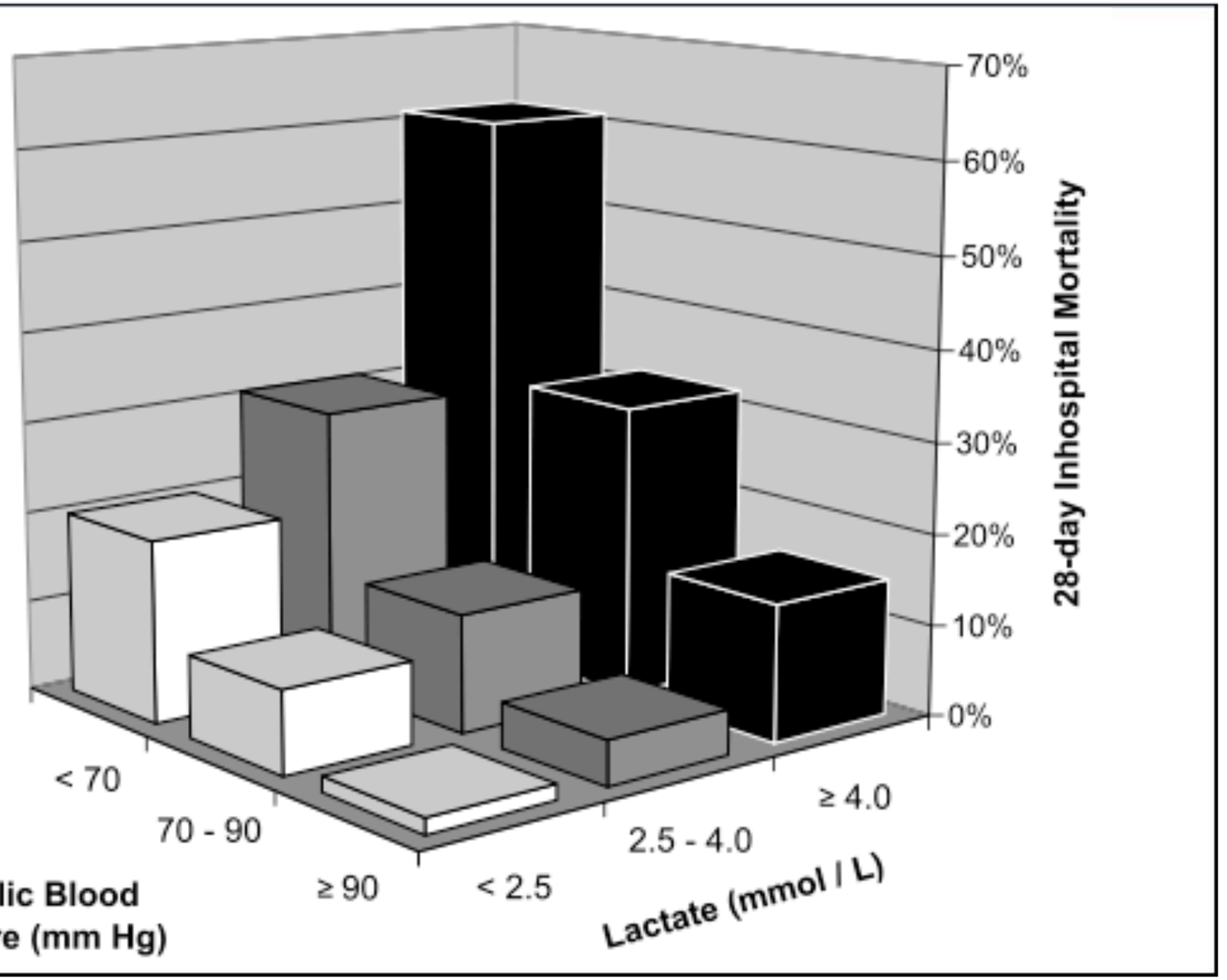
Intensive Care Med (2007) 33:1892–1899
DOI 10.1007/s00134-007-0680-5

ORIGINAL

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

Occult hypoperfusion and mortality in patients with suspected infection

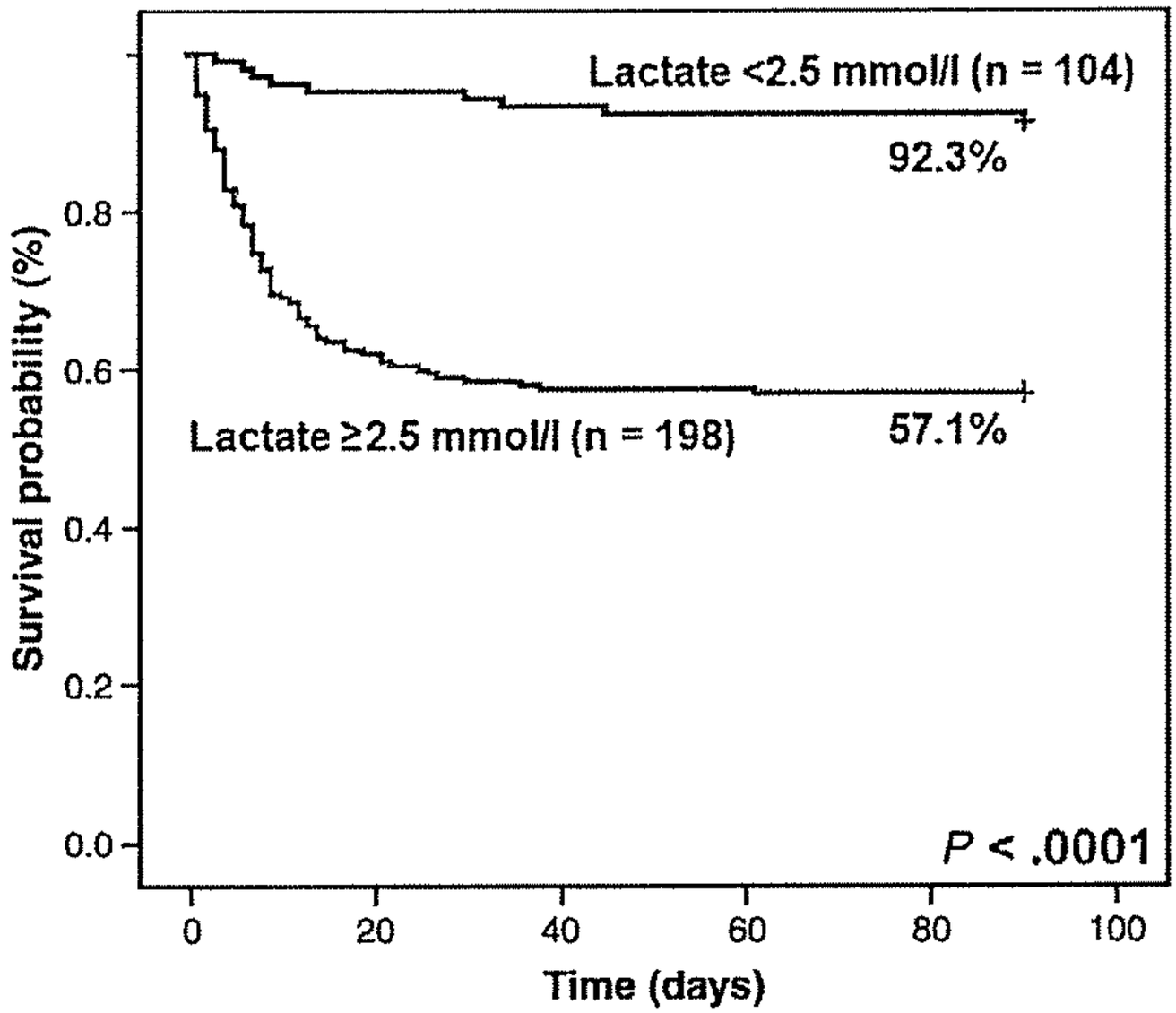
Emergency Room



Persistent sepsis-induced hypotension without hyperlactatemia: Is it really septic shock?

Glenn Hernandez*, Ricardo Castro, Carlos Romero, Claudio de la Hoz, Daniela Angulo, Ignacio Aranguiz, Jorge Larrondo, Andres Bujes, Alejandro Bruhn

J Crit Care 2011;26:435



Persistent sepsis-induced hypotension without hyperlactatemia may not constitute a real septic shock.

Our results support the need to review the current definition of septic shock.

Hyperlactatemia could represent an objective parameter worth to be explored as a potential diagnostic criterion for septic shock

MULTICENTER STUDY OF EARLY LACTATE CLEARANCE AS A DETERMINANT OF SURVIVAL IN PATIENTS WITH PRESUMED SEPSIS

Ryan C. Arnold,* Nathan I. Shapiro,† Alan E. Jones,‡ Christa Schorr,§ Jennifer Pope,† Elisabeth Casner,‡ Joseph E. Parrillo,§ R. Phillip Dellinger,§ Stephen Trzeciak,* and on behalf of the Emergency Medicine Shock Research Network (EMShockNet) Investigators

SHOCK, Vol. 32, No. 1, pp. 35–39, 2009

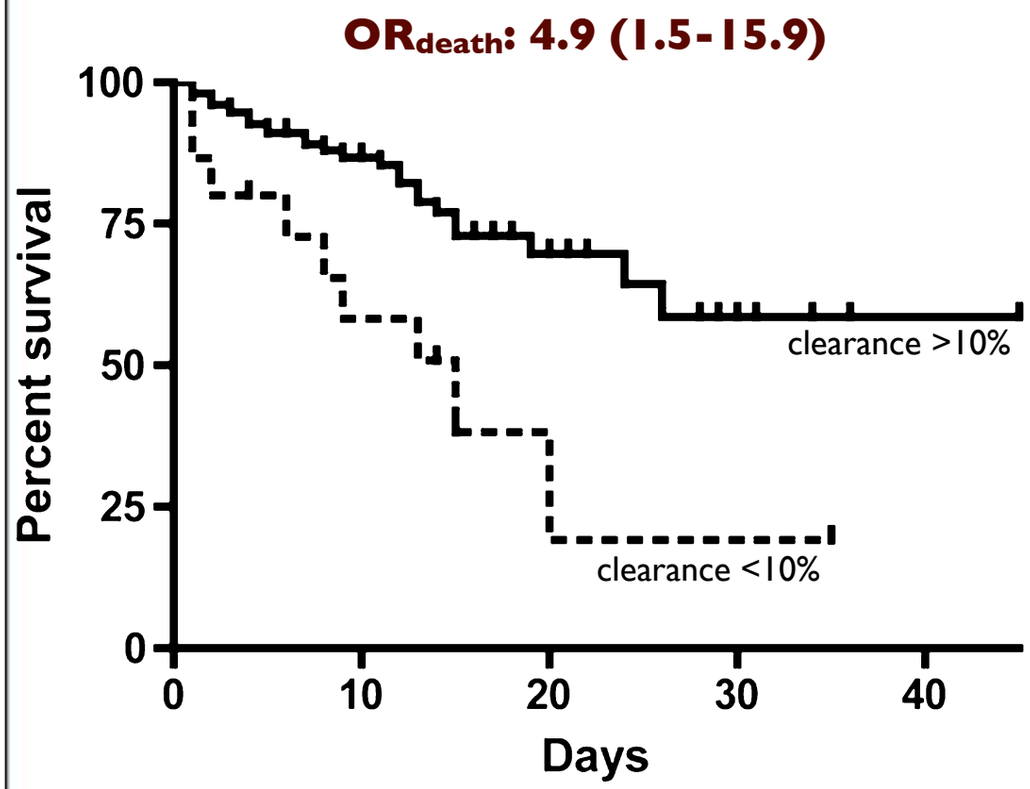


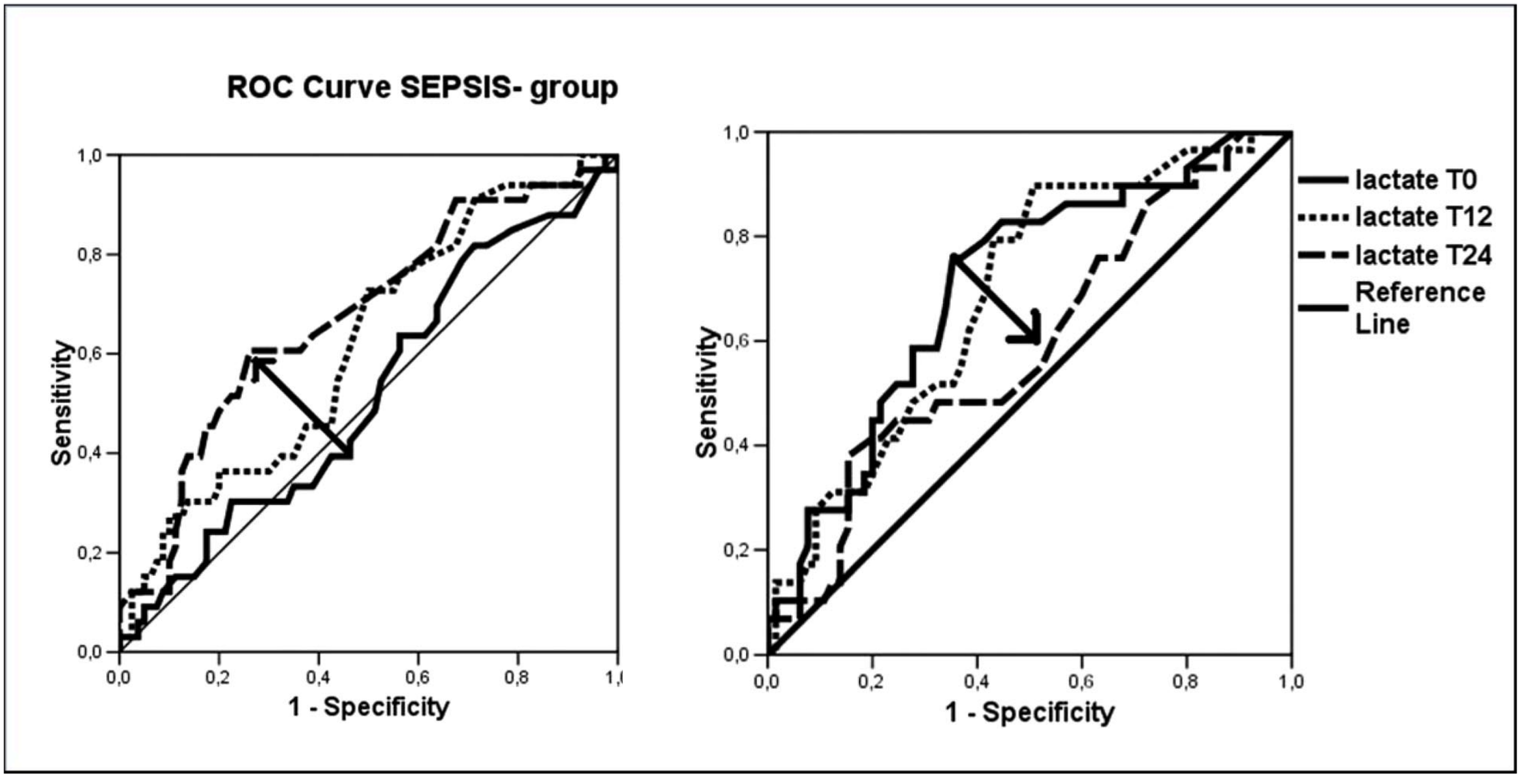
TABLE 4. **Survivors versus nonsurvivors (n = 166)**

	Survivors (n = 128)	Nonsurvivors (n = 38)	*P*
Age, mean (SD), y	66 (15)	66 (16)	1.00
SBP <90 mmHg despite i.v. fluids, n (%)	42 (33)	21 (55)	0.02
Initial serum lactate, mean (SD)	4.3 (2.6)	4.7 (2.8)	0.41
Serial serum lactate, mean (SD)	2.2 (1.6)	3.6 (2.8)	<0.001
Individual organ failure, n (%)			
Cardiovascular	42 (33)	21 (55)	0.02
Pulmonary	20 (16)	8 (21)	0.64
Renal	43 (34)	11 (29)	0.70
Hepatic	9 (7)	5 (13)	0.40
Coagulopathy	15 (12)	8 (21)	0.26
Total SOFA score, mean (SD)	3.6 (2.6)	3.7 (2.7)	0.84
Continuous $ScvO_2$ monitoring, n (%)	112 (87)	36 (95)	0.28
$ScvO_2$ ≥70% achieved, n (%)	99 (88)	26 (72)	0.03
Lactate clearance ≥10%, n (%)	122 (95)	29 (76)	0.001

Prognostic Value of Blood Lactate Levels: Does the Clinical Diagnosis at Admission Matter?

Tim C. Jansen, MD, Jasper van Bommel, MD, PhD, Paul G. Mulder, PhD, Alexandre P. Lima, MD, Ben van der Hoven, MD, Johannes H. Rommes, MD, PhD, Ferdinand T. F. Snellen, MD, and Jan Bakker, MD, PhD

J Trauma. 2009;66:377–385.



Review Article

Blood lactate monitoring in critically ill patients: A systematic health technology assessment*

Tim C. Jansen, MD; Jasper van Bommel, MD, PhD; Jan Bakker, MD, PhD

Crit Care Med 2009 Vol. 37, No. 10

Conclusions: The use of blood lactate monitoring has a place in risk-stratification in critically ill patients, but it is unknown whether the routine use of lactate as a resuscitation endpoint improves outcome. This warrants randomized controlled studies on the efficacy of lactate-directed therapy.

Lactate Clearance vs Central Venous Oxygen Saturation as Goals of Early Sepsis Therapy

Alan E. Jones, MD

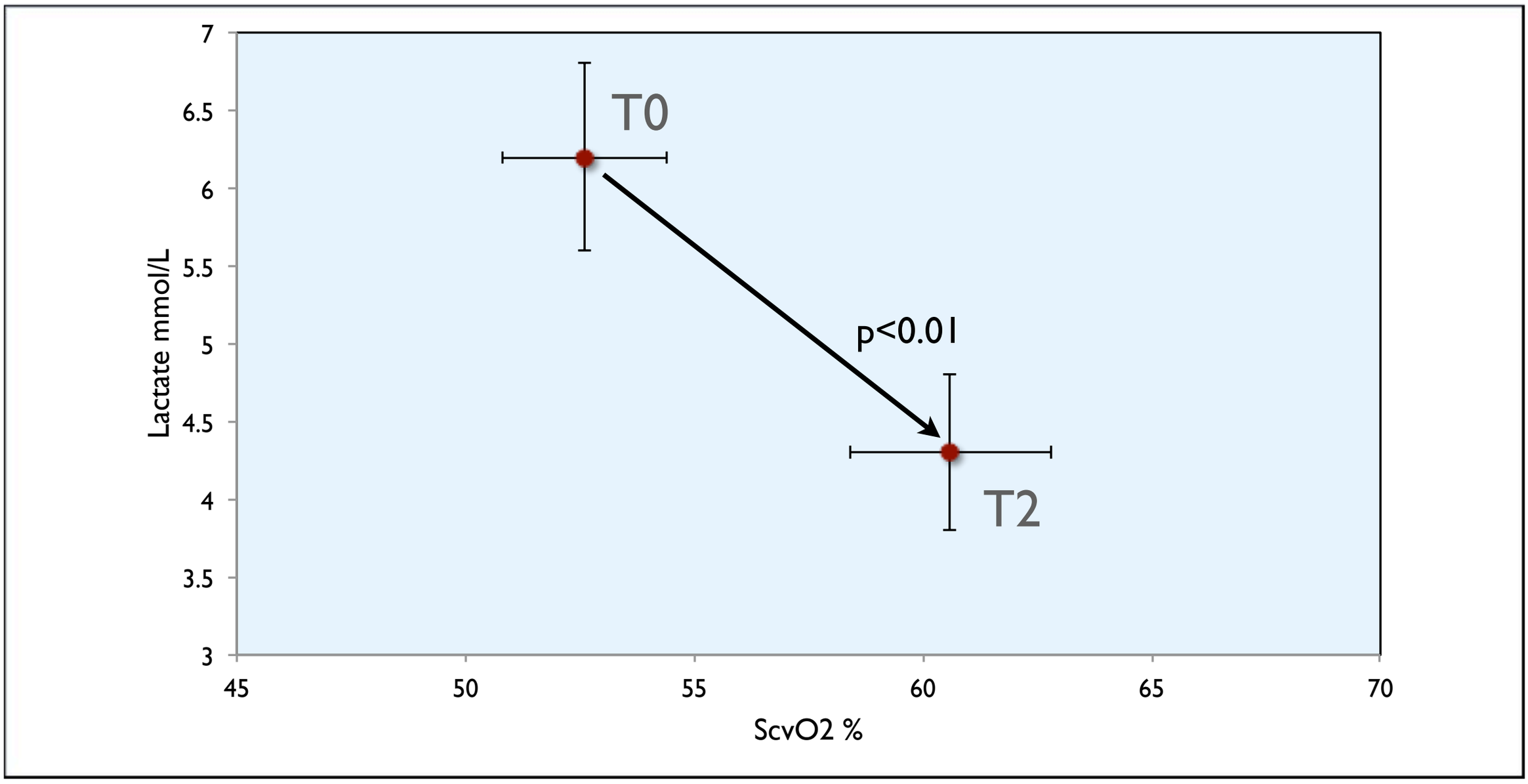
Table 5. Hospital Mortality and Length of Stay

Variable	Lactate Clearance Group (n = 150)	$ScvO_2$ Group (n = 150)	Proportion Difference (95% Confidence Interval)	*P* Value[b]
In-hospital mortality, No. (%)[a]				
Intent to treat	25 (17)	34 (23)	6 (–3 to 15)	
Per protocol	25 (17)	33 (22)	5 (–3 to 14)	
Length of stay, mean (SD), d				
ICU	5.9 (8.46)	5.6 (7.39)		.75
Hospital	11.4 (10.89)	12.1 (11.68)		.60
Hospital complications				
Ventilator-free days, mean (SD)	9.3 (10.31)	9.9 (11.09)		.67
Multiple organ failure, No. (%)	37 (25)	33 (22)		.68
Care withdrawn, No. (%)	14 (9)	23 (15)		.15

JAMA. 2010;303(8):739-746 (doi:10.1001/jama.2010.158)

$ScvO_2$ and Lactate

$ScvO_2 \leqq 60\%$ § n=15



Early Lactate-Guided Therapy in Intensive Care Unit Patients

A Multicenter, Open-Label, Randomized Controlled Trial

Tim C. Jansen[1], Jasper van Bommel[1], F. Jeanette Schoonderbeek[3], Steven J. Sleeswijk Visser[4], Johan M. van der Klooster[5], Alex P. Lima[1], Sten P. Willemsen[2], and Jan Bakker[1], for the LACTATE study group*

[1]Department of Intensive Care, Erasmus MC University Medical Centre, Rotterdam, The Netherlands; [2]Department of Biostatistics, University Medical Centre Rotterdam, Rotterdam, The Netherlands; [3]Department of Intensive Care, Ikazia Hospital, Rotterdam, The Netherlands; [4]Department of Intensive Care, Reinier de Graaf Hospital, Delft, The Netherlands; and [5]Department of Intensive Care, St. Franciscus Gasthuis, Rotterdam, The Netherlands

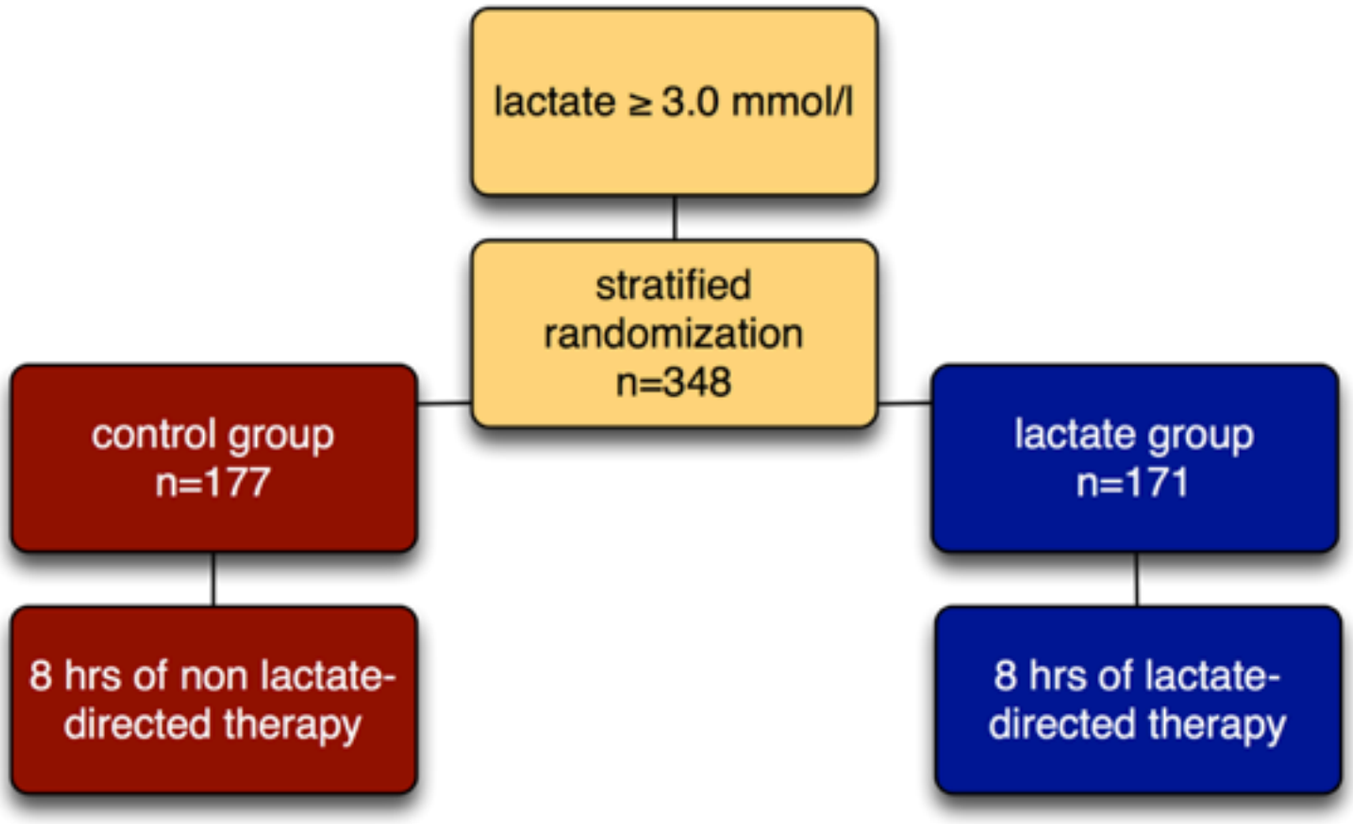
LACTATE study group

D Gommers[1], B v.d Hoven[1], W Thijsse[1], C Groeninx Van Zoelen[1], J Weigel[1], P Gerritsen[1], B v.d Berg[1], J Lenoble[1], D Reis Miranda[1], J Rischen[1], B. Dellen[1], M Zijnen[1], C Ince[1], E Kompanje[1], C Birsak[1], H de Geus[1], J Epker[1], M Muller[1], W Mol[1], W in t Veld[1], C. Bruning[1], E forman[1], E Klijn[1], P Mulder[2], M Middelkoop[3], J Zandee[3], Wilma Smit[3], G Burggraaff[3], I Meynaar[4], L Dawson[4], M v Spreuwel[4], P Tangkau[4], E Salm†[4 5], M. Ruijters[4], N Verburg[4], R. Kleijn[4], A Rietveld[5], P de Feiter[5] and A Brouwers[5]

Ikazia hospital Rotterdam
St. Fransiscus Gasthuis hospital Rotterdam
Reinier de Graaf hospital Delft
Erasmus MC Rotterdam

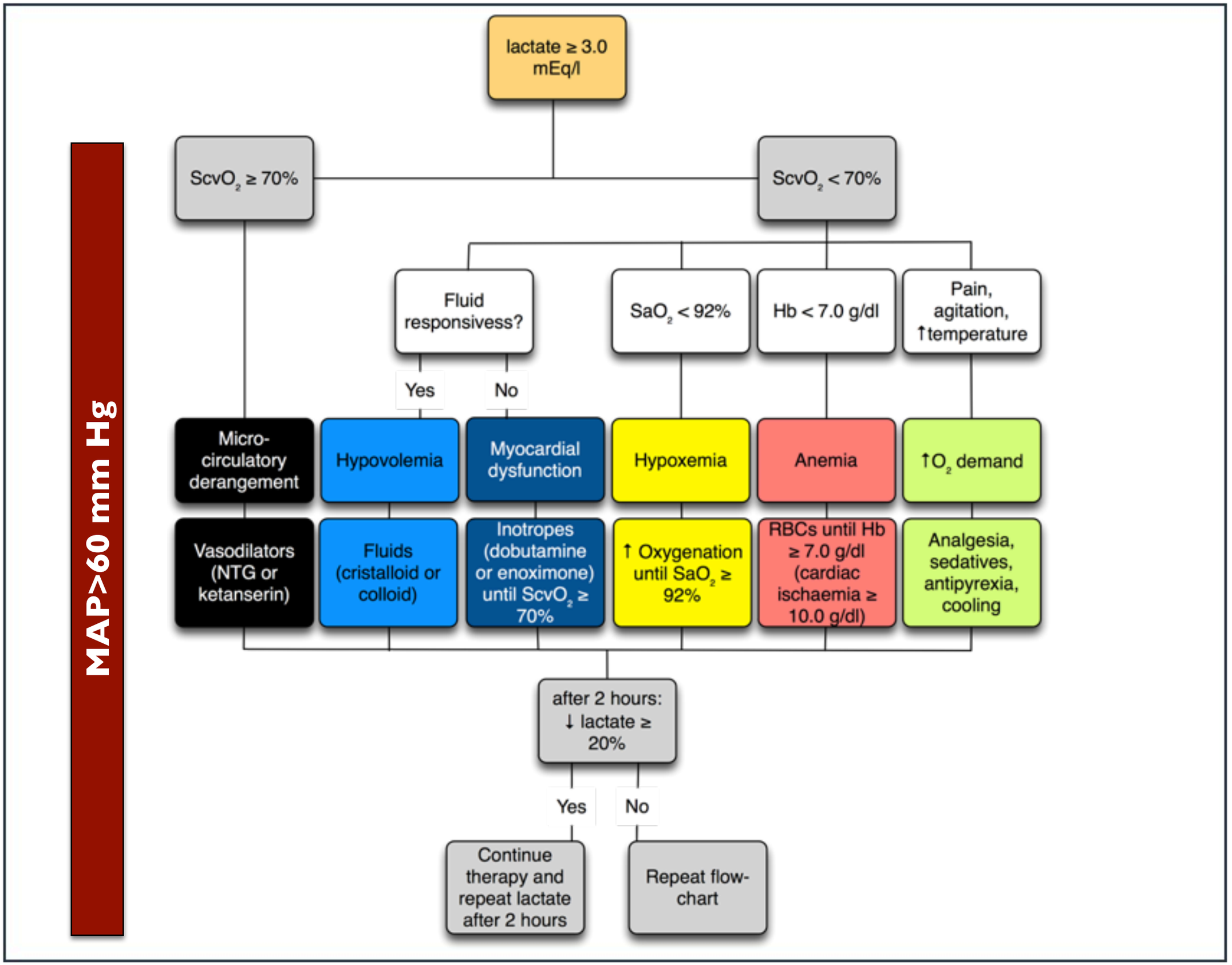
ClinicalTrial.gov number NCT00270673

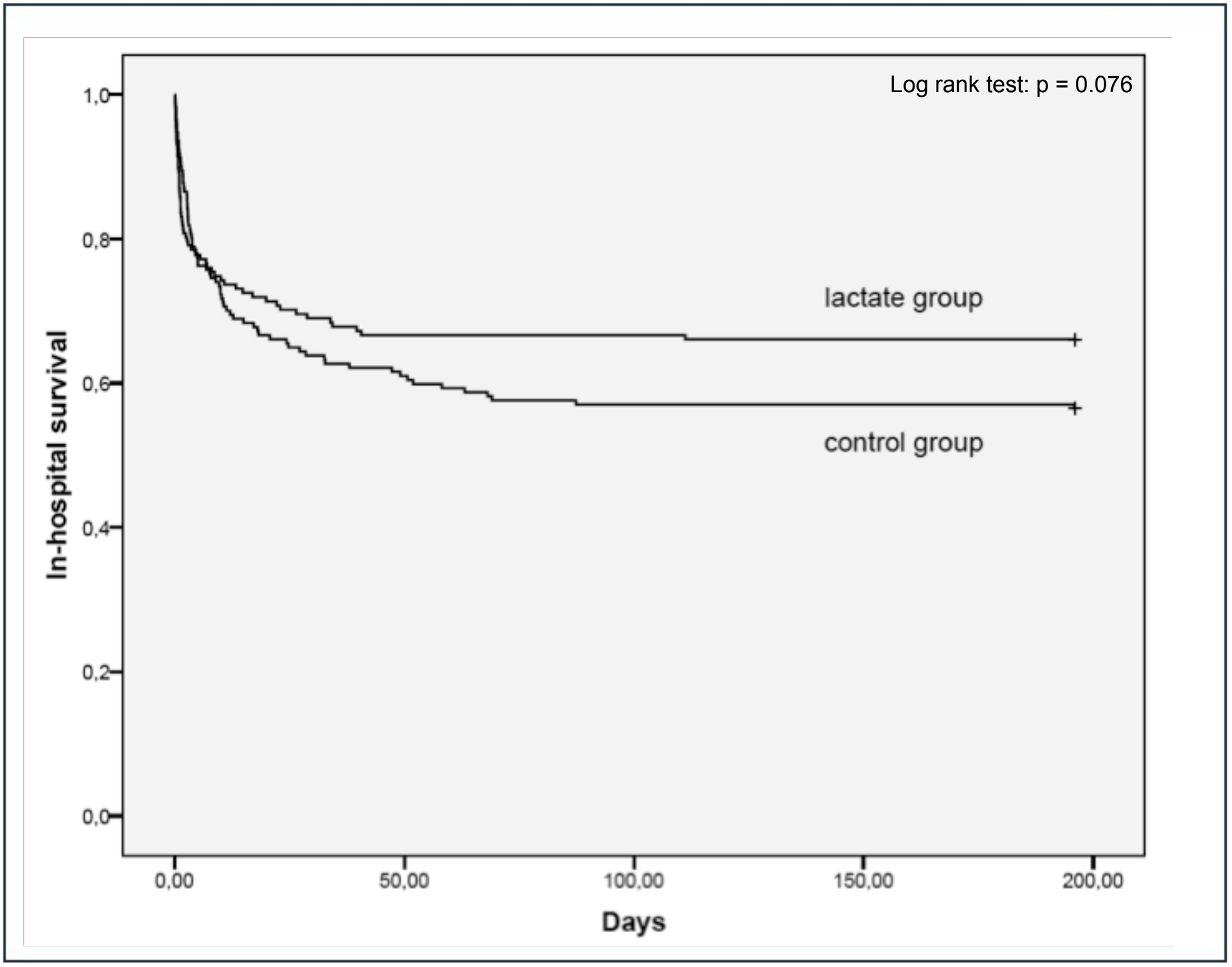
Am J Respir Crit Care Med Vol 182. pp 752–761, 2010



No lactate levels
standard therapy

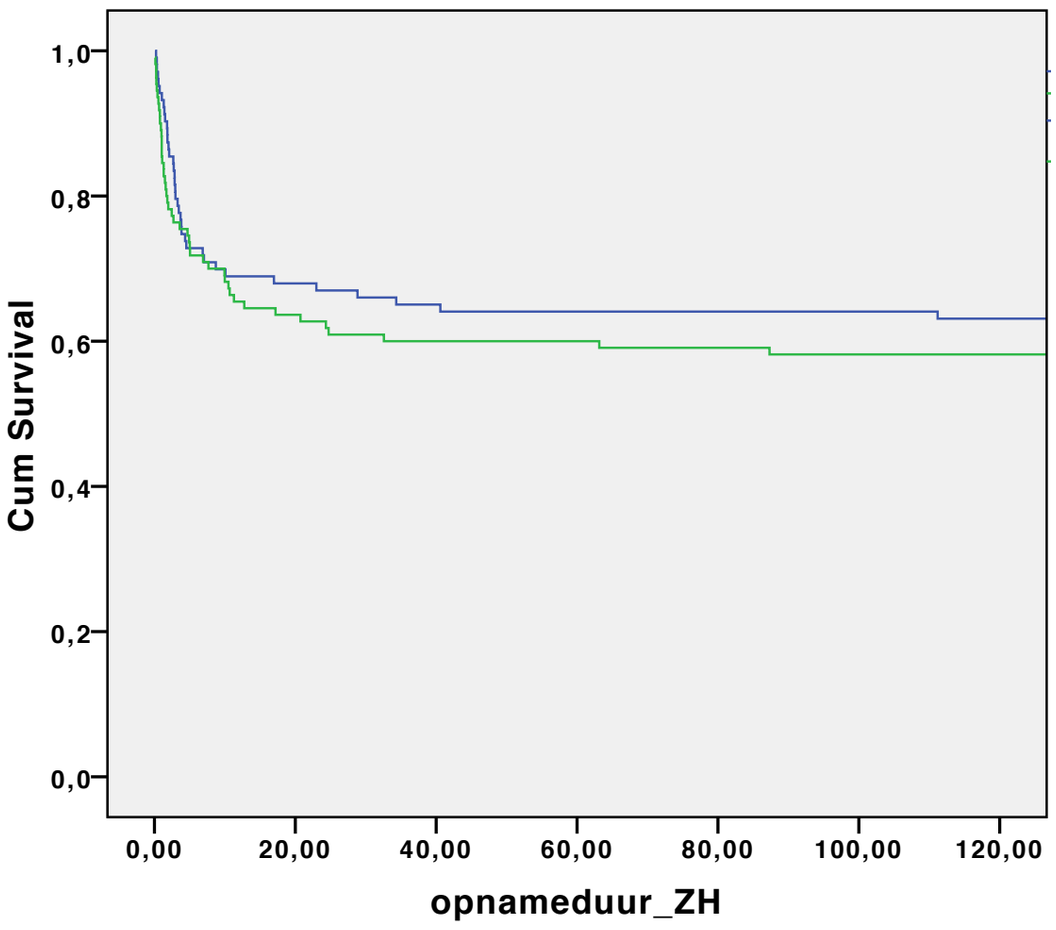
every 2h lactate level
goal: ⬇20%
$ScvO_2$ mandatory
goal > 70%


MAP>60 mm Hg
lactate ≥ 3.0 mEq/l
ScvO2 ≥ 70%
ScvO2 < 70%
Fluid responsivess?
SaO2 < 92%
Hb < 7.0 g/dl
Pain, agitation, ↑temperature
Yes
No
Micro-circulatory derangement
Hypovolemia
Myocardial dysfunction
Hypoxemia
Anemia
↑O2 demand
Vasodilators (NTG or ketanserin)
Fluids (cristalloid or colloid)
Inotropes (dobutamine or enoximone) until ScvO2 ≥ 70%
↑ Oxygenation until SaO2 ≥ 92%
RBCs until Hb ≥ 7.0 g/dl (cardiac ischaemia ≥ 10.0 g/dl)
Analgesia, sedatives, antipyrexia, cooling
after 2 hours: ↓ lactate ≥ 20%
Yes
No
Continue therapy and repeat lactate after 2 hours
Repeat flow-chart

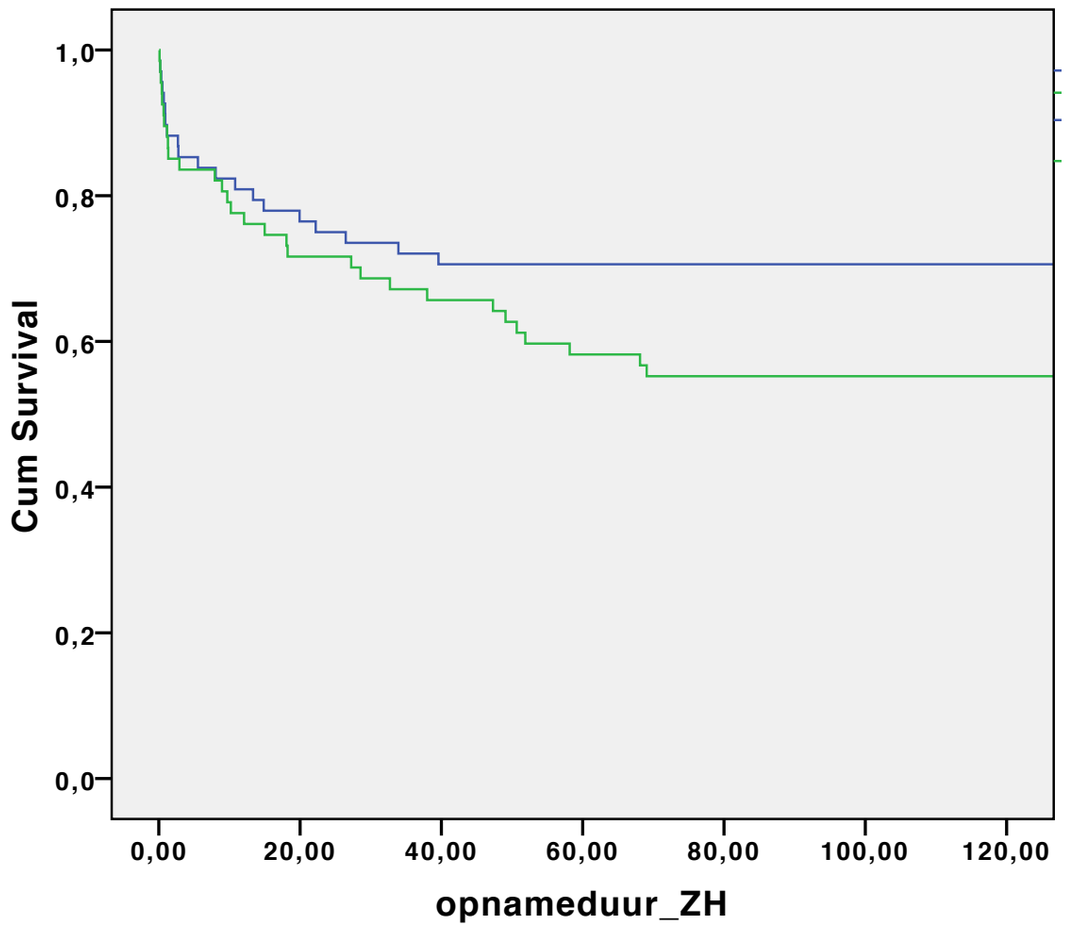

Log rank test: p = 0.076
lactate group
control group
In-hospital survival
1,0
0,8
0,6
0,4
0,2
0,0
0,00
50,00
100,00
150,00
200,00
Days

Subgroups

non sepsis



sepsis



Cox's proportional hazards analysis

- **ICU Mortality**
  - **HR 0.66 (0.45-0.98) p=0.037**

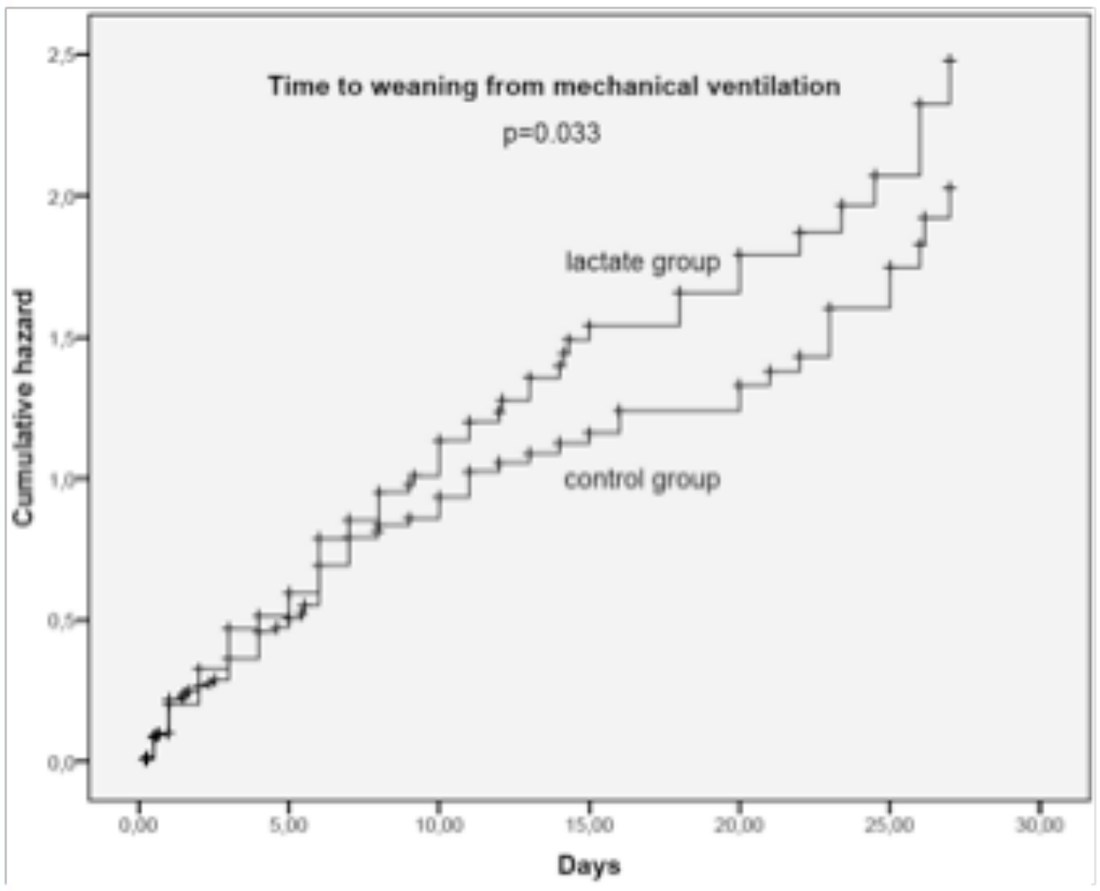
- **Hospital mortality**
  - **HR 0.61 (0.43-0.87) p=0.006**

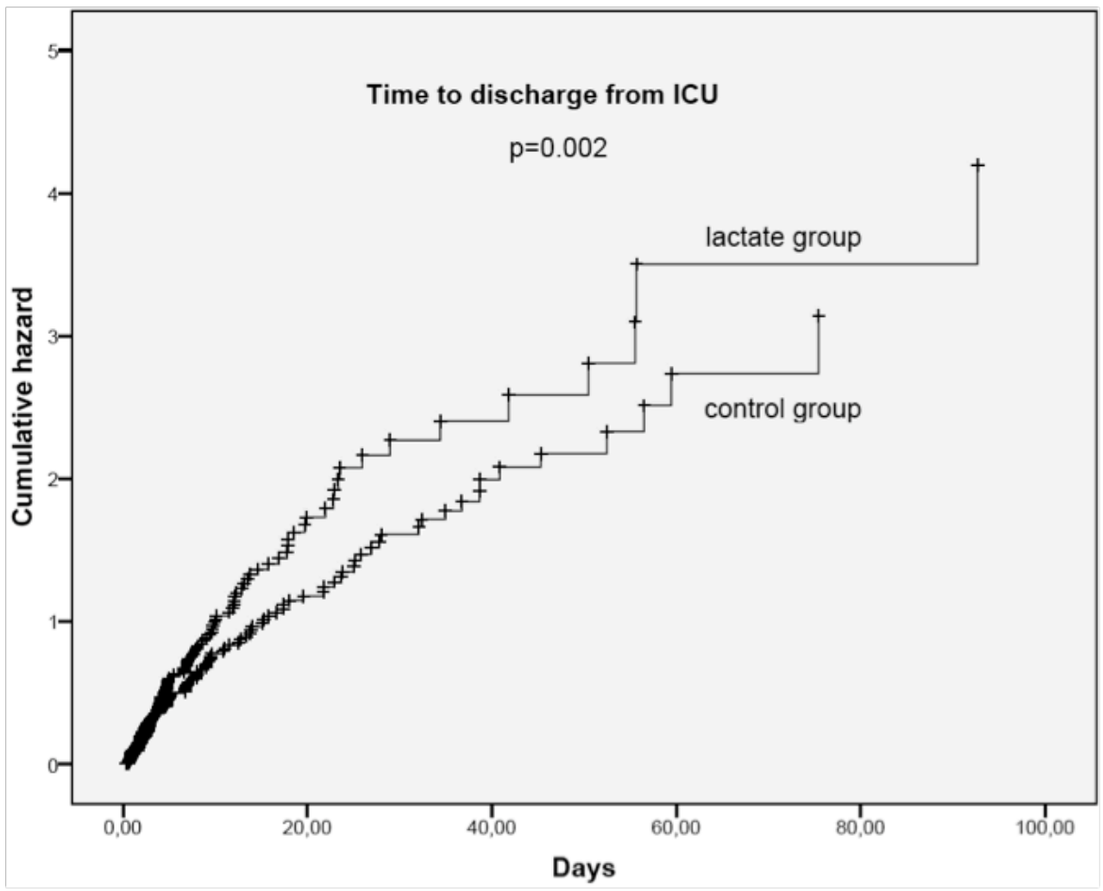
Organ failure

SOFA score	Control (n=177)	Protocol (n=171)
Baseline	6.3 (5.6-7.1)	6.4 (5.6-7.1)
End of protocol (T=8h)	7.2 (6.5-7.9)	6.9 (6.2-7.6)
Observation time (T=9-72h)	7.0 (6.3-7.7)	6.4 (5.7-7.2)**

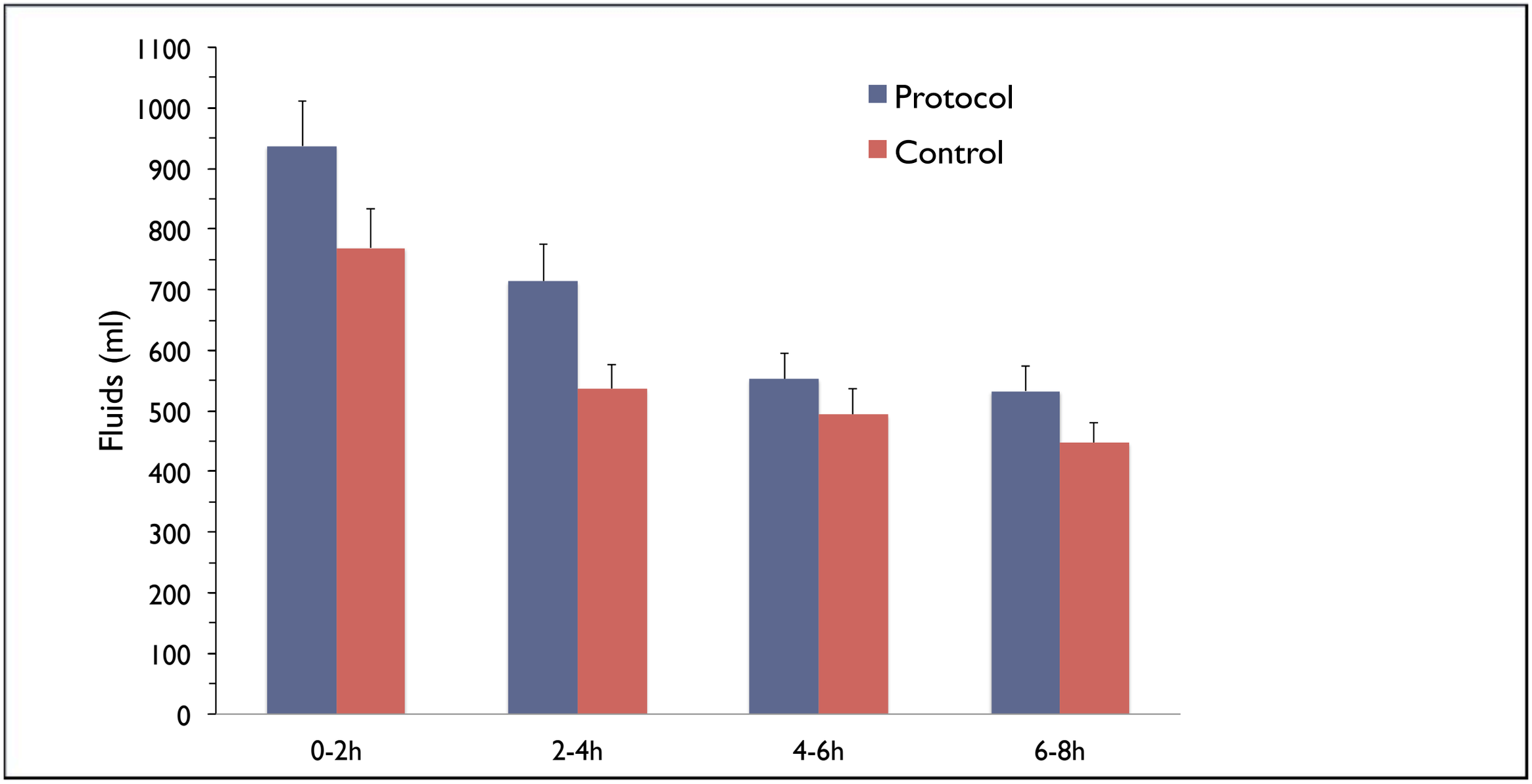
Resource use

Weaning and ICUstay

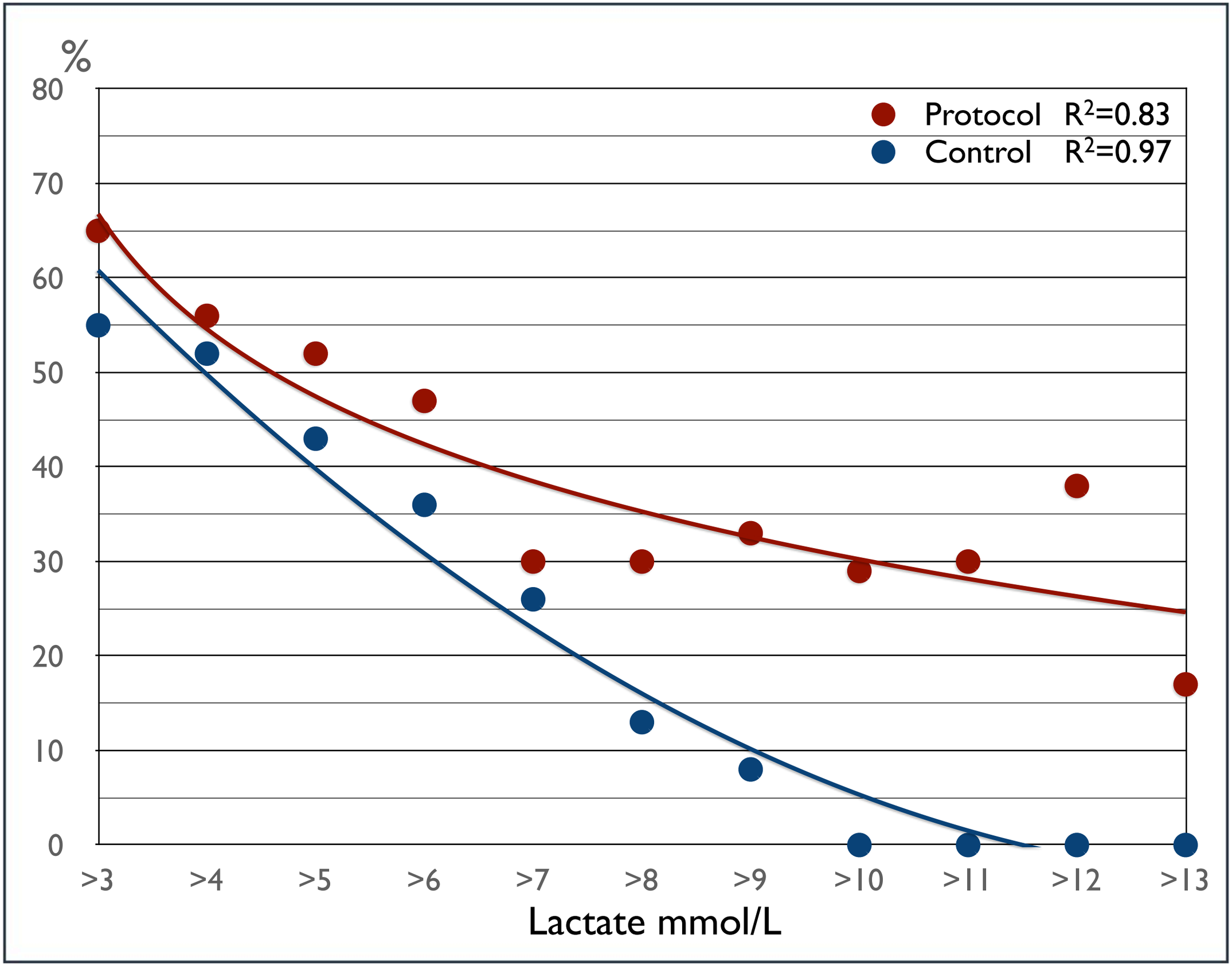




Differences in treatment following randomization



Survival in relation to baseline lactate level



Conclusion

- Therapy aimed to optimize the balance between oxygen demand and oxygen supply **($ScvO_2$)** and decrease lactate levels by 20% /2h for 8h in patients with increased lactate levels reduced in-hospital mortality **(when corrected for predefined risk factors)** and it decreased organ failure and use of health care resources.