Monitorace hemodynamiky v anestezii

Jan Beneš

KARIM LFP UK a FN Plzeň

COI

- Dlouholetá spolupráce s firmamy Edwards Lifesciences Inc., Pulsion – Getinge a/nebo CNSystems na vývoji monitorovacích systémů a jejich klinické aplikaci..

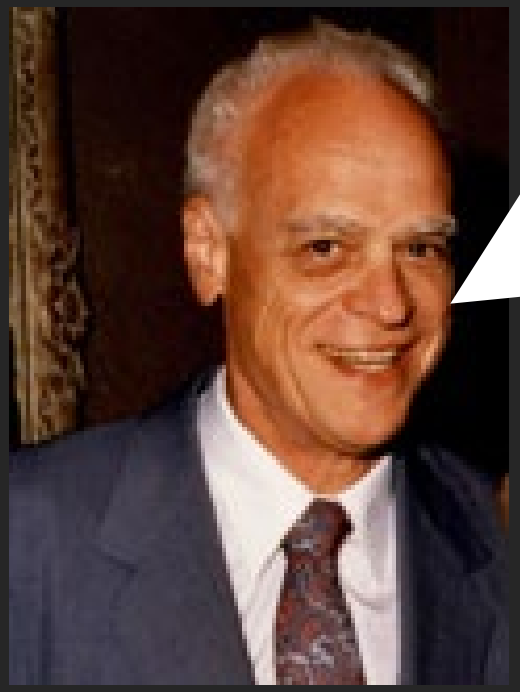
OUTLINE

- PROČ TO VŠECHNO ZAČALO
- CO TO ZNAMENÁ DNES
- A JAK TO TEDY DĚLAT

BACK TO THE 80s

Like a virgin...

BACK TO THE 80s



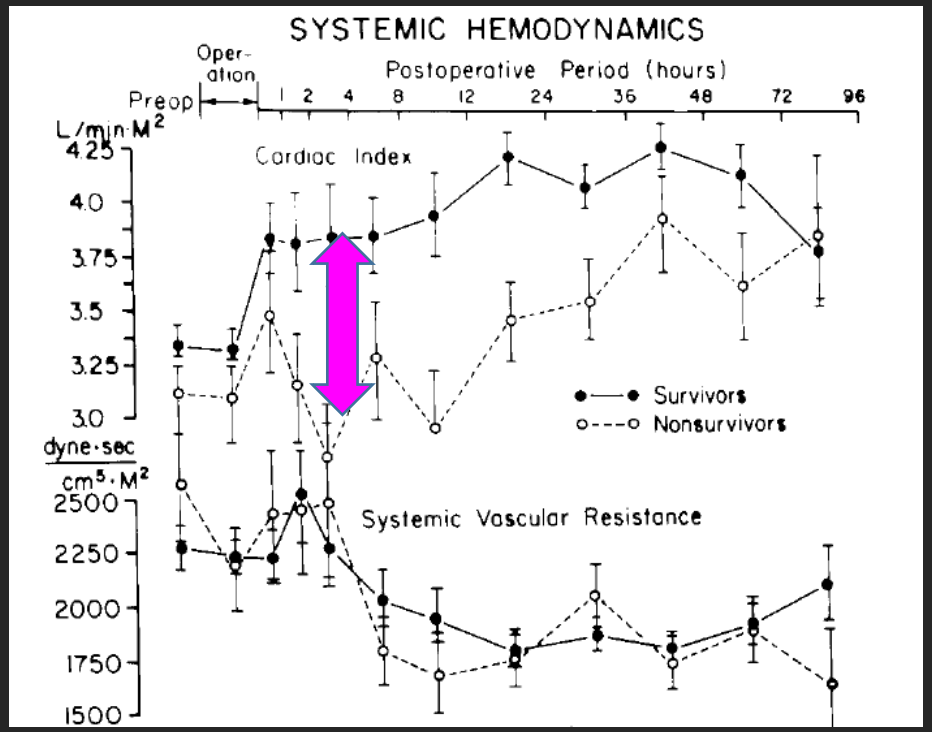
Postoperative deaths may be due to anatomic problems including surgical technical errors, judgment errors and the severity of the patients' illness as well as inadequate physiologic compensations. It follows that therapeutic goals include surgical correction of the anatomic problems, followed by supplementation of those physiologic compensations that are determinants of survival. Thus, the physiologic goals of therapy are not the normal values of unstressed, healthy volunteer subjects, but rather the values of survivors of a life-threatening surgical illness.[17]

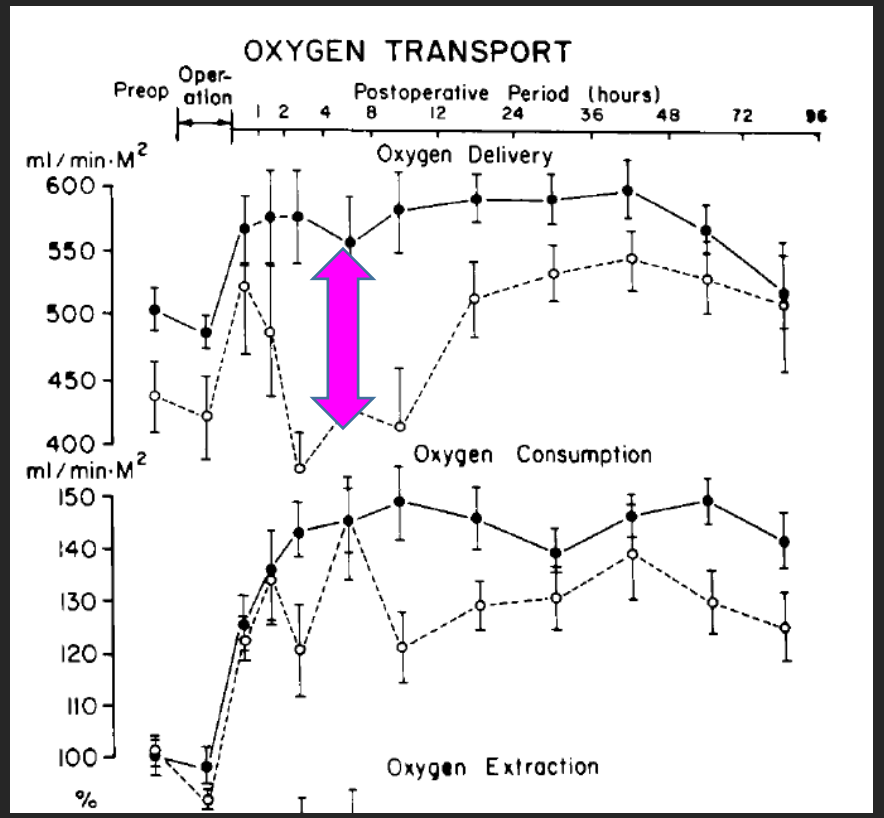
0090-3493/85/1302-0085$02.00/0
CRITICAL CARE MEDICINE

Vol. 13, No. 2
Printed in U.S.A.

Hemodynamic and oxygen transport patterns in surviving and nonsurviving postoperative patients

RICHARD D. BLAND, MD; WILLIAM C. SHOEMAKER, MD; EDWARD ABRAHAM, MD; JUAN CARLOS COBO, MD



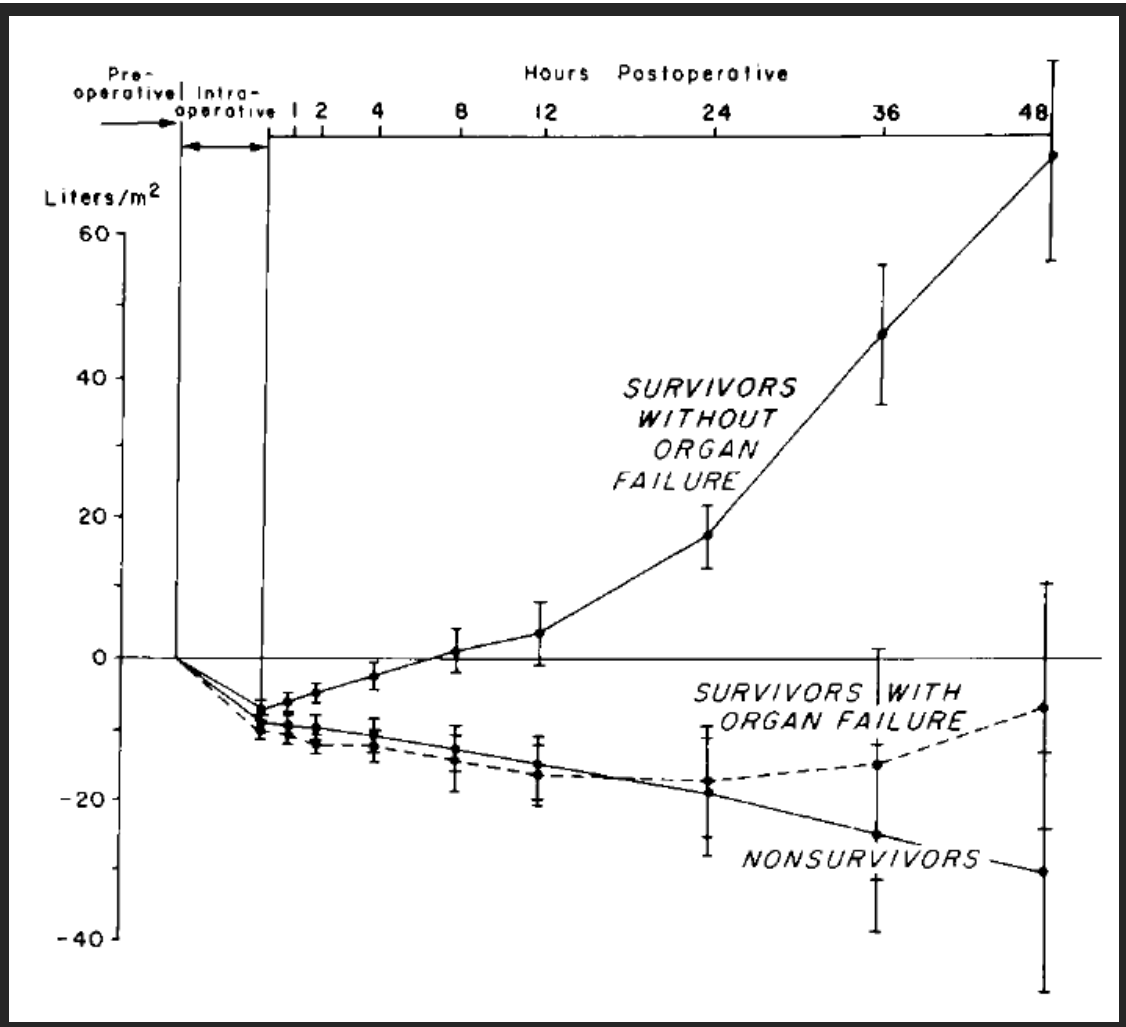


0090-3493/88/1611-1117$02.00/0
CRITICAL CARE MEDICINE

Vol. 16, No. 11
Printed in U.S.A.

Tissue oxygen debt as a determinant of lethal and nonlethal postoperative organ failure

WILLIAM C. SHOEMAKER, MD; PAUL L. APPEL, MPA; HARRY B. KRAM, MD



KREV = HLAVNÍ TRANSPORTNÍ SLUŽBA

$$DO_2 \approx CO \times Hb \times SaO_2$$

$$CO = SV \times HR$$

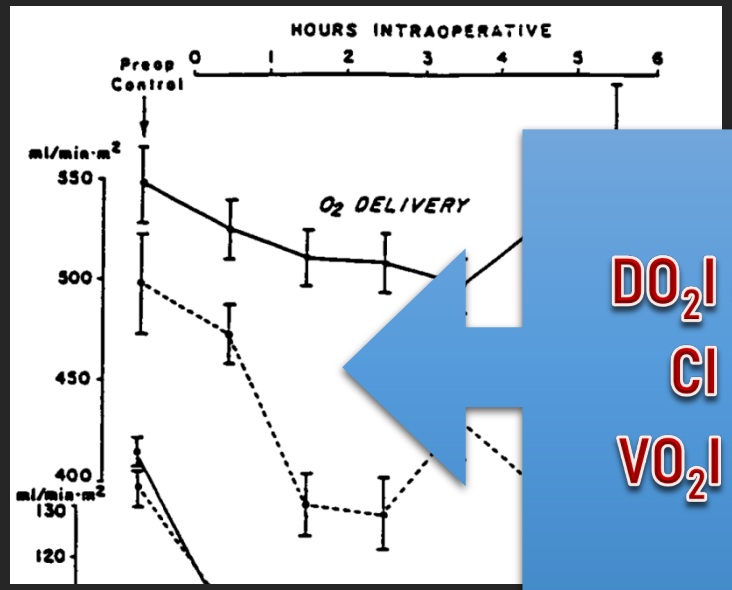
$$SV = EF \times EDV$$

$$DO_2 \approx HR \times EF \times EDV \times Hb \times SaO_2$$

Prospective Trial of Supranormal Values of Survivors as Therapeutic Goals in High-Risk Surgical Patients*

William C. Shoemaker, M.D.; Paul L. Appel, M.P.A.; Harry B. Kram, M.D.; Kenneth Waxman, M.D.; and Tai-Shion Lee, M.D., F.C.C.P.

(Chest 1988; 94:1176-86)



DO_2I 600 ml/m
CI 4,5 l/min
VO_2I 170 ml/m

Table 9—*Summary of Mortality of the Prospective Series*

Series	Date	Control Number	Control Deaths	Protocol Number	Protocol Deaths, %
Series 1	1/78-6/80	168	57 (34%)	108	21 (19%)
Control period between trials	6/80-5/83	239	66 (28%)	. . .	. . .
Series 2	5/83-5/84	105	34 (32%)	28	1 (4%)
Control period after trials	5/84-5/85	160	40 (25%)	. . .	. . .
Total		672	197 (29%)	136	22 (16%)

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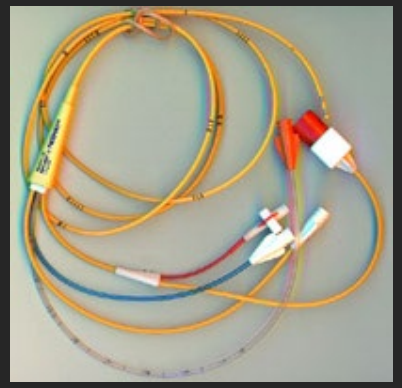


EJA

Eur J Anaesthesiol 2018; **35**:1–15

ORIGINAL ARTICLE

Does goal-directed haemodynamic and fluid therapy improve peri-operative outcomes?

A systematic review and meta-analysis

Matthew A. Chong, Yongjun Wang, Nicolas M. Berbenetz and Ian McConachie

95 prací

11 659 pacientů

Mortalita: OR 0,66, NNT – 59

Morbidita:

Pneumonie – OR 0.69 NNT – 38

AKI – 0.72 NNT – 29

Infekce rány – 0.48 NNT – 19

Délka hospitalizace: -0,9 dne

Table 2 Baseline data

Trial	Year	Patients Sample size
Ackland *et al.*[84]	2015	204
Bartha *et al.*[85]	2013	150
Ben Romdhane *et al.*[86]	2014	30
Bender *et al.*[87]	1997	104
Benes *et al.*[88]	2010	120
Benes *et al.*[89]	2015	80
Berlauk *et al.*[90]	1991	89
Bisgaard *et al.*[92]	2013	70
Bisgaard *et al.*[91]	2013	40
Bonazzi *et al.*[93]	2002	100
Boyd *et al.*[69]	1993	107
Brandstrup *et al.*[82]	2012	150
Broch *et al.*[81]	2016	79
Buettner *et al.*[80]	2008	80
Bundgaard-Nielsen *et al.*[79]	2013	42
Calvo Vecino *et al.*[78]	2014	121
Cecconi *et al.*[77]	2011	40
Challand *et al.*[76]	2012	179
Cordero-Rochet *et al.*[2]	2014	
Colantonio *et al.*[75]	2015	
Conway *et al.*[74]	2002	57
Correa-Gallego *et al.*[73]	2015	135
Donati *et al.*[72]	2007	135
El Sharkawy *et al.*[71]	2013	59
Fellahi *et al.*[70]	2015	100
Forget *et al.*[94]	20	82
Funk *et al.*[60]		
Gan *et al.*[68]	200	
Gerent *et al.*[67]	2015	125
Goepfert *et al.*[66]	2013	100
Han *et al.*[62]	2016	40
Hand *et al.*[63]	2016	94
Harten *et al.*[64]	2008	30
Hughes *et al.*[65]	201	30
Jammer *et al.*[61]	201	
Jerez Gomez-Coronado *et al.*[60]	200	
Jhanji *et al.*[59]	2010	135
Kapoor *et al.*[57]	20	0
Kapoor *et al.*[58]	20	
Kellman *et al.*[56]	20	
Khambalia *et al.*[55]	2015	60
Kulkarni *et al.*[54]	2012	31
Kumar *et al.*[52]	2015	40
Kumar *et al.*[53]	2016	60

Table 2 (*continued*)

Trial	Year	Patients Sample size
Lai *et al.*	2015	220
Lopes *et al.*	2007	33
Martini *et al.*[49]		59
Mayer *et al.*[48]		60
McKendry *et al.*[47]	2004	174
McKenny *et al.*[46]	2013	102
Mikor *et al.*[45]	2015	79
M[illegible] *et al.*[44]	2015	130
N[illegible] *et al.*[43]	2012	250
N[illegible] *et al.*[42]		
N[illegible] *et al.*[41]		
Osawa *et al.*[40]	2016	126
Oubaha *et al.*[95]	2009	29
Park *et al.*[39]	2016	47
Parke *et al.*[38]	2015	144
Pearse *et al.*[36]	2005	122
Pearse *et al.*[37]	2014	734
Peng *et al.*[35]	2014	26
[illegible] *et al.*[34]		
Pillai *et al.*[33]	2011	66
Polonen *et al.*[31]	2000	403
Ramsingh *et al.*[30]		38
Salzwedel *et al.*[29]		160
Sandham *et al.*[28]	2003	1994
[illegible] *et al.*[27]	2013	6
Schmid *et al.*[26]	2016	180
Schultz *et al.*[25]	1985	70
Senagore *et al.*[24]		64
Sinclair *et al.*[23]		40
Smetkin *et al.*[22]	2009	40
Srinivasa *et al.*[21]	20	
[illegible] *et al.*[20]	20	
Valentine *et al.*[18]	1998	120
Van Dellen *et al.*[17]	2013	84
Venn *et al.*[16]	2002	90
Wakeling *et al.*[13]	2005	128
Wilson *et al.*[12]	1999	138
Yassen *et al.*[11]	2012	60
Zakhaleva *et al.*[10]	2013	91

Table 2 (*continued*)

Trial	Year	Patients Sample size
[illegible] *et al.*[9]	2014	60
[illegible] *et al.*[8]	2012	40
Zhang *et al.*[7]	2012	60
Zhang *et al.*[6]	2013	80
Zheng *et al.*[4]	2013	60
Zheng *et al.*[5]	2016	90
Ziegler *et al.*[3]	1997	72

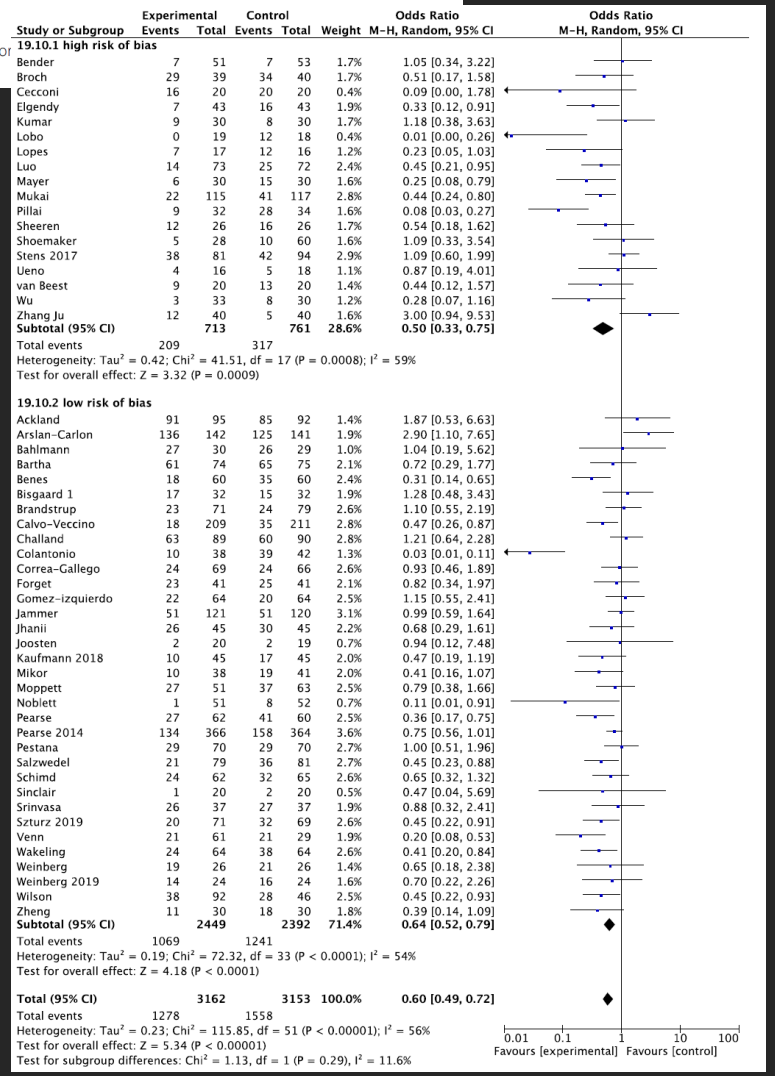
Giglio et al. Journal of Anesthesia, Analgesia and Critical Care (2021) 1:26
https://doi.org/10.1186/s44158-021-00026-3

Journal of Anesthesia, Analgesia and Critical Care

REVIEW Open Access

Perioperative goal-directed therapy and postoperative complications in different kind of surgical procedures: an updated meta-analysis

Mariateresa Giglio[1*], Giandomenico Biancofior
Nicola Brienza[6] and Filomena Puntillo[6]



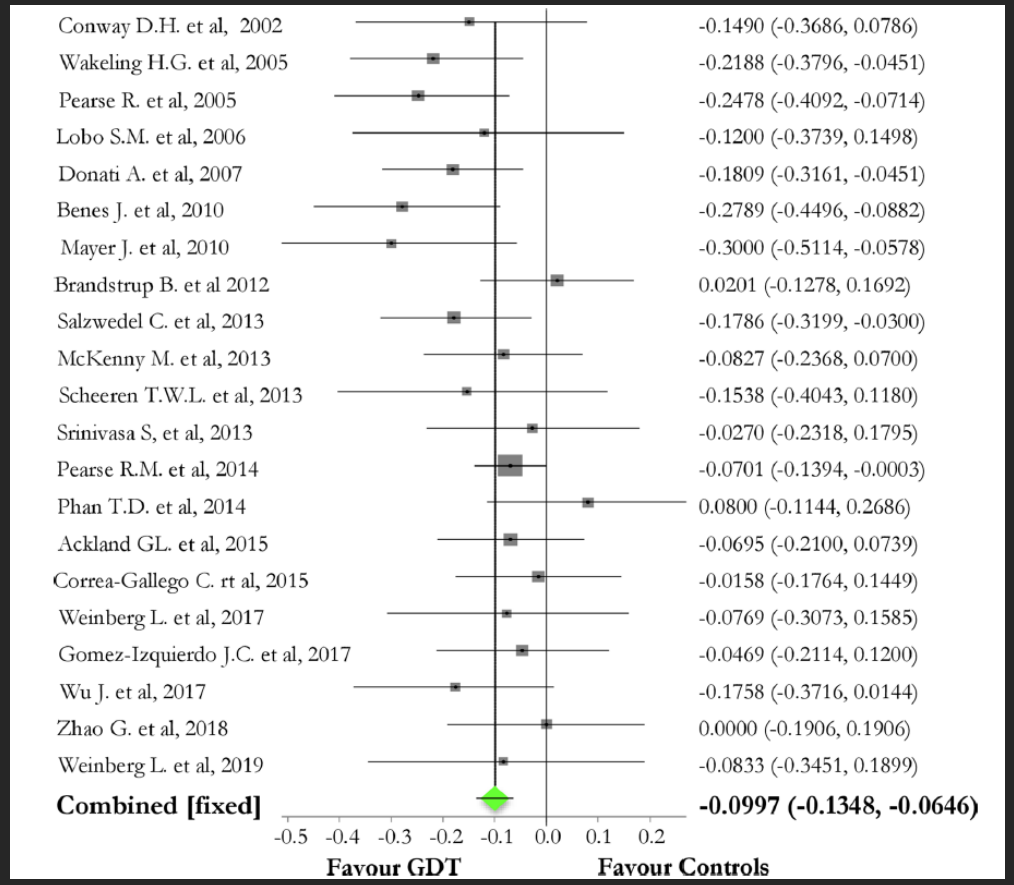
Messina et al. Crit Care (2021) 25:43
https://doi.org/10.1186/s13054-021-03464-1

Critical Care

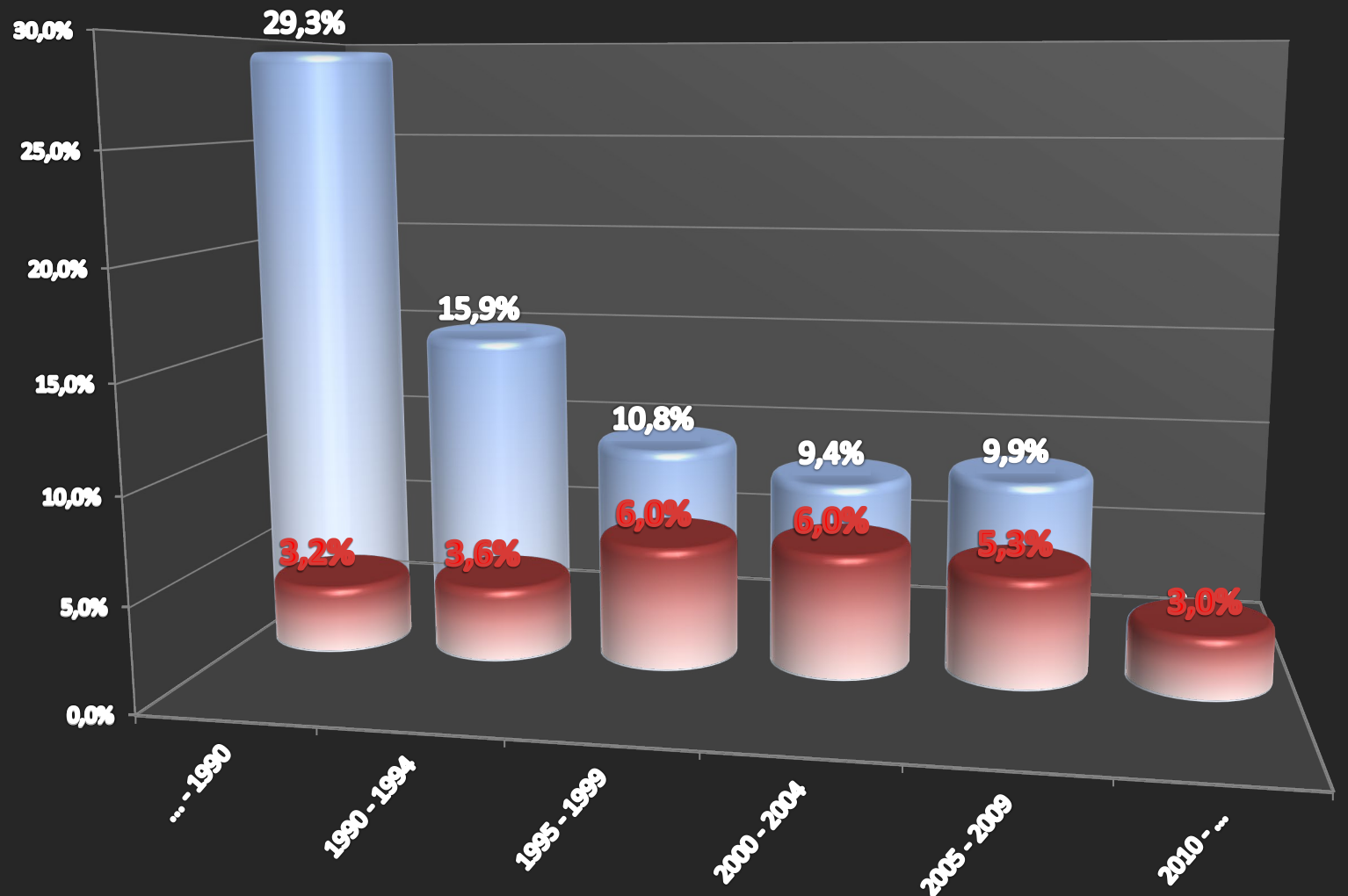
RESEARCH Open Access

Association between perioperative fluid administration and postoperative outcomes: a 20-year systematic review and a meta-analysis of randomized goal-directed trials in major visceral/noncardiac surgery

Antonio Messina[1,2*], Chiara Robba[3,4], Lorenzo Calabrò[1], Daniel Zambelli[1], Francesca Iannuzzi[4], Edoardo Molinari[4], Silvia Scarano[4], Denise Battaglini[4], Marta Baggiani[5], Giacomo De Mattei[6], Laura Saderi[7], Giovanni Sotgiu[7], Paolo Pelosi[3,4] and Maurizio Cecconi[1,2]



VÝVOJ MORTALITY v pGDT studiích



Intensive Care Med (2010) 36:1327–1332
DOI 10.1007/s00134-010-1869-6

ORIGINAL

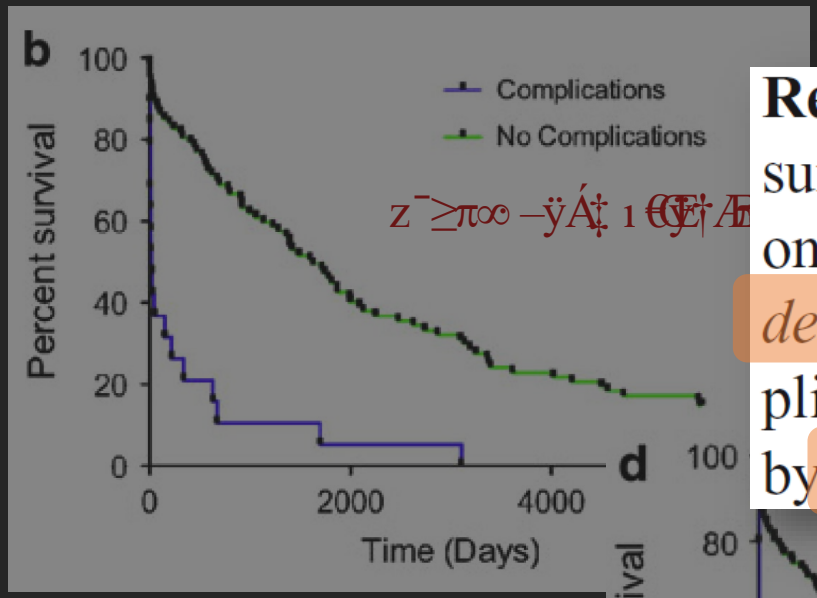
Andrew Rhodes
Maurizio Cecconi
Mark Hamilton
Jan Poloniecki
Justin Woods
Owen Boyd
David Bennett
R. Michael Grounds

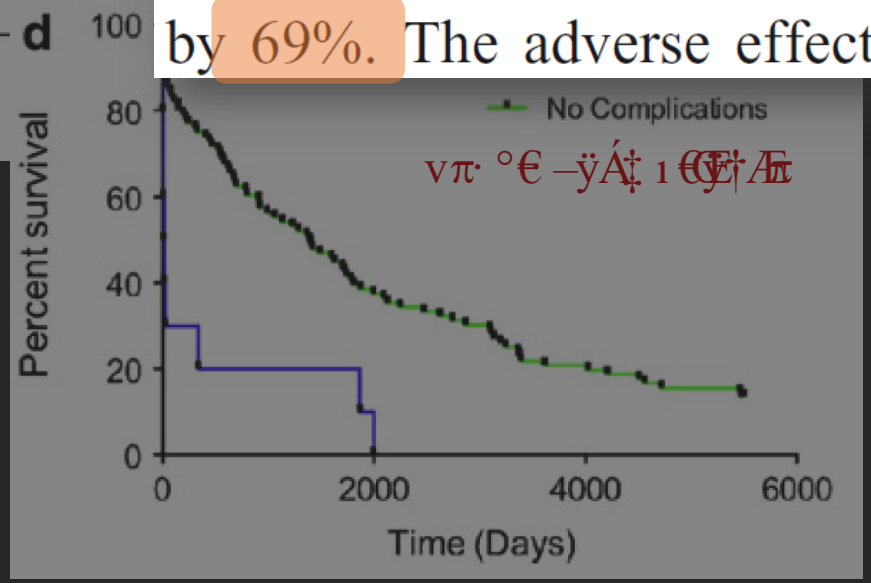
Goal-directed therapy in high-risk surgical patients: a 15-year follow-up study

Determinants of Long-Term Survival After Major Surgery and the Adverse Effect of Postoperative Complications

Shukri F. Khuri, MD,†‡ William G. Henderson, PhD,§ Ralph G. DePalma, MD,¶ Cecilia Mosca, MSPH,§ Nancy A. Healey, BS,* Dharam J. Kumbhani, MD, SM,* and the Participants in the VA National Surgical Quality Improvement Program*

105 951 pts





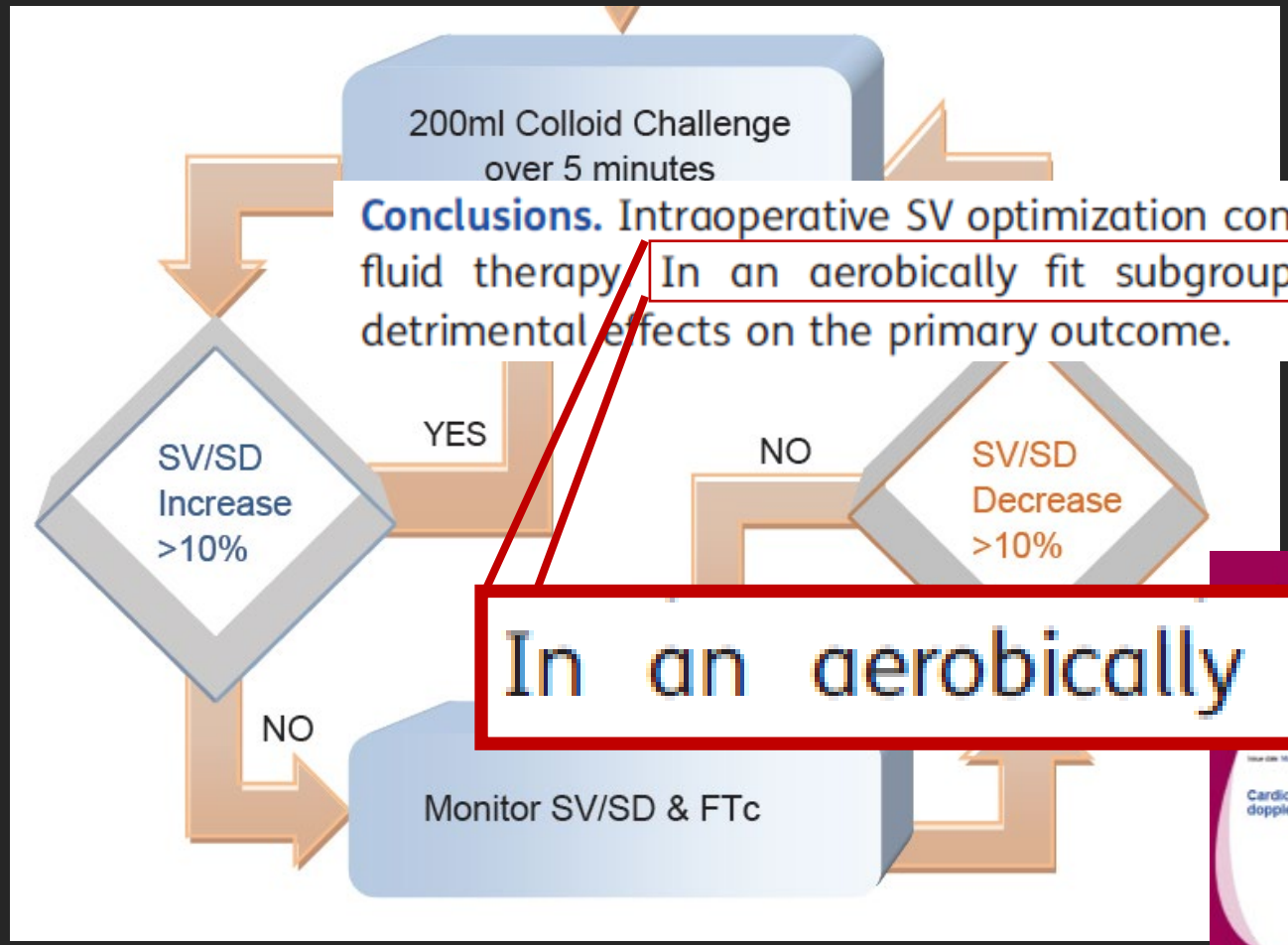
Results: The most important determinant of decreased postoperative survival was the occurrence, within 30 days postoperatively, of any one of 22 types of complications collected in the NSQIP. *Independent of preoperative patient risk*, the occurrence of a 30-day complication in the total patient group reduced median patient survival by 69%. The adverse effect of a complication on patient survival

British Journal of Anaesthesia **108** (1): 53–62 (2012)
Advance Access publication 26 August 2011 · doi:10.1093/bja/aer273

BJA

Randomized controlled trial of intraoperative goal-directed fluid therapy in aerobically fit and unfit patients having major colorectal surgery

C. Challand[1,3], R. Struthers[2,3], J. R. Sneyd[2,3], P. D. Erasmus[2], N. Mellor[1], K. B. Hosie[1] and G. Minto[2,3]*



Conclusions. Intraoperative SV optimization conferred no additional benefit over standard fluid therapy. In an aerobically fit subgroup of patients, GDT was associated with detrimental effects on the primary outcome.

In an aerobically fit subgroup

British Journal of Anaesthesia 97 (6): 755–7 (2006)
doi:10.1093/bja/ael290

Editorial

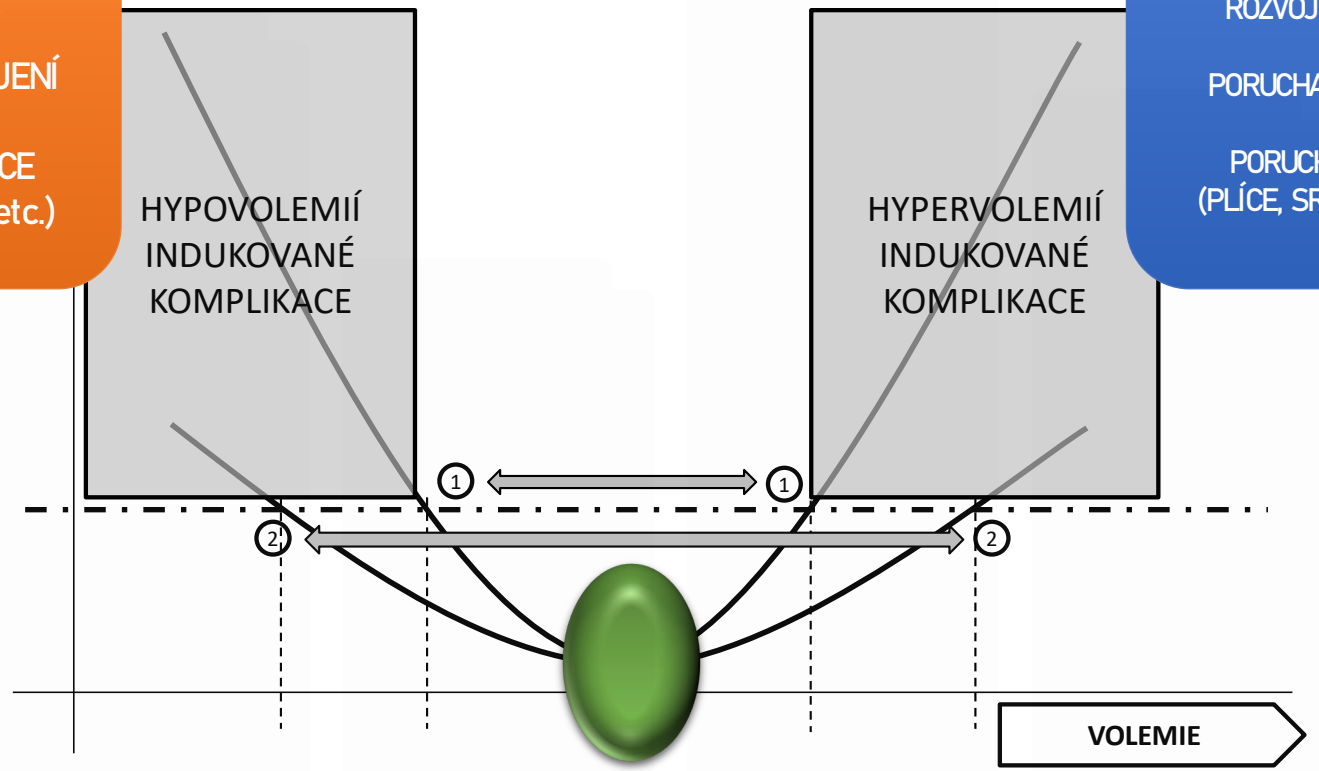
Wet, dry or something else?

REGIONÁLNÍ HYPOPERFUZE

PORUCHA DODÁVKY O2

PORUCHA HOJENÍ

PORUCHA FCE (GIT, LEDVIN etc.)



PŘETÍŽENÍ TEKUTINAMI

HEMODILUCE A DILUCE SRÁŽECÍCH FAKTORŮ

ROZVOJ OTOKŮ

PORUCHA HOJENÍ

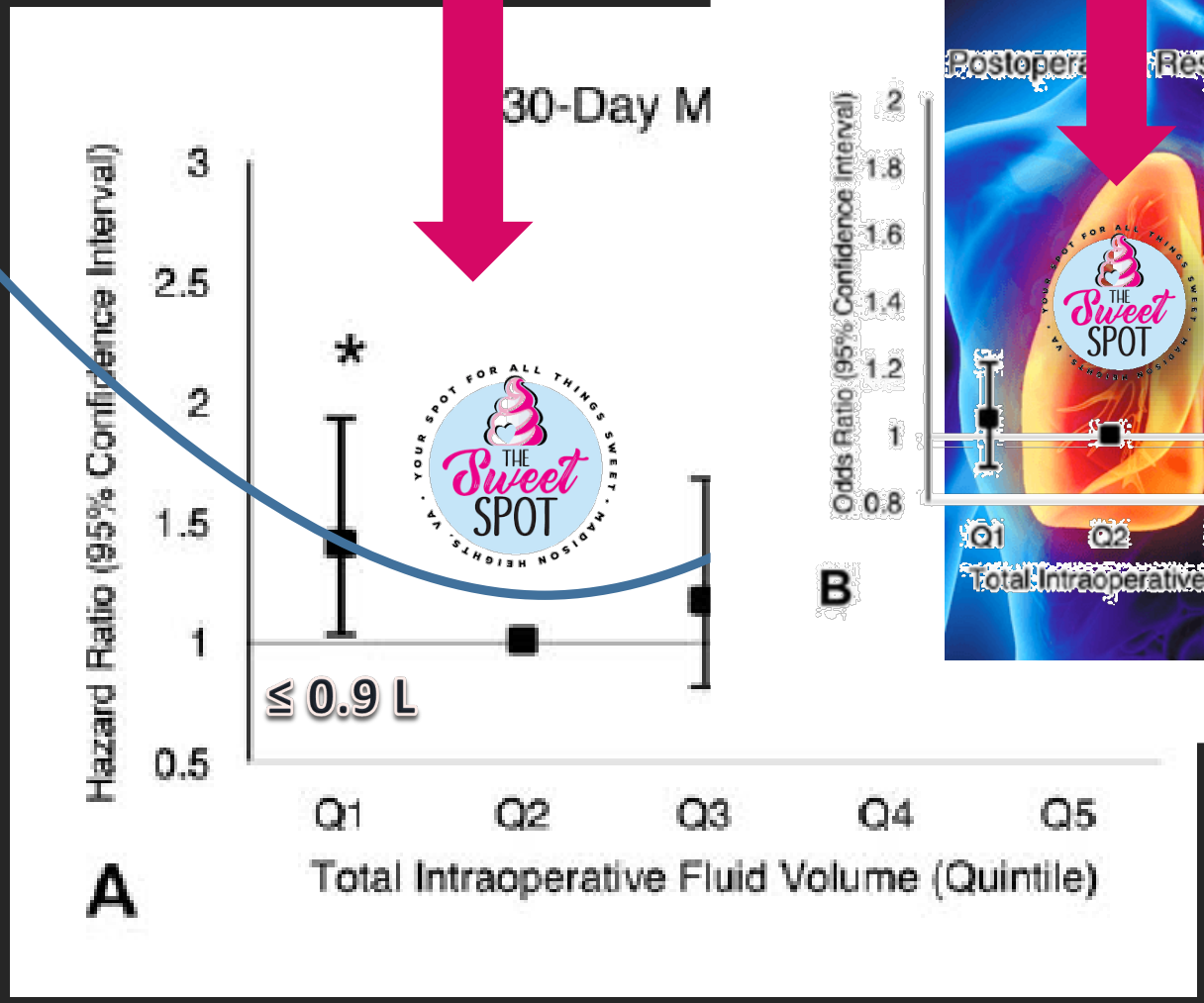
PORUCHA FCE (PLÍCE, SRDCE etc.)

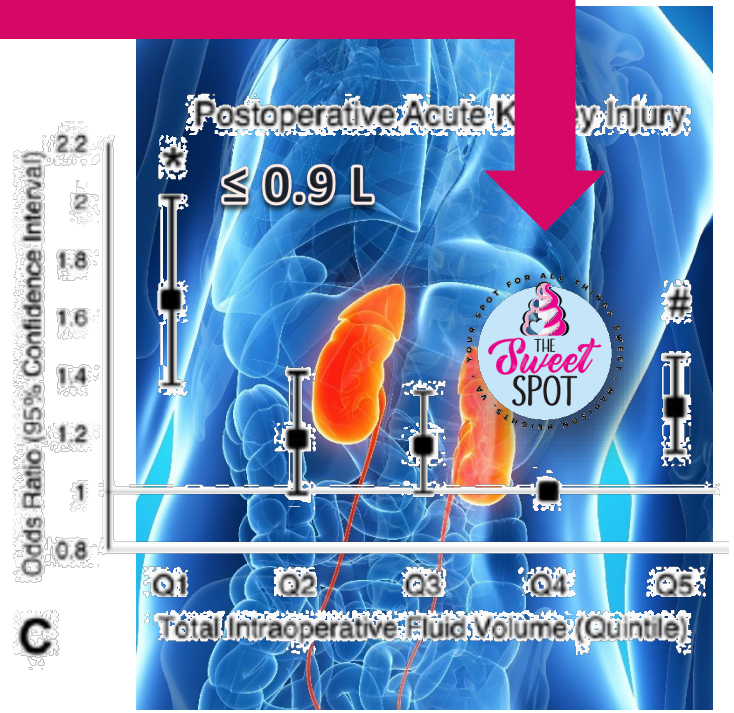
Effects of Intraoperative Fluid Management on Postoperative Outcomes

A Hospital Registry Study

Christina H. Shin, MD, Dustin R. Long, MD,* Duncan McLean, MBChB,*† Stephanie D. Grabitz, Cand. Med,* Karim Ladha, MD, MSc,‡ Fanny P. Timm, Cand. Med,* Tharusan Thevathasan, Cand. Med,* Alberto Pieretti, MD,§ Cristina Ferrone, MD,§ Andreas Hoeft, MD, PhD,¶ Thomas W. L. Scheeren, MD, PhD,|| Boyd Taylor Thompson, MD,** Tobias Kurth, MD, ScD,††‡‡ and Matthias Eikermann, MD, PhD**

92 094 pts





Randomized clinical trial

British Journal of Surgery 2013; **100**: 66–74

Randomized clinical trial of goal-directed fluid therapy within an enhanced recovery protocol for elective colectomy

S. Srinivasa[1], M. H. G. Taylor[2], P. P. Singh[1], T.-C. Yu[1], M. Soop[3] and A. G. Hill[1]

[1]Department of Surgery, South Auckland Clinical School, Middlemore Hospital, University of Auckland, [2]Department of Anaesthesia, Middlemore Hospital, and [3]Department of Surgery, University of Auckland, Auckland, New Zealand
Correspondence to: Dr S. Srinivasa, PO Box 93311, Otahuhu, Auckland, New Zealand (e-mail: sanketsri@gmail.com)

This randomized trial has demonstrated no effect

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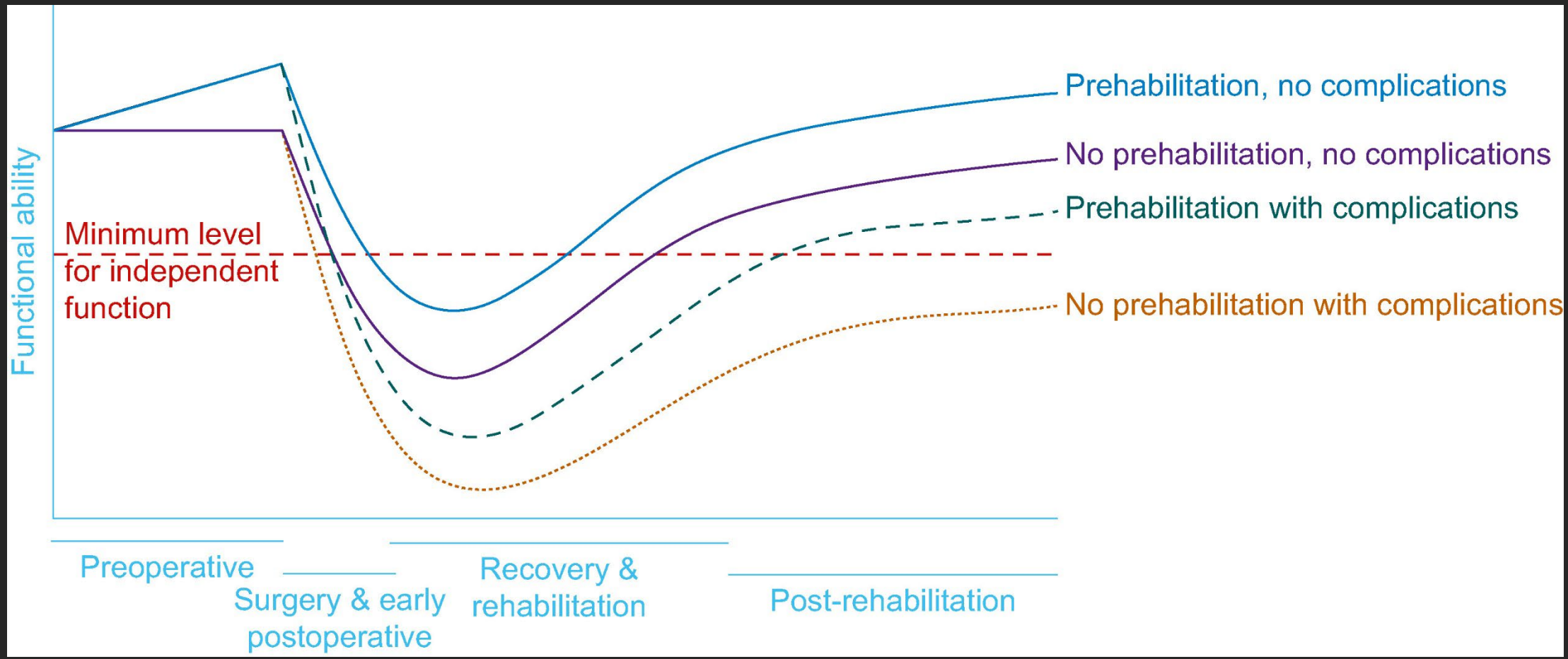
Volume 130, Number 1, January 2023

British Journal of Anaesthesia, 130 (1): 9–14 (2023)
doi: 10.1016/j.bja.2022.09.016
Advance Access Publication Date: 1 November 2022

EDITORIALS

Prehabilitation: high-quality evidence is still required

Dileep N. Lobo[1,2,*], Pavel Skořepa[1,3], Dhanwant Gomez[1] and Paul L. Greenhaff[2,4]



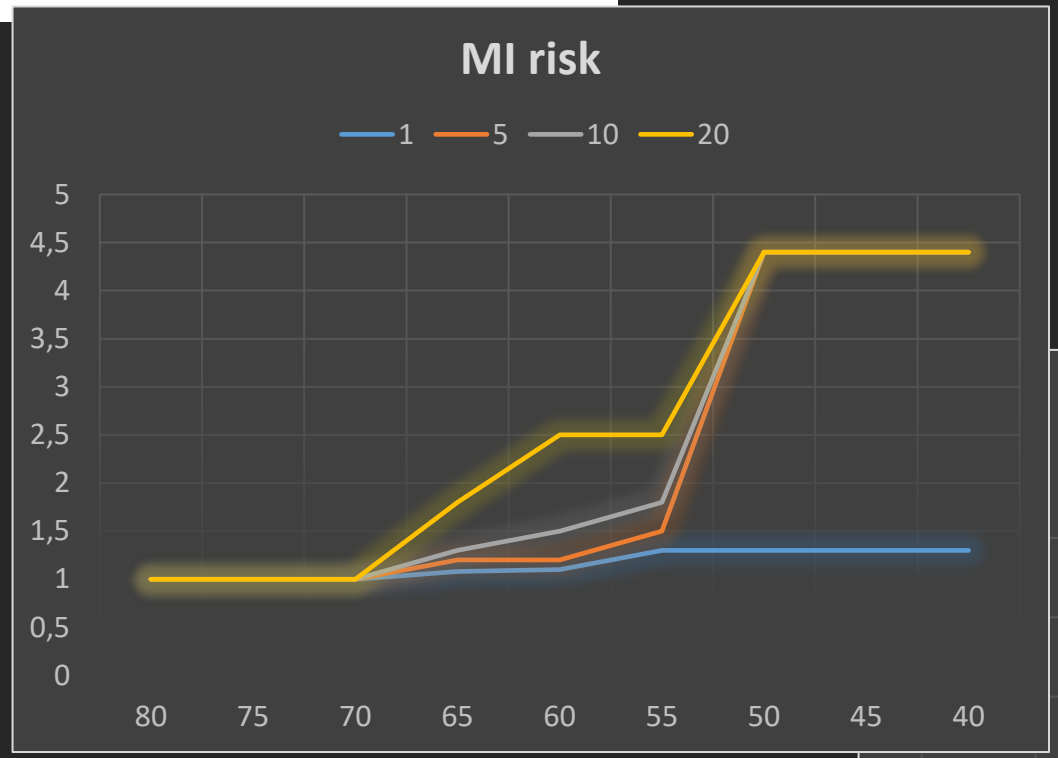
CARDIOVASCULAR

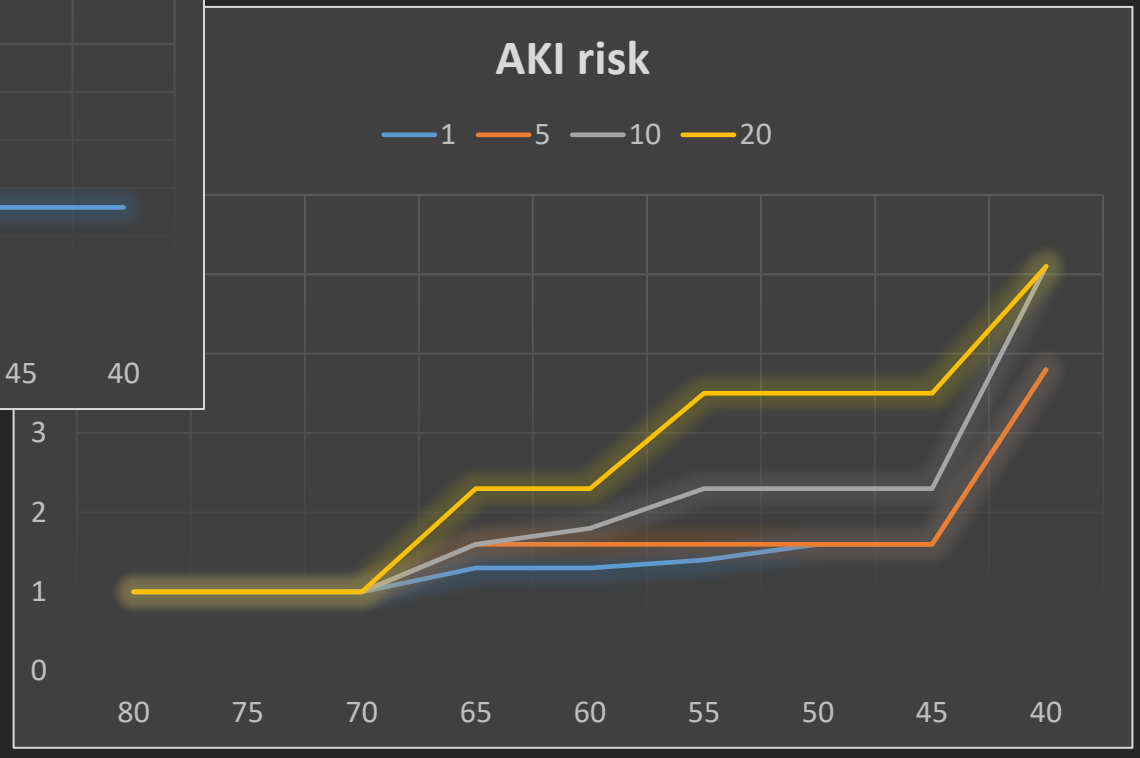
Intraoperative hypotension and the risk of postoperative adverse outcomes: a systematic review

E. M. Wesselink[1,*], T. H. Kappen[1], H. M. Torn[1], A. J. C. Slooter[2] and W. A. van Klei[1]

785 806 pts
42 std

MAP





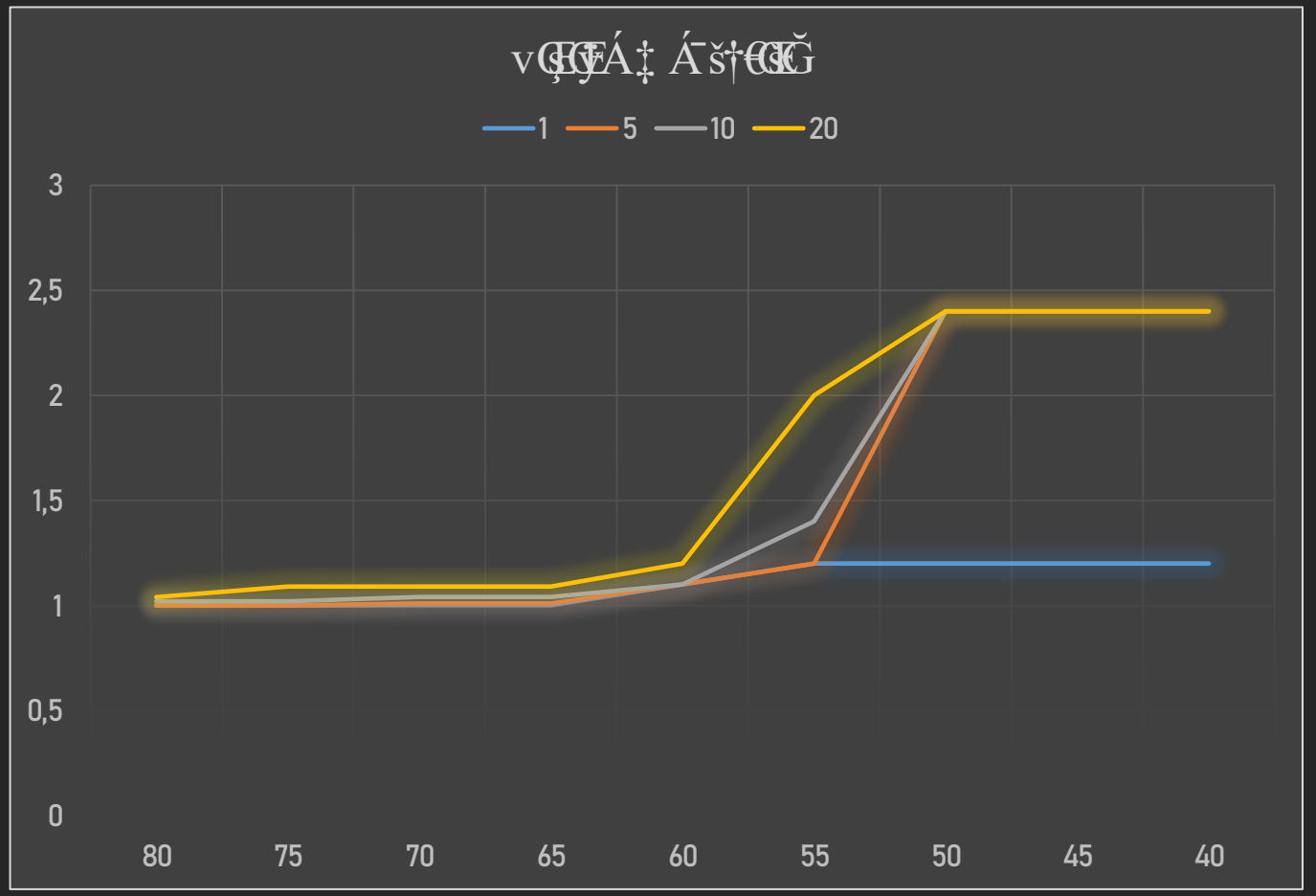
CARDIOVASCULAR

Intraoperative hypotension and the risk of postoperative adverse outcomes: a systematic review

E. M. Wesselink[1,*], T. H. Kappen[1], H. M. Torn[1], A. J. C. Slooter[2] and W. A. van Klei[1]

785 806 pts
42 std

MAP

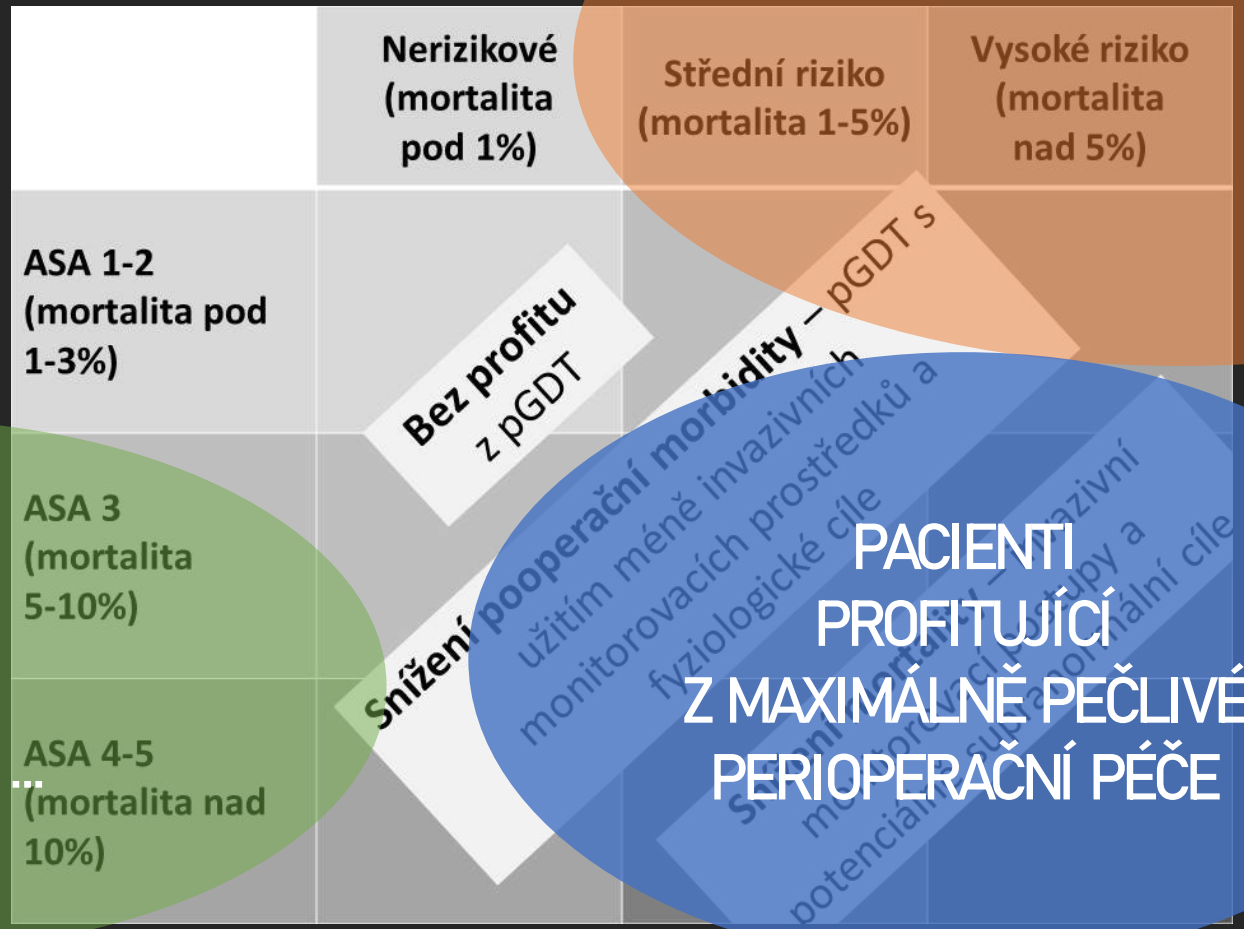


TAKŽE SHRNUTÍ POSLEDNÍCH 40 LET

- ROZSÁHLÉ (OPERAČNÍ) TRAUMA MŮŽE BÝT SPOJENO S ROZVOJEM KYSLÍKOVÉHO DLUHU
- OPTIMALIZACE HEMODYNAMIKY JE JEDNOU Z MOŽNOSTÍ INTERVENCE
- VHODNĚJŠÍ JE KOMPLEX POSTUPŮ MAXIMALIZUJÍCÍCH PŘIPRAVENOST K VÝKONU A MINIMALIZACE TRAUMATU
- VŠEHO MOC ŠKODÍ ...
- ALE I HYPOTENZE A KOMPLIKACE SE POČÍTAJÍ ...

A JAK TO TEDY DĚLAT ...

- STRATIFIKOVAT ... VRÁTIT SE V ČASE a PŘIPRAVIT



PACIENTI PROFITUJÍCÍ ZE ZMĚNY OPERAČNÍHO POSTUPU..

PACIENTI PROFITUJÍCÍ Z PREHABILITACE ...

PACIENTI PROFITUJÍCÍ Z MAXIMÁLNĚ PEČLIVÉ PERIOPERAČNÍ PÉČE

A JAK TO TEDY DĚLAT ...

MAP

PPV
SV/CO
SVV

PPV

$etCO_2$

100 mmHg

CÍL MAP_{chron} +/- 20%

60 mmHg

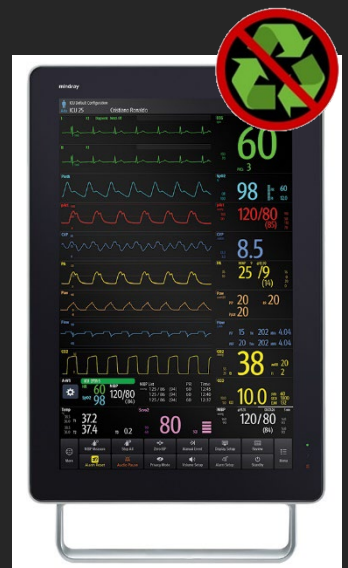
A JAK TO TEDY DĚLAT ...

EDV

VTI (SV/CO)
vVTI (SVV)
FTc
dVCI

PVI
PI (≈SV)

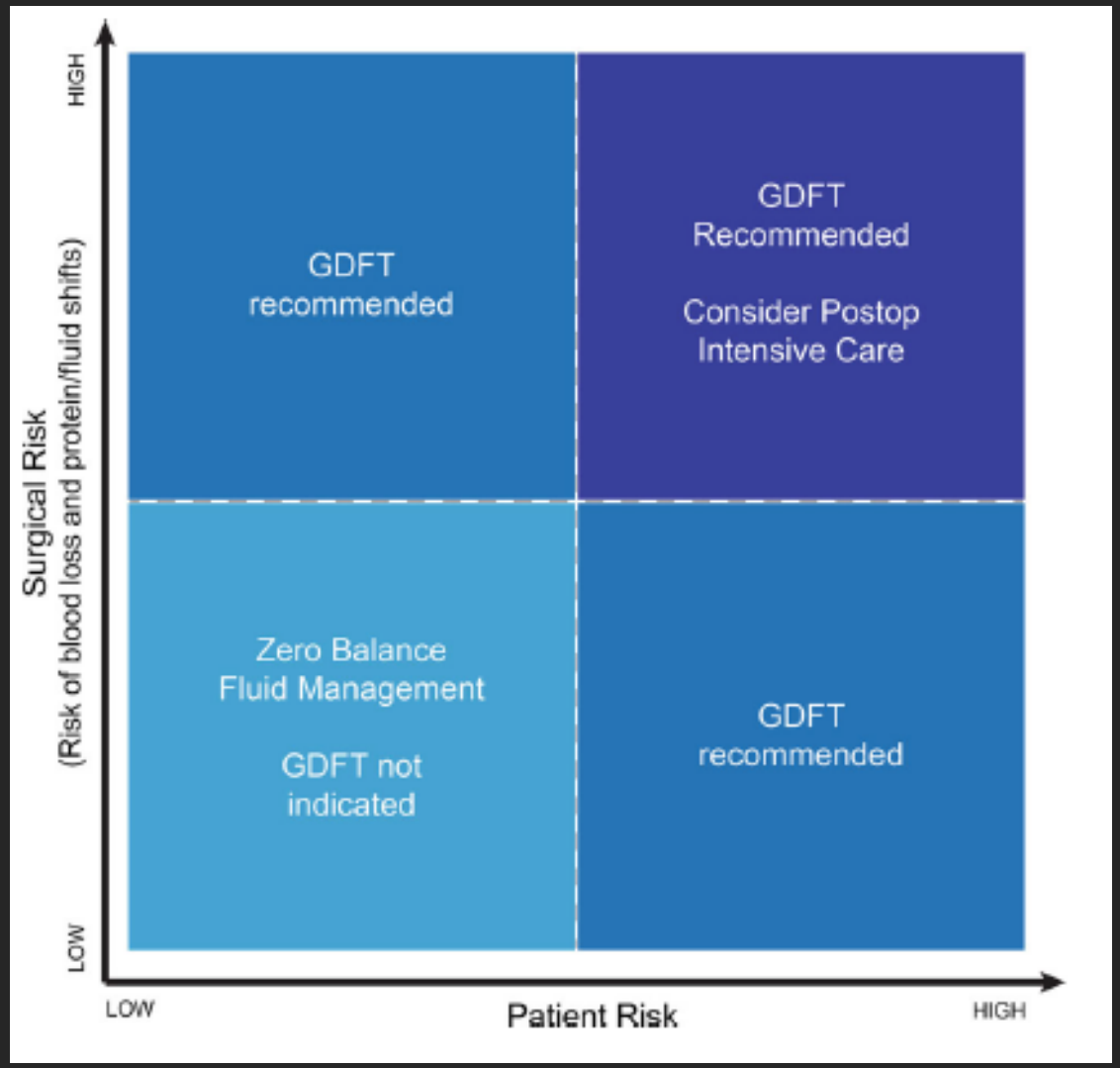
PPV
SV/CO
SVV



PPV

$etCO_2$

PPV
SV/CO
SVV
Ea-dyn
...



15 % ... 20 mm

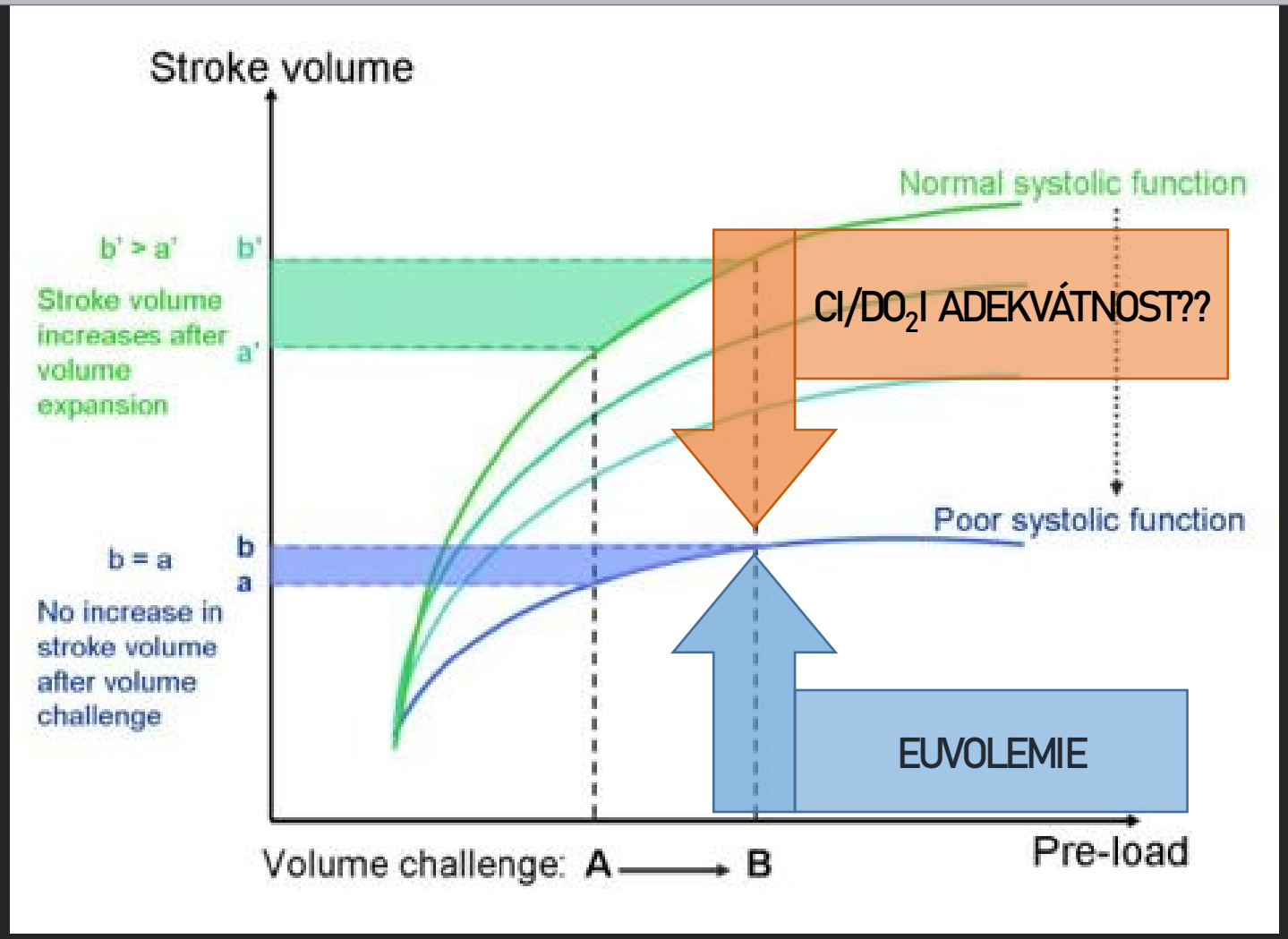
CÍL DynVar < 13–15 %
VCI ≈ 20 mm
FTc > 330 ms

330 ms

FC SVI > 30–35 ml/m²
VTI > 20 cm

30–35 ml/m² ... 20 cm

KDY PŘIDAT KROK 3 ??

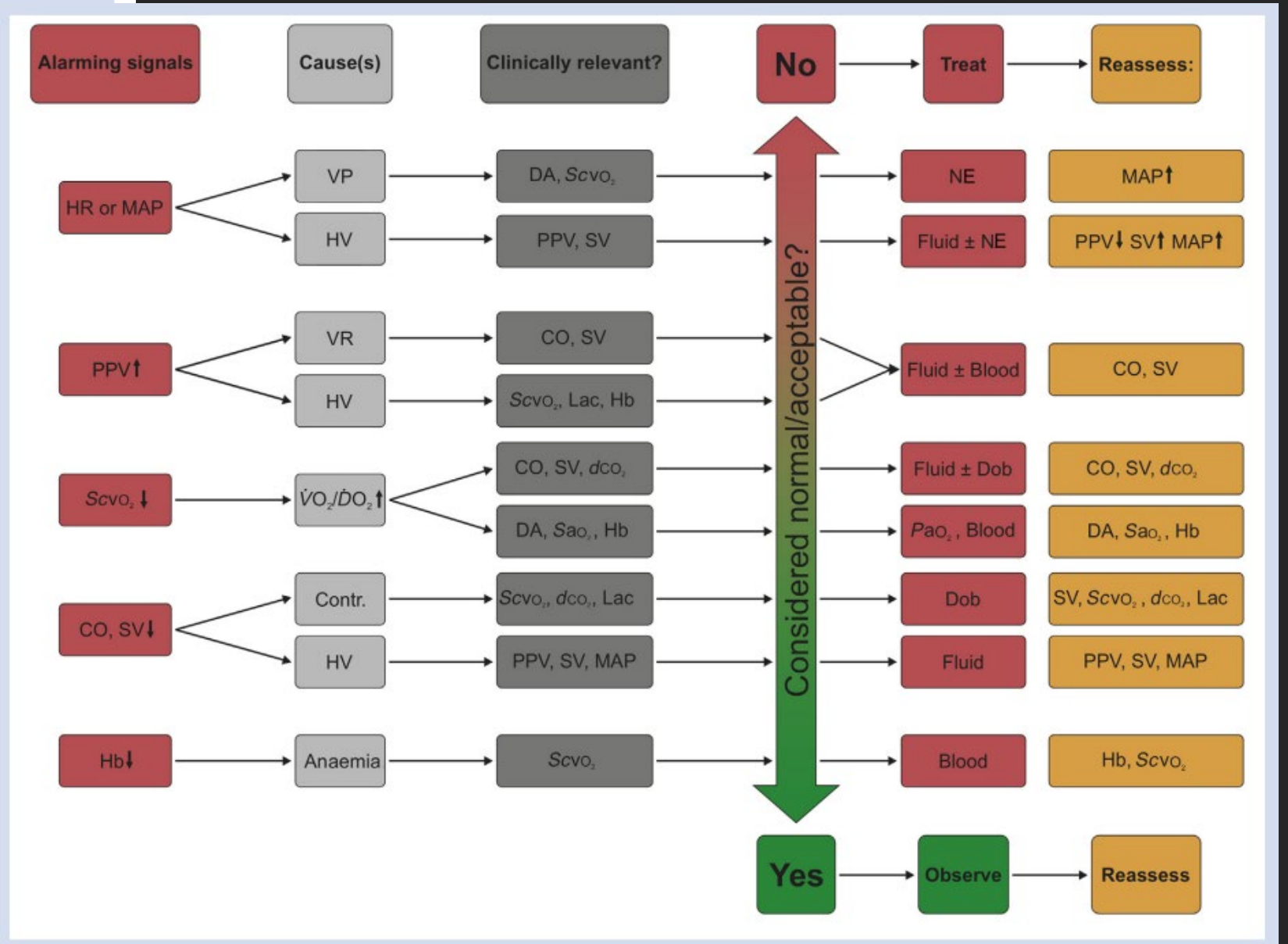


British Journal of Anaesthesia, 125 (4): 419–423 (2020)
doi: 10.1016/j.bja.2020.05.048
Advance Access Publication Date: 18 July 2020

EDITORIALS

Intraoperative hypotension is just the tip of the iceberg: multimodal, individualised, contextualised management intraoperative cardiovascular dynamics

Zsolt Molnar[1,2], Jan Benes[3,4,5] and Bernd Saugel[6,7,*]



Professor Michelle Chew

Linköping University Hospital, Sweden

The *British Journal of Anaesthesia* is pleased to announce the appointment of Professor Michelle Chew as our newest editor from 1st February 2024.

Professor Chew is Academic Chair and Professor in Anaesthesiology, Intensive Care and Acute Care at Linköping University Hospital, Sweden.

Her research interests revolve around the heart in the high-risk patient, perioperatively and during critical illness.

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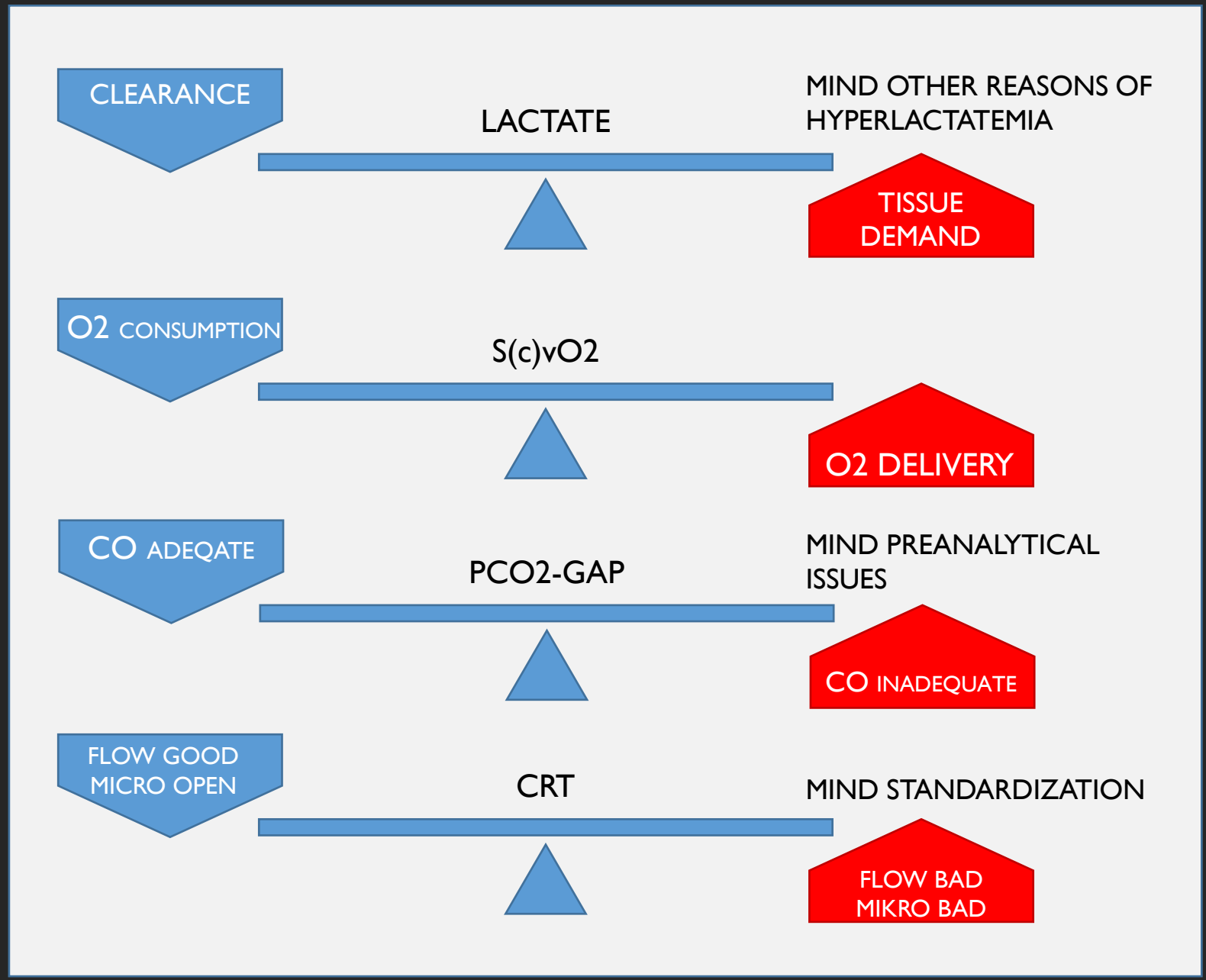

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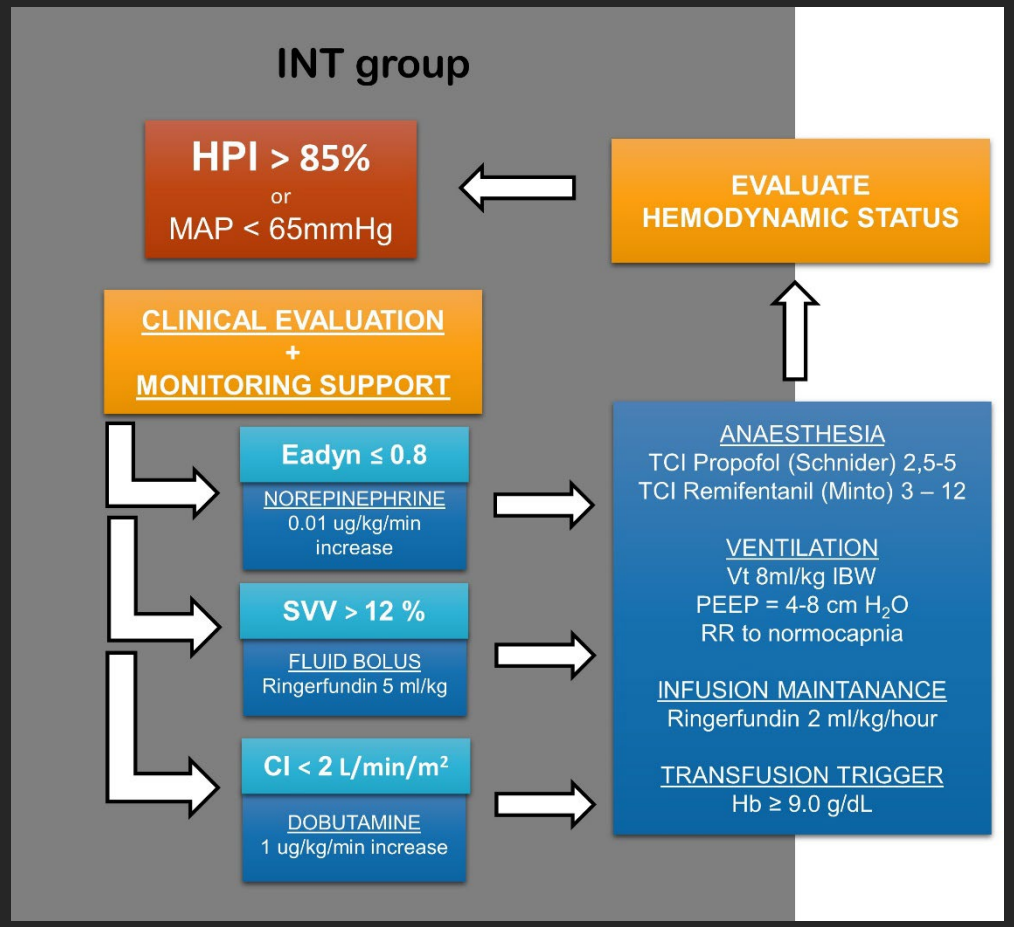
ORIGINAL ARTICLE

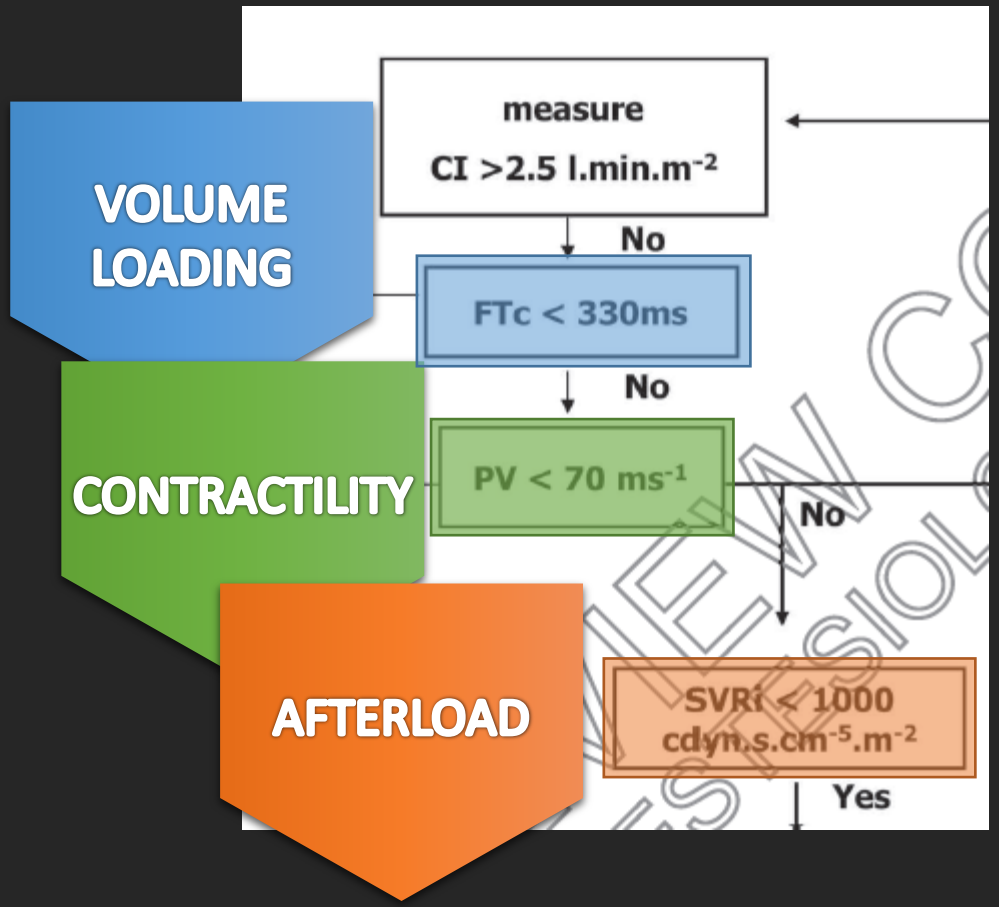
A protocol based on hypotension probability indicator *vs.* standard care to prevent intraoperative hypotension during supratentorial brain surgery: a prospective randomized pilot trial

Jiri POUSKA [1, 2], Jakub KLETECKA [1, 2], Jan ZATLOUKAL [1, 2], Vaclav CERVENY [1], Jan BENES [1, 2, 3] *



Multi-parametric functional hemodynamic optimization improves postsurgical outcome after intermediate risk open gastrointestinal surgery, a randomized controlled trial

Authors: Pavel Szturz, M.D., Ph.D[1,2], Pavel Folwarczny, M.D.[1], Roman Kula, M.D., CSc. [1], Jan Neiser, M.D.[1,2], Pavel Ševčík, Prof., M.D., CSc.[1,2], Jan Benes, assoc.Prof, M.D., Ph.D.[3*]



Journal of Clinical Monitoring and Computing
https://doi.org/10.1007/s10877-024-01132-7

REVIEW

Intraoperative haemodynamic monitoring and management of adults having non-cardiac surgery: Guidelines of the German Society of Anaesthesiology and Intensive Care Medicine in collaboration with the German Association of the Scientific Medical Societies

Bernd Saugel[1,2] · Thorsten Annecke[3] · Berthold Bein[4] · Moritz Flick[1] · Matthias Goepfert[5] · Matthias Gruenewald[6] · Marit Habicher[7] · Bettina Jungwirth[8] · Tilo Koch[9] · Karim Kouz[1,2] · Agnes S Meidert[10] · Gunther Pestel[11] · Jochen Renner[12] · Samir G Sakka[13] · Michael Sander[7] · Sascha Treskatsch[14] · Amelie Zitzmann[15] · Daniel A Reuter[15]

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- Oscillometric arterial pressure monitoring should – if possible – be performed on the upper arm.
- For oscillometric arterial pressure monitoring, a cuff size appropriate for the circumference of the upper arm should be selected and the cuff should be placed tightly around the upper arm without contact with the olecranon.
- For oscillometric arterial pressure monitoring, the upper arm cuff should be positioned at the level of the heart and external compression or manipulation of the cuff during the measurement should be avoided.
- For patients under general anaesthesia, oscillometric arterial pressure monitoring ought to be performed every 3 min. The measurement interval should be adapted to the clinical context.
- Continuous arterial pressure monitoring should be used in all patients who – because of anaesthesiologic or surgical procedures or concomitant diseases – are at risk for complications associated with hypotension or hypertension.
- Continuous arterial pressure monitoring ought to be performed with an arterial catheter.
- In low or moderate risk patients, non-invasive continuous arterial pressure monitoring may be considered.

- In patients with an indication for intraarterial arterial pressure monitoring, the arterial catheter should be inserted before induction of anaesthesia.
- Arterial catheters should primarily be inserted in the radial artery.
- The pressure transducer should always be checked for correct levelling or zeroing.
- The dynamic response of the measurement system should be closely checked.
- Especially during changes in patient position, arterial pressure ought to be measured closely or – even better – continuously.
- In all positions where the usual reference level "right atrium" is lower than the cranial base, non-invasively measured mean arterial pressure should be corrected for the difference in hydrostatic pressure or the reference level of the continuous arterial pressure measurement should be set at the level of the cranial base.
- Mean arterial pressure should be used for intraoperative arterial pressure management.
- Mean arterial pressure should be maintained above 65 mmHg.

- Bradycardia should be treated when it is accompanied by clinically important hypotension, reduced perfusion, or reduced oxygen delivery.
- If tachycardia is present, hypovolaemia should be excluded.

- Echocardiography should be performed in patients with haemodynamic instability not responding to initial treatment, especially when the cause of haemodynamic instability is unclear.
- Echocardiography may be considered to guide haemodynamic therapy.

- To assess fluid responsiveness, dynamic preload variables (e.g., pulse pressure variation or stroke volume variation) should be used in mechanically ventilated patients.
- If dynamic preload variables cannot be used, stroke volume or cardiac output-based fluid challenge tests ought to be performed to assess fluid responsiveness.
- Static preload variables (e.g., central venous pressure) should not be used to assess fluid responsiveness.
- Even in fluid-responsive patients, the indication for fluid administration should be determined individually based on haemodynamics and clinical context.
- Urine output alone should not be used to diagnose hypovolaemia or to guide haemodynamic management.

- Stroke volume/cardiac output monitoring may be considered in patients with a high risk for complications.
- Stroke volume/cardiac output target values should be individually defined for each patient.
- Stroke volume/cardiac output should be interpreted in the context of clinical and metabolic signs of hypoperfusion.
- Stroke volume/cardiac output should not be routinely maximised.
- If hypoperfusion or inadequate tissue oxygenation is suspected, central venous oxygen saturation may be used for additional assessment of haemodynamics.
- When hypoperfusion or inadequate tissue oxygenation are suspected, lactate should be measured to assess haemodynamics.
- Elevated lactate should be interpreted considering possible non-haemodynamic causes.
- Near-infrared spectroscopy may be considered to complement the hemodynamic assessment.
- Monitoring the microcirculation using vital microscopy should not be used to guide haemodynamic therapy.

THM, DOTAZY a DÍKY ...

- STRATIFIKOVAT , NAPLÁNOVAT A PŘIPRAVIT
- SPRÁVNÝ TLAK PRO VŠECHNY
- ZERO FLUID / RESTRIKCE + pGDFT INDIVIDUÁLNÍ TOP UP
- IDENTIFIKACE, KDE TO NESTAČÍ ... NA TO NESTAČÍ CO/CI
- MULTIPARAMETRICKÉ PROTOKOLY pGDT

FENICE II

ESICM
EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE

Observační studie podávání tekutin na JIP organizovaná CD section ESICM

benesj@fnplzen.cz
@JanBenes79