

Hemodynamic Monitoring from OR to SICU – Impact on Surgical Outcomes

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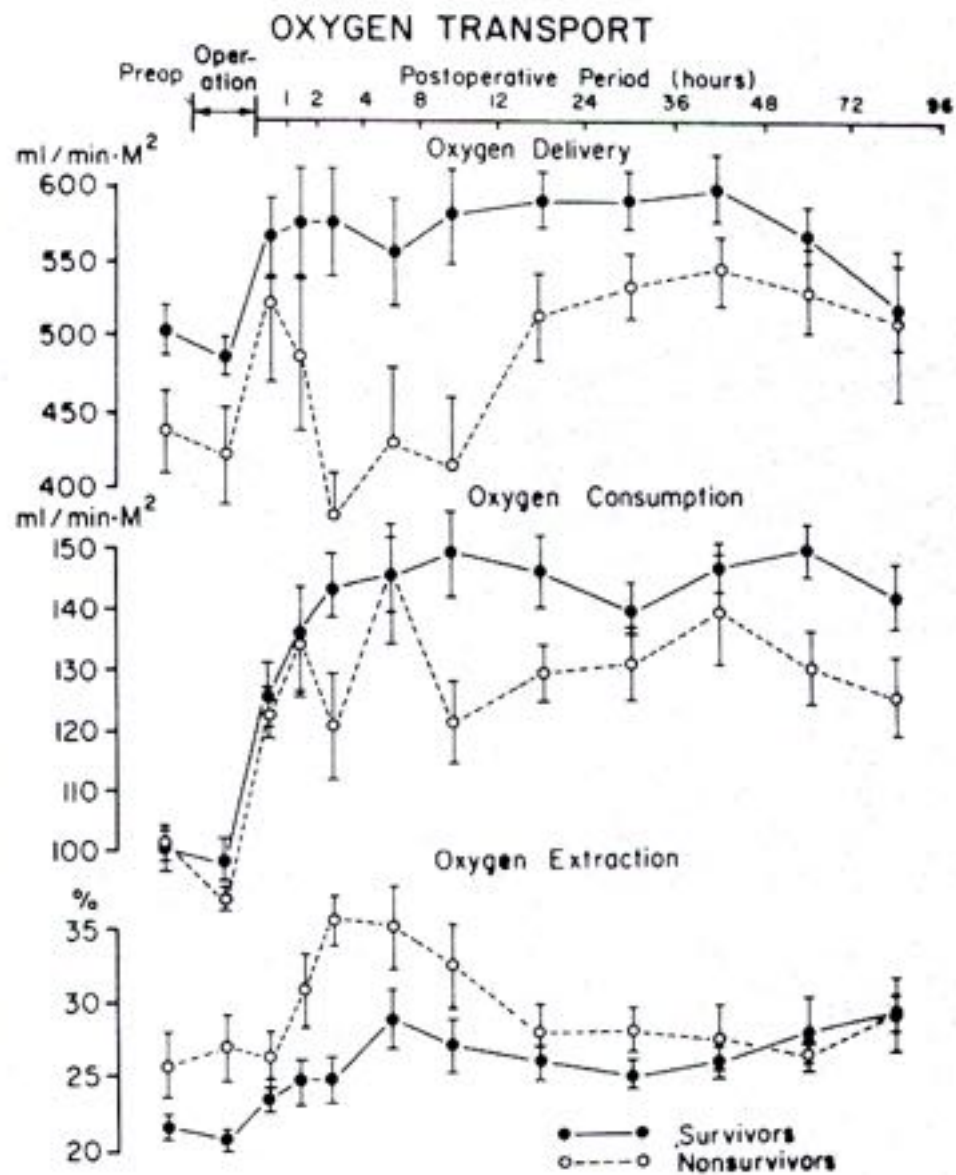
REVIEW

Clinical review: Update on hemodynamic monitoring - a consensus of 16

Jean-Louis Vincent^{1*}, Andrew Rhodes², Azriel Perel³, Greg S Martin⁴, Giorgio Della Rocca⁵, Benoit Vallet⁶, Michael R Pinsky⁷, Christoph K Hofer⁸, Jean-Louis Teboul⁹, Willem-Pieter de Boode¹⁰, Sabino Scolletta¹¹, Antoine Vieillard-Baron¹², Daniel De Backer¹, Keith R Walley¹³, Marco Maggiorini¹⁴ and Mervyn Singer¹⁵

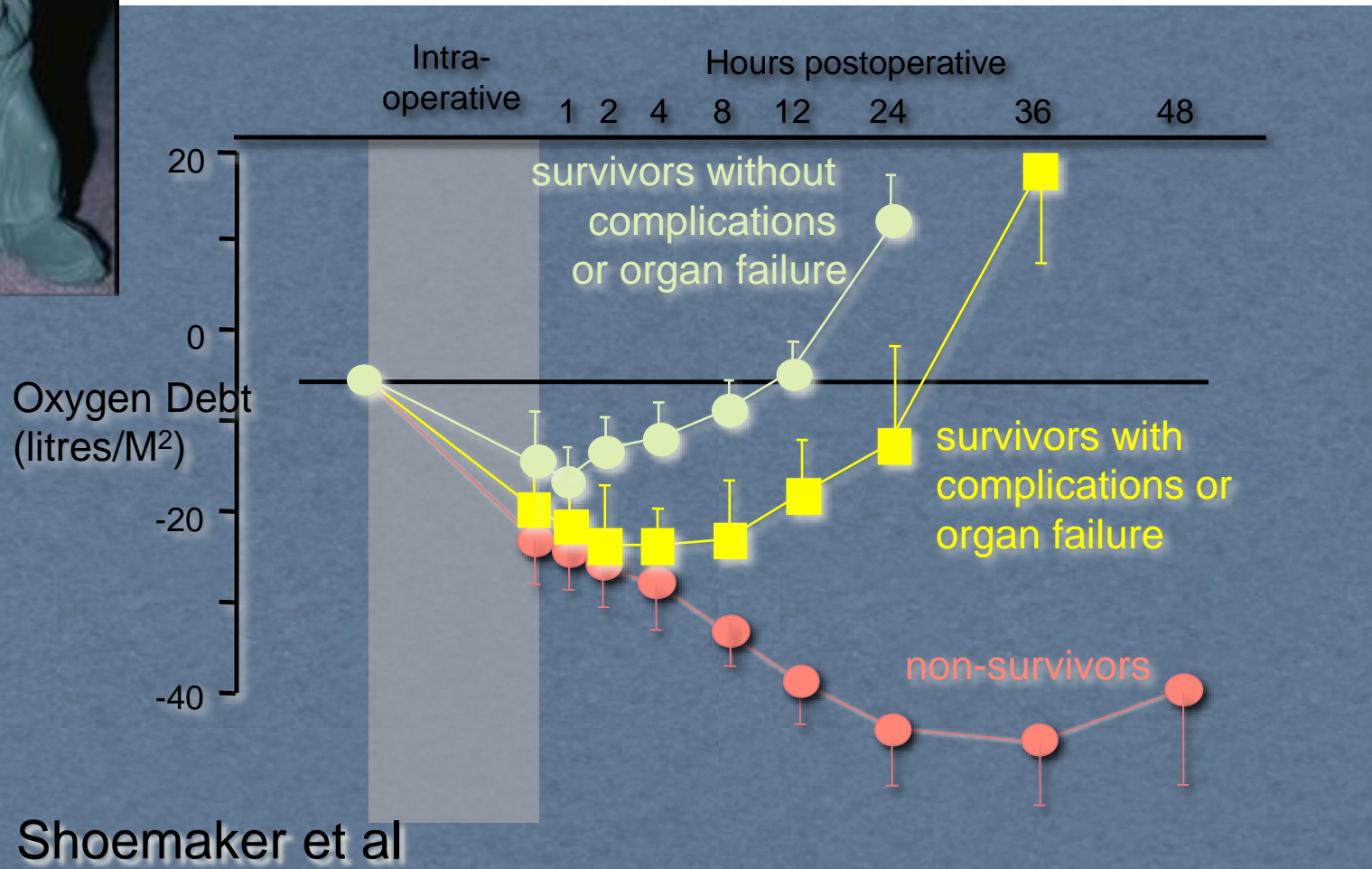
Principles:

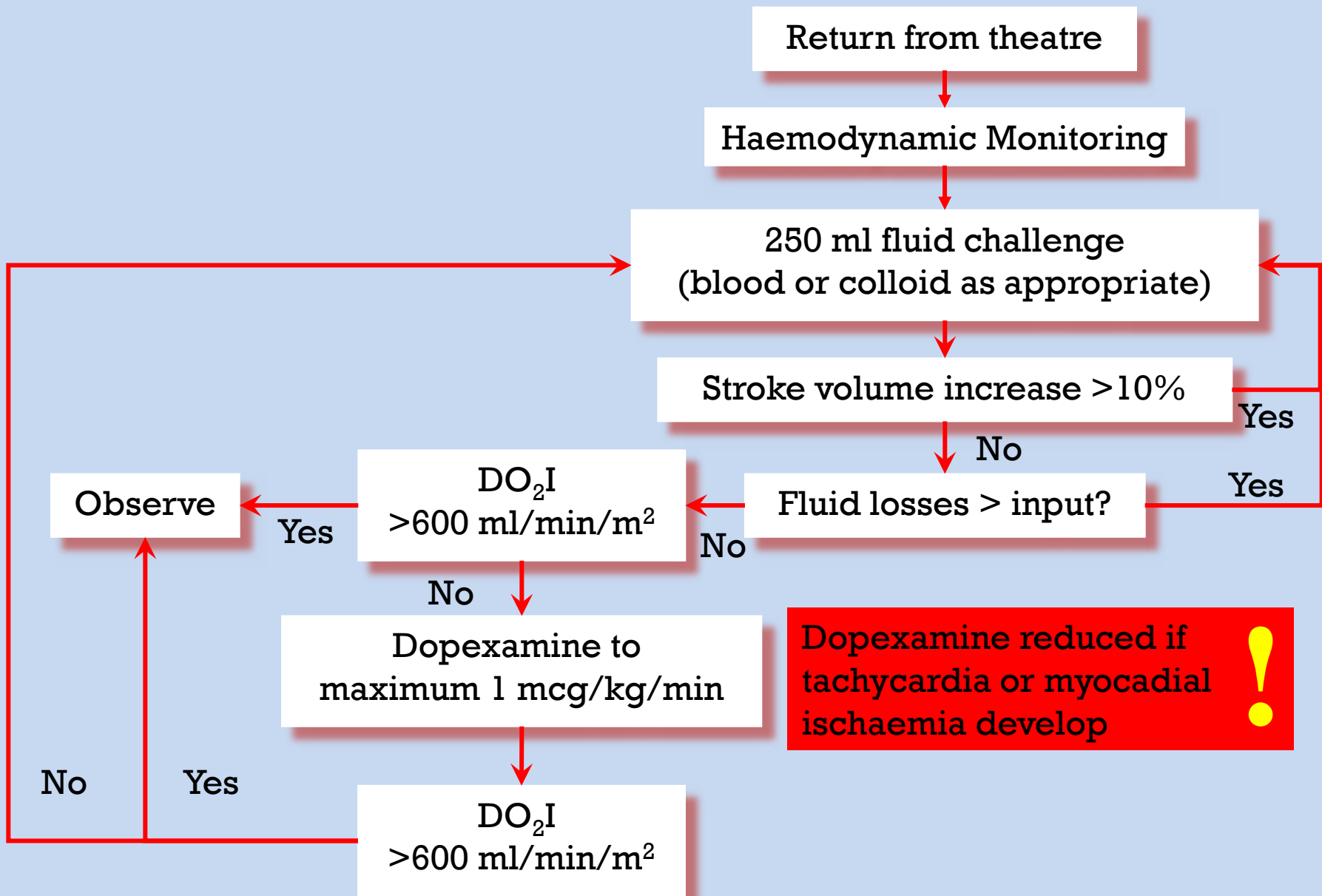
- ✓ **No hemodynamic monitoring technique can improve outcome by itself.**
- ✓ **Monitoring requirements may vary over time and can depend on local equipment availability and training.**



Shoemaker. CCM. 1979; 7; 237.

Peri-operative Oxygen Debt

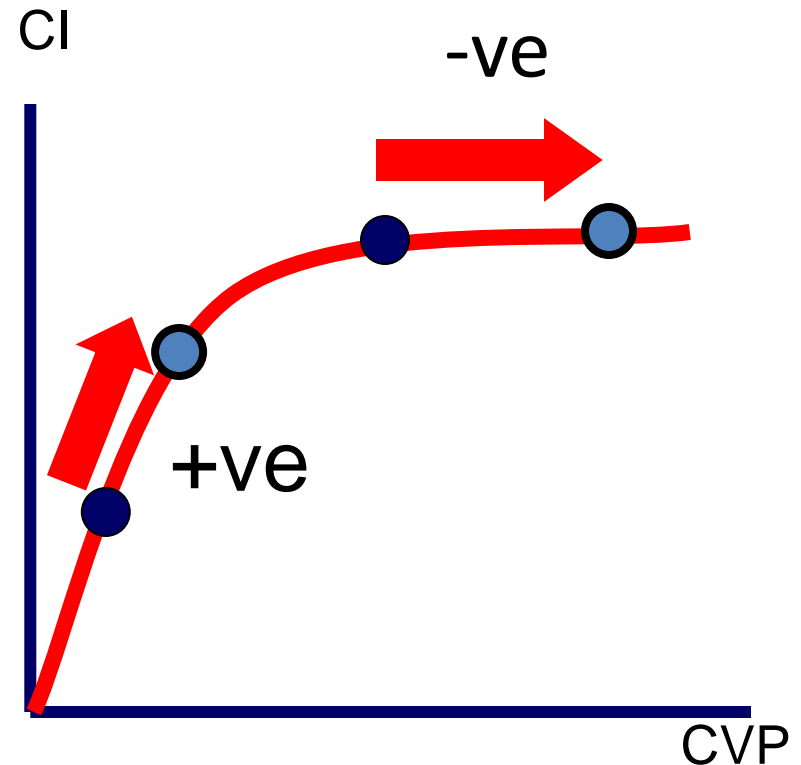




Dopexamine reduced if tachycardia or myocardial ischaemia develop !

What is a fluid challenge?

1. Give sufficient fluid to raise CVP by $\sim 2\text{mmHg}$ and observe cardiac index.
2. Define response by changes in cardiac index.



Parsons T, Cecconi M, Rhodes A. COCC 2011

Perioperative increase in global blood flow to explicit defined goals and outcomes after surgery: a Cochrane Systematic Review¹

M. P. W. Grocott¹, A. Dushianthan^{1*}, M. A. Hamilton², M. G. Mythen³, D. Harrison⁴, K. Rowan⁴ and Optimisation Systematic Review Steering Group³



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Table 2 Data synthesis for all outcomes. RR, relative risk; IV, inverse variance; MD, mean difference

Outcome	Number of studies	Number of patients	Statistical method	Effect size and I^2	P-value
Mortality (longest follow-up)	31	5292	RR (IV, fixed, 95% CI)	0.89 (0.76–1.05), $I^2=15\%$	0.18
Mortality (hospital or 28 day)	31	5292	RR (IV, fixed, 95% CI)	0.81 (0.65–1.00), $I^2=01\%$	0.055
Renal impairment	21	4307	RR (IV, fixed, 95% CI)	0.71 (0.57–0.90), $I^2=20\%$	0.004
Arrhythmia	12	2921	RR (IV, fixed, 95% CI)	0.84 (0.67–1.06), $I^2=00\%$	0.14
Total number of infections	9	733	RR (IV, fixed, 95% CI)	0.88 (0.69–1.12), $I^2=00\%$	0.29
Infection types					
Chest/pneumonia	13	2945	RR (IV, fixed, 95% CI)	0.78 (0.61–1.00), $I^2=00\%$	0.054
Sepsis	5	474	RR (IV, fixed, 95% CI)	0.68 (0.26–1.77), $I^2=06\%$	0.43
Abdominal	6	55	RR (IV, fixed, 95% CI)	0.53 (0.23–1.22), $I^2=00\%$	0.14
Wound	10	2802	RR (IV, fixed, 95% CI)	0.65 (0.50–0.84), $I^2=22\%$	0.0013
Urinary tract	8	612	RR (IV, fixed, 95% CI)	0.54 (0.26–1.15), $I^2=00\%$	0.11
Respiratory failure/ARDS	9	844	RR (IV, fixed, 95% CI)	0.51 (0.28–0.93), $I^2=00\%$	0.027
Myocardial infarction	15	3328	RR (IV, fixed, 95% CI)	1.01 (0.71–1.45), $I^2=00\%$	0.95
Congestive cardiac failure/ pulmonary oedema	14	3223	RR (IV, fixed, 95% CI)	1.00 (0.81–1.24), $I^2=00\%$	0.98
Venous thrombosis	10	2740	RR (IV, fixed, 95% CI)	1.04 (0.39–2.77), $I^2=12\%$	0.93
Number of patients with complications	17	1841	RR (IV, random, 95% CI)	0.68 (0.58–0.80), $I^2=34\%$	<0.00001
Length of hospital stay	27	4729	MD (IV, random, 95% CI)	-1.16 (-1.89 to -0.43), $I^2=87\%$	0.0019
Length of critical care stay	14	1873	MD (IV, random, 95% CI)	-0.45 (-0.94 to -0.03), $I^2=87\%$	0.065

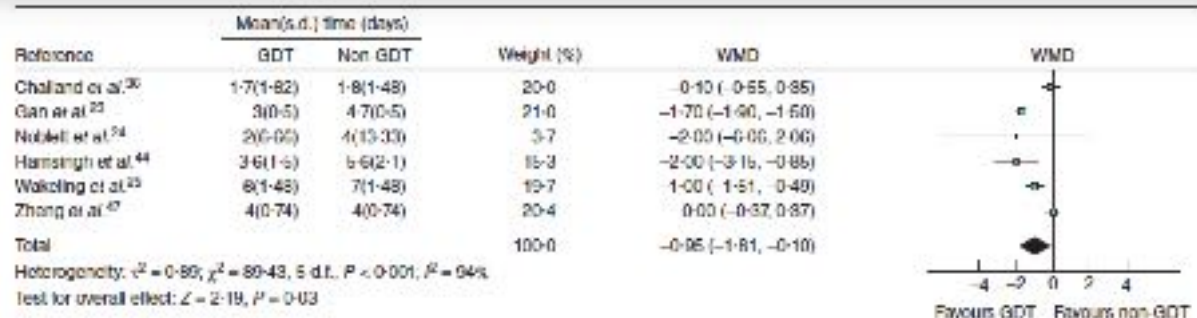
Perioperative increase in global blood flow to explicit defined goals and outcomes after surgery: a Cochrane Systematic Review[†]

M. P. W. Grocott¹, A. Dushianthan^{1*}, M. A. Hamilton², M. G. Mythen³, D. Harrison⁴, K. Rowan⁴
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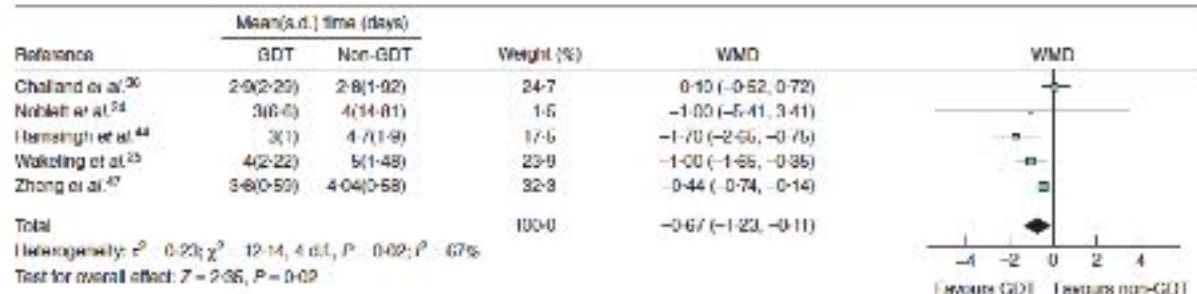
The data indicate that for every 100 patients exposed to treatment, **13/100 will avoid a complication**, 2/100 will avoid renal impairment, 5/100 will avoid respiratory failure, and 4/100 will avoid a postoperative wound infection.

Meta-analysis of the effect of goal-directed therapy on bowel function after abdominal surgery

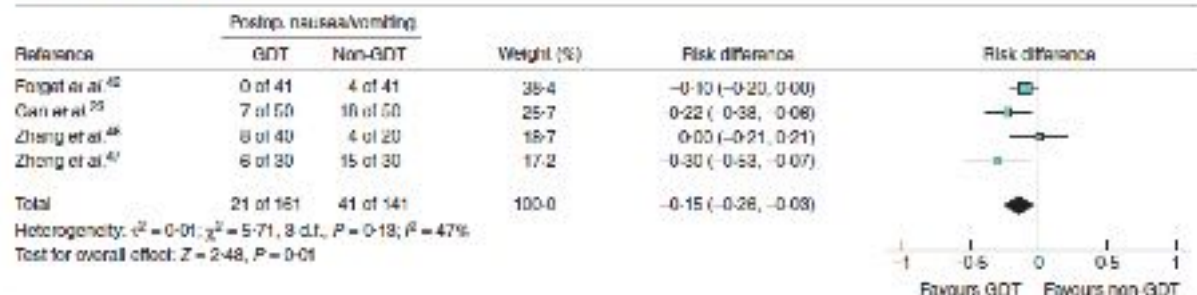
J. C. Gómez-Izquierdo¹, L. S. Feldman², F. Carli¹ and G. Baldini¹



a Time to tolerate oral intake



b Time to first bowel motion

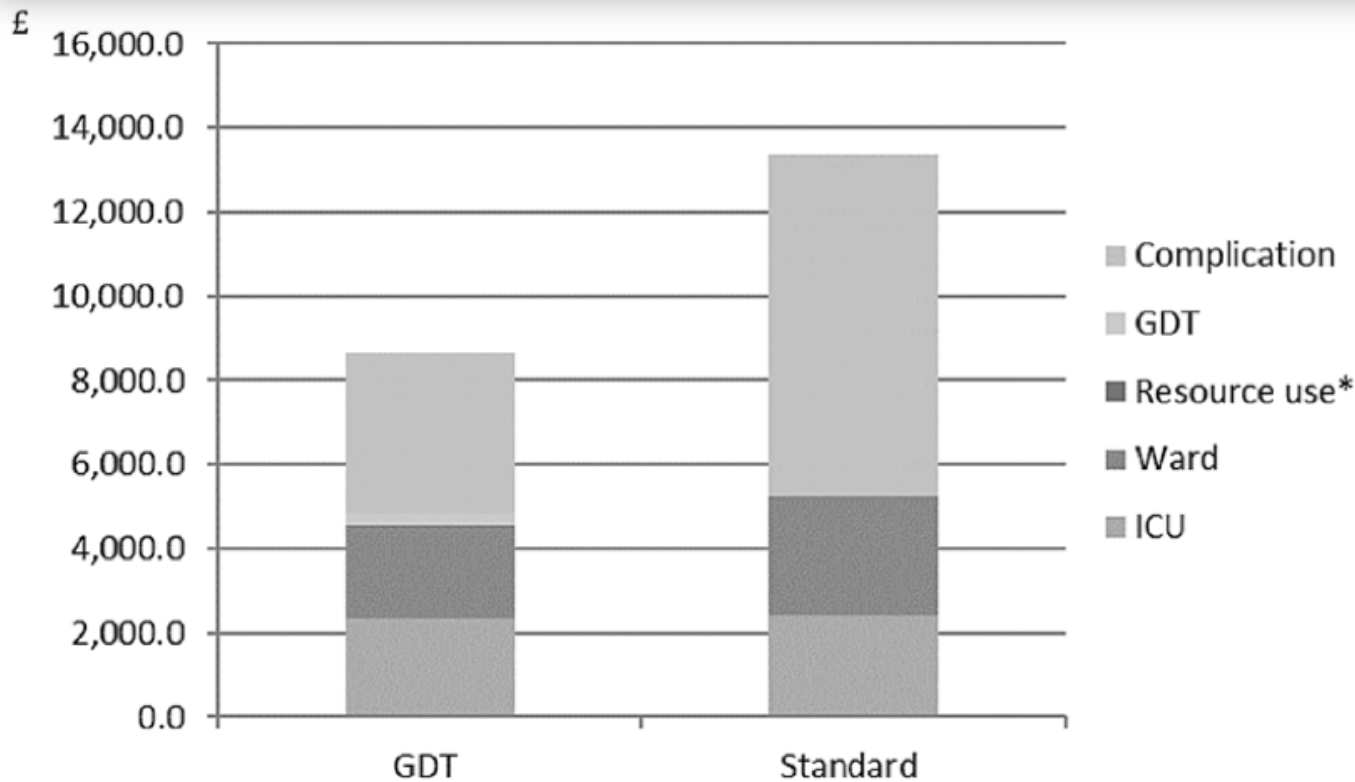


c Postoperative nausea and/or vomiting

BJS 2015; 102: 577-589

A Cost-Effectiveness Analysis of Postoperative Goal-Directed Therapy for High-Risk Surgical Patients

Claudia Ebm, MD, MSc¹; Maurizio Cecconi, MD, FRCA, FICM, MD (UK)^{1,2}; Les Sutton, MBA, MSc¹; Andrew Rhodes, MD, FRCP, FRCA, FICM^{1,2}



* Includes fluids, drugs, supplementary material

And what about cardiac surgery....?

Goal Directed Resuscitation in Cardiac Surgery (GRICS).

Osawa E et al. 2015

- Single centre RCT
- 126 **elective primary and redo adult cardiac surgical** patients for coronary artery bypass grafting, valve or combined procedures.
 - Deemed to be at **high risk** of complications
- Intervention to maintain **CI > 3 L/min/m²** from bypass to 8 hours post op.

Goal Directed Resuscitation in Cardiac Surgery (GRICS).

Osawa E et al. 2015

Interventions

- **GDT received more fluid (1000ml [625-1500] vs. 500ml [500-1000], $p < 0.0001$)**
- **Similar doses of dobutamine (4mcg/kg [3-5] vs. 4 [3-6], $p=0.218$)**
- **Lower duration of vasopressor support (0 [0-3] vs. 3 [0-5] day, $p=0.01$)**
- **Similar rates of RBC transfusion (0 vs. 1.6%, $p=0.323$)**

Goal Directed Resuscitation in Cardiac Surgery (GRICS).

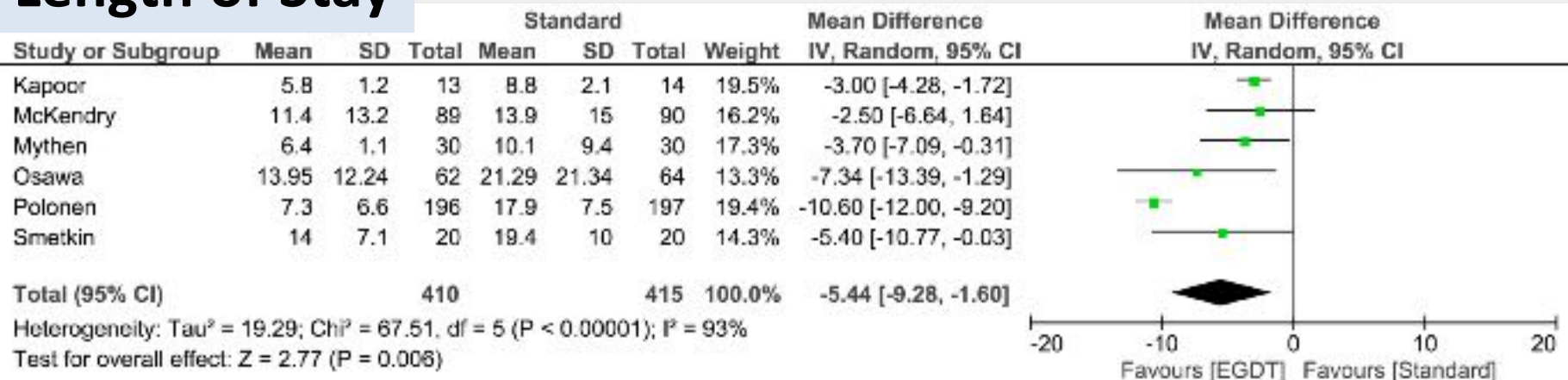
Osawa E et al. 2015

Outcomes

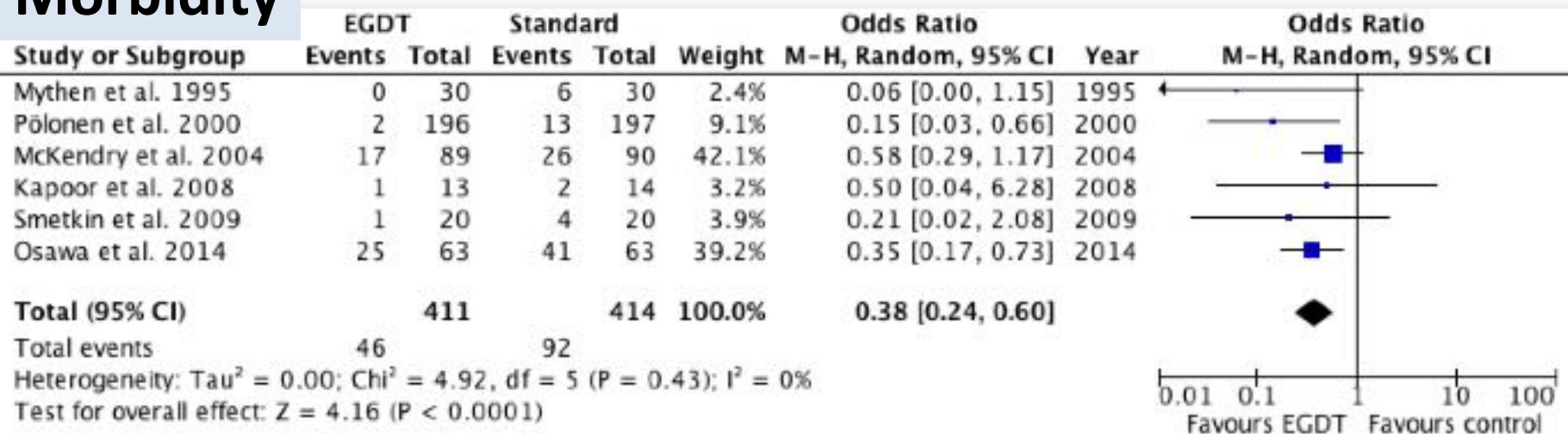
- **GDT group had:**
 - **Lower complication rates (25 [40%] vs. 41 [64%], $p=0.008$)**
 - **Shorter ICU stay (3 [3-4] vs. 5 [4-7] days, $p < 0.001$)**
 - **Shorter hospital stay (9 [8-16] vs. 12 [9-22] days, $p=0.05$)**
 - **Similar rates of hospital mortality 3% vs. 5% ($p=0.45$)**

Updated Meta-analysis (unpublished)

Length of Stay



Morbidity



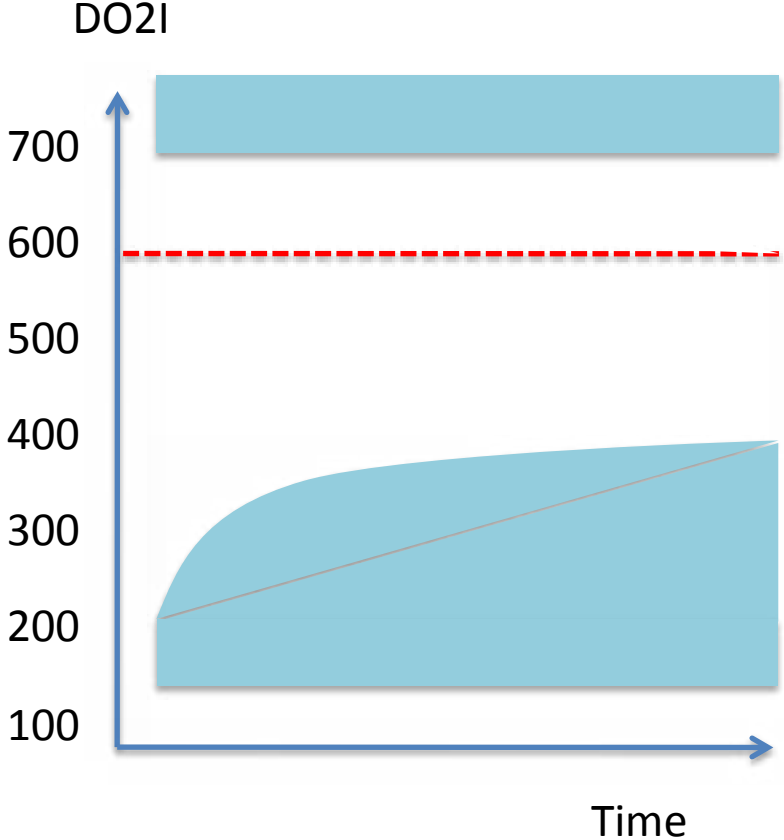
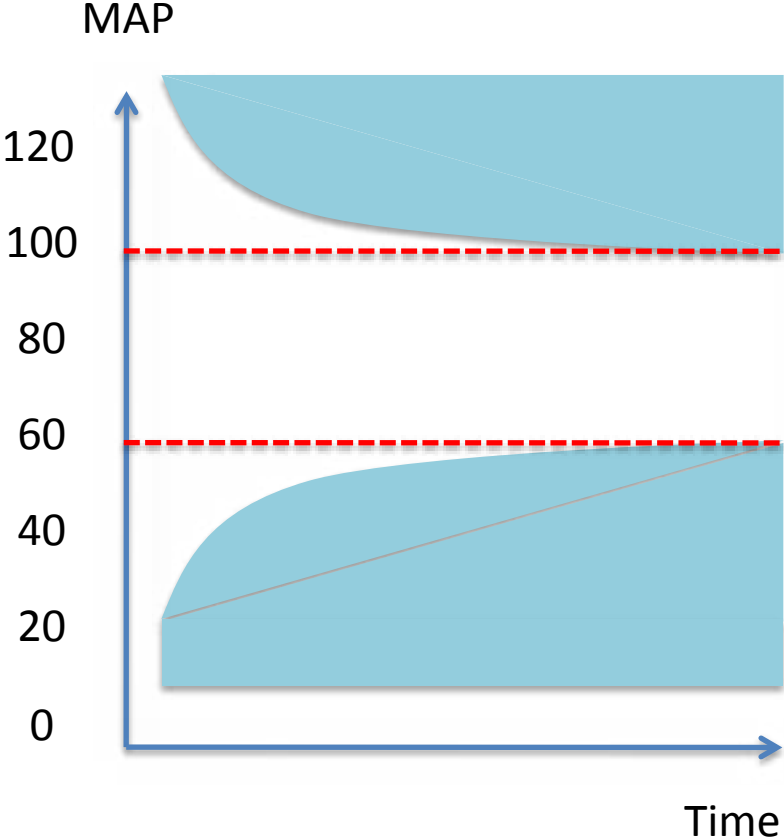
Residual questions

- **Is the difference due to the act of protocolizing care?**
- **Are all elements of the protocol necessary?**
 - Different protocols
 - Different monitors
 - Different targets
- **Are the results generalizable?**
 - During or after surgery
 - Which patients

How therapies can be guided.

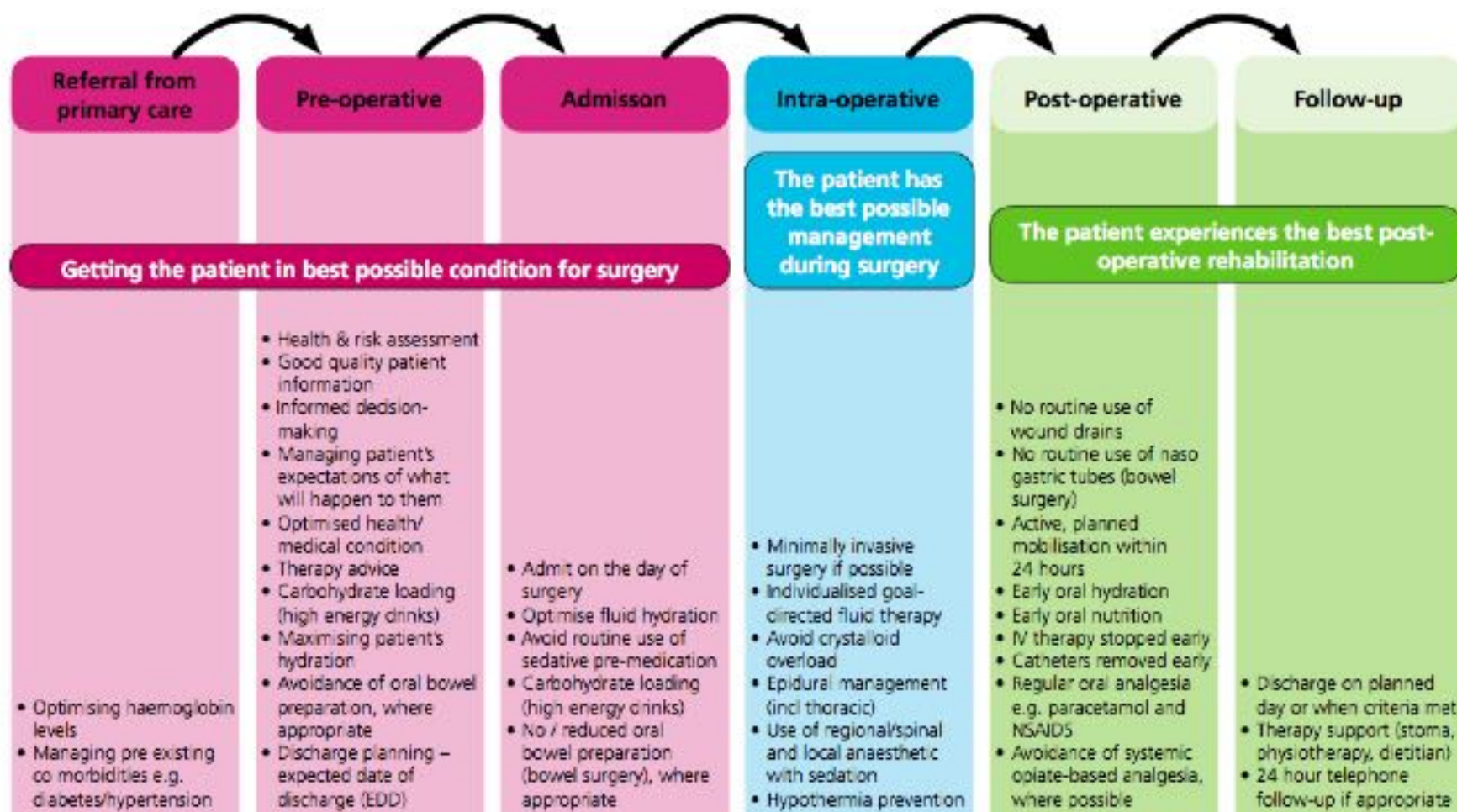
- **It is essential to have in this population**
 - An adequate MAP
 - An adequate perfusion.
- **Titrating therapy to perfusion requires monitoring of flow**
 - Step 1. Optimize volaemic status
 - Either using functional haemodynamics or stroke volume challenge
 - Step 2. Ensure DO2I is in a target range.
 - Volume +/- inotropes.

Endpoints for Goal Directed Therapy



The enhanced recovery pathway

Active patient involvement



Whole team involvement

Conclusions

- ✓ **Post operative morbidity and mortality is common.**
- ✓ **There is marked variability in practice in how post operative care is delivered- this is exemplified with the handling of haemodynamics.**
- ✓ **There is evidence that protocolized haemodynamic therapy can reduce variability and complications.**
- ✓ **This should be part of a comprehensive package of care to improve the outcomes for this patient group.**

Thank You!