

ANAESTHETIC AND PERI-OPERATIVE CONSIDERATIONS IN SEVERE CARDIOPULMONARY DISEASE

Mike M Royal Hobart 'St Richard's Ho

With acknowledgements & thanks to **Doug Hacking**



Mike Margarson MD

Royal Hobart Hospital, Tasmania

(St Richard's Hospital, Chichester UK)





- "We are all Bariatric Anaesthetists today"
- 120-140 kg, BMI 40? every week
- I 50-200 kg gets interesting..
- Where does the Morbidity pick up??
- What do we do with the ASA IV Obese pt?

"SEVERE OBESITY"



Permission obtained for image use



FOCUS OF THIS LECTURE

ASA Status & Obesity

The Key Co-morbidities

Peri-operative Considerations

Red Flags & Investigations







OBVIOUS CONTRIBUTORS TO OUTCOME

Pre-operative Factors Frailty & Co-morbidity i.e. ASA Status



Operative Factors - Anaesth & Surgical - Complications

...and how are these modifiable??



The ASA Physical Status Classification System has been in use for 60 years.

The purpose of the system is to assess and communicate a patient's preanesthesia medical co-morbidities.

- The classification system alone does not predict the perioperative risks, deconditioning), it can be helpful in predicting perioperative risks.
- However It's somewhat subjective...

ASA STATUS

but used with other factors (eg, type of surgery, acute conditions, level of



ASA VI

ASA IV

ASA V

ASA Status

- A normal healthy patient
- A patient with mild systemic disease (without substantive functional limitation)
- A patient with moderate to severe systemic disease (with substantial functional limitation)
 - A patient with severe systemic disease that is a constant threat to life
 - A moribund patient who is not expected to survive (without the operation)
- A declared brain-dead patient whose organs are being removed for donor purposes

From a UK Bariatric Dataset.

- 4990 procedures recorded, 2001 2021. (at time of audit)
 - 4600 at SRH since April 2006 generally better data
- 14 deaths in total



- aprox 230 ICU Admits (198 at SRH)
- 4300 with documented ASA status (NB primary and revisional)

NB - These all underwent surgery ie were screened / approved by MDT

NB - 30-day mortality (60% post-discharge...)











Elective Procedures



-		
	ials	
671	Surgery soon after COVID-19: transparent big data have value but caveful interpretation is still required <i>I. M. Cook and T. Lowton</i>	
677	More anaesthetists; fewer operations? Difficult questions for the specialty and stark planning	
68.4	implications of the 7th National Audit Project's anaesthetic activity survey J. J. Pandit Sniffing out pneumonia in the ICU A. Conway Morris and T. P. Hellyer	
684	Senting out preamona in the KU A. Convay Merris and L. H. Henyer Universal videolaryngoscopy, take care when crossing the Rubicon C. Lyons and B. H. Harte	
Origin	al Articles	
697	Postoperative modality and complications in patients with and without pre-operative 5485-549-2 intection: a service evaluation of 24 million linked records using OpenSAFEX C. D. McInterrey, A. Kotzé, S. Bocon, J. E. Cutting, L. Fisher, B. Goldocre, G. A. Jahnson, J. Kun, D. McGauchi, A. Mehrkin and S. R. Moneniangle	4.
701	Patient characteristics, anaesthetic workload and techniques in the UK: an analysis from the 7th Nasional Andle Hingeet (NAP7) activity survey A. O. Kow. J. Soor, E. A. Armittiong, T. Kourannow, M. J. Dower, S. C. Spikely, J. Cohris, C. Jolge J. K. Mappell, S. Adgovol, J. Colletgies, J. Doreg, S. J. Finney, G. Kinst, Q. N. Licons, G. Nicklak, A. Morton, J. P. Noian, B. Patel, V. J. Popochara, F. Hond, R. S. Schelfeld, J. H. Smith, J. Vanop and T. M. Cok.	
712	In Print, F. Proposition (* Print, IK. Schneimer, P.R. Smith, F. Poling, and S.M. Cook Analysis of chalded breafts to identify critically if patients with versibilitor-associated pneumonia. I. W. Fellow, W. Altmed, J. R. White, P. von Oost, N. J. W. Pottoy, C. Docherty, J. Bornard-Smith, B. Martan, L. Wellers, R. McMullor, S. A. Roberts, R. Goodaire, P.M. Dark and S. J. Forder.	
m	A multicentre sandomised controlled trial of the McGrath TM Mac videolaryngoscope versus conventional largogocopy M. Kriege, R. R. Repens, T. Luckstra, S. Payne, O. Kuratz, I. Transva and J. Schmidtmann	
730	Effect of pneumatic leg compression on post-induction hypotension in elderly patients undergoing robot-assisted flaparotopic prostatectomy: a double-blind randomised controlled trial $J \in Port, J, Va, C. S. Kori, JW. Bords, V. Joi and YK. Xim$	
719	Design and validation of a virtual reality trainer for ultrasound-guided regional anaesthesia A. Chuor, J. Qian, A. Bogdonovych, A. Kurnor, M. McKendrick and G. McLeod	
Guide	lines	
747	Management of vagus nerve stimulistion therapy in the prei-operative period L. Budderick, G. Tunhy, O. Sohmon, S. Tokhom, B. Stounton, P. Ennis, N. Goit, I. K. Mappett, A. Chalksery, B. D. Johods, E. J. Sweeneg, D. O'lliker, A. O'Rore, A. Honey and C. M. Latkin.	
	w Articles	
758	Current perspectives on matemity critical care K. Crimheld, D. Hurner, M. Vosco, G. Victory and D. N. Lucos. (Mal)institution in critical lifesis and beyond: a narrative teniew J. A. E. Pohlenz-Son;	
	J. L. Merriweather and L. Wondrag	
Revie	wer Recommendations How to plan, do and report patient and public involvement in research A. Portridge, J. Hickman, L. Savic and C. L. Shellon	
Scien	ce Letter	
784	Inhalational anaesthetics: an assessment of agent delivery and capture M. Voghelo,	
	R. H. Koy, L. Jones and P. Gneig Correspondence	

ELECTIVE BARIATRICS - ASA AND RISK

- Suggest Ignore the BMI when Assessing ASA Status
- We tell our Under-promise and over-deliver!
 Suggest tell your Acad

 - Tell your high risk ASA 3 (and ASA 4 if any), that risk is 1:20 to 1:50









Mortality amongst patients undergoing Bariatric Surgery: The relative power of ASA status, BMI, Weight, Age and Gender as predictors of 30-day Outcome Tom Gill¹, Mark Oakey¹, Kanish Amin¹, Lorraine Albon², Michael Margarson¹ Departments of ¹Anaesthesia and ²Bariatric Medicine, St Richard's Hospital, Chichester UK 22.5 P<0.0001

Patients who had been approved by the MDT! 1-3 (5/3/09) ASA 1-3 (5/3498) vs ASA 3+ or 4 (8/249)

Obesity surgery mortality risk score: proposal for a clinically useful score to predict mortality risk in patients undergoing gastric bypass Eric J. DeMaria, M.D.^{a,b,*}, Dana Portenier, M.D.^b, Luke Wolfe, M.S.^a

- Age >45 yrs
- Male gender
- Hypertension
- BMI >50
- Previous thrombo-embolic disease

 But only validated in open Gastric Bypass

DeMaria EJ et al. Surg Obes Relat Dis 2007; 3: 134-40

OBESITY SURGERY MORTALITY RISK SCORE

Mortality rates according to number of co-morbidities used in multivariate model

Co-morbidity (n)	Patients (n)	Deaths (n)	Mortality rate (9
0	356	0	0
1	601	3	0.50
2	596	7	1.17
3	403	12	2.98
4	101	6	5.94
5	18	3	16.67



CARDIAC FUNCTION AND ECHO

Perioperative cardiopulmonary exercise testing D.Z.H. Levett^{1,2,10,*}, S. Jack^{1,2,10}, M. Swart^{3,10}, J. Carlisle³, J. Wilson⁴,

C. Snowden⁵, M. Riley⁶, G. Danjoux⁷, S.A. Ward⁸, P. Older⁹, M.P.W. Grocott^{1,2,10} and For the Perioperative Exercise Testing and

Levett DZH et al. Br J Anaesth 2018; 120: 484-500.

- (CPET): consensus clinical guidelines on indications,
- organization, conduct, and physiological interpretation

CPET: IN THEORY





OBES SURG DOI 10.1007/s11695-016-2351-5

Cardiopulmonary Exercise Testing Has no Additive Incremental Value to Standard Scoring Systems when Risk Stratifying for Bariatric Surgery

Samantha R Warnakulasuriya¹ • David R Yates¹ • Jonathan T. Wilson¹ • Michael Stone¹ • Jonathan Redman¹ • Simon Davies¹

CPET:

IN PRACTICE





Permission obtained for image use





SPECTRUM OF RISK















Visceral Fat -Immune & Haemostatic Modulation



Types of Android Obesity





Intra-visceral adiposity



Visceral fat Subcutaneous Fat



Extra-visceral adiposity

THE HIGH-RISK OBESE PATIENT

What makes them (but its usually a him) High Risk?







- Surgeon
- Anaesthetist
- Psychologist
- Dietician ullet
- Physician •

- Hostile abdo, 'tight apple' shape,
- CV fitness, Airway, Drug issues
- Alcohol / Drugs / Eating disorders
- Ability to maintain nutrition post op
- Accelerated retinopathy, Neuropathy, Exocrine Insufficiency, Bile acid malabsorption, Renal stones

RISK IS DIFFERENT TO DIFFERENT TEAMS!

WHAT ARE THE CO-MORBIDITIES THAT KILL?

CARDIAC

- Cardiac...
- Thrombo-embolic (late)
- Respiratory Arrests (first night)
- Intra-operative Airway Disasters
- Surgical Bleeding



ITS THE HEART



Obesity and Cardiovascular Disease Circulation. 2021;143:e984–e1010





- Inflammation
- **Endothelial Dysfunction**
- Dyslipidaemia
- Insulin resistance
 - Hypertension &
 - Cardiomyopathy
- Pro-thrombotic State





- "Adipokines"
- Pro-inflammatory Cytokines
- Cardiodepressant Interleukins
- Pulmonary Hypertension
- Sympathetic Overdrive (OSA)
- Wall Stress
- Dilatation & Re-modelling
- Fibrosis
- Bi-ventricular Dysfunction
- Atrial Fibrillation



Outcome	Cases ^a
Aortic valve stenosis	1252
Heart failure	4803
Deep vein thrombosis	8891
Arterial hypertension	119 500
Peripheral artery disease	3514
Coronary artery disease	24 531
Atrial fibrillation	13 538
Pulmonary embolism	5097
Subarachnoid hemorrhage	1834
Abdominal aortic aneurysm	758
Intracerebral hemorrhage	1655
Ischemic stroke	3554
Transient ischemic attack	3485
Thoracic aortic aneurysm	231

0.8



Body Mass Index in relation to 14 CV conditions in the UK Biobank Eur Heart J 2020: 41:221-226

0.9





Obesity and Cardiovascular Disease Circulation. 2021;143:e984–e1010

Association between Body Mass Index and risk of;

- heart failure with reduced ejection fraction (HFrEF) and
- heart failure with preserved ejection fraction (HFpEF)



SLEEP-DISORDERED BREATHING

Obstructive Sleep Apnoea - OSA

Overlap Syndrome (with COPD)

Obesity Hypoventilation Syndrome - OHS





Snoring

Obstructive Sleep Apnoea

Central Apnoeas

Upper Airways Resistance Syndrome Obesity Hypoventilation Syndrome



- Pulmonary hypertension and RV/LV dysfunction
- Cardiovascular instability and risk...
- Reduced responses to Hypercapnia / Hypoxaemia with Abnormal breathing patterns
- Increased sensitivity to residual anaesthetic agents & esp. opioids
- Anatomically difficult airway
- Difficult Bag-Mask Ventilation & Difficult Intubation (Stressors of CVS!)
- Tendency for upper airway Collapse & Obstruction post-op



WHAT ARE THE CO-MORBIDITIES THAT KILL?

CARDIAC

- Cardiac...
- Thrombo-embolic (late)
- Respiratory Arrests (first night)
- Intra-operative Airway Disasters
- Surgical Bleeding



WHAT ARE THE CO-MORBIDITIES THAT KILL?

CARDIAC DECOMPENSATION

- Assume poor LV & RV Function
- Assume Pulmonary Hypertension
- Be prepared for AF (K⁺?? & Watch Dobutamine / Salbutamol!)
- Assume your NIBP won't work (!)
- ...and assume you will be ventilating hard to move a heavy chest with the obvious impacts on Venous Return

PHYSIOLOGICAL RESERVE

Physiological reserve



Calvani R et al. *J Cachexia Sarcopenia Muscle* 2015; 6: 278-86



WHAT DO WE ASK?

- Breathless at rest when they speak
- Orthopnoea How many pillows? "I sleep in a chair.."
- Very poor ex tolerance cannot climb a single flight of stairs
- "The building is on fire you have to climb a flight of stairs to get out"
- OSA Screening STOP-BANG
- Diagnosed severe OSA/OHS but do not use / tolerate CPAP "What would happen if I took your CPAP away?"

ASA III	A patient with moderate to severe systemic diseas (with substantial functional limitation)
ASA IV	A patient with severe systemic disease that is a constant threat to life





se		
	se	

WHAT DO WE TEST?

- Echo will usually need TOE looking for Ejection Fraction • ECG - for AF, conduction defects. (Send them to a cardiologist) Sleep Study - aiming to get them onto CPAP (v. rarely BIPAP) Bloods looking for; Renal dysfunction, Glycosylated Hb, Bicarbonate

ASA III	A patient with moderate to severe systemic diseas (with substantial functional limitation)
ASA IV	A patient with severe systemic disease that is a constant threat to life



se	





- Can he/she be improved?
- What is the level of risk?
- How great the potential benefit?
- Age and calorie intake...
- Value of the MDT

SAVE THE EFFORT

RISK-BENEFIT





SUMMARY

- We continue to push the boundaries of risk
- Bigger, Older and Sicker Patients
- Understand the key co-morbidities
- Especially those that impact on cardio-respiratory systems
- Seek sleep-disordered breathing, seek limited exercise tolerance!
- Evaluate, re-evaluate and where appropriate, say no.
- Get your patient back home
- Be careful, be safe...



THANKS YOU FOR YOUR ATTENTION.

m.margarson@nhs.net