ANAESTHETIC AND PERI-OPERATIVE CONSIDERATIONS IN SEVERE CARDIOPULMONARY DISEASE

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With acknowledgements & thanks to
Doug Hacking

"SEVERE OBESITY"

- "We are all Bariatric Anaesthetists today"
- 120-140 kg, BMI 40? - every week
- 150-200 kg - gets interesting..
- Where does the Morbidity pick up??
- What do we do with the ASA IV Obese pt?

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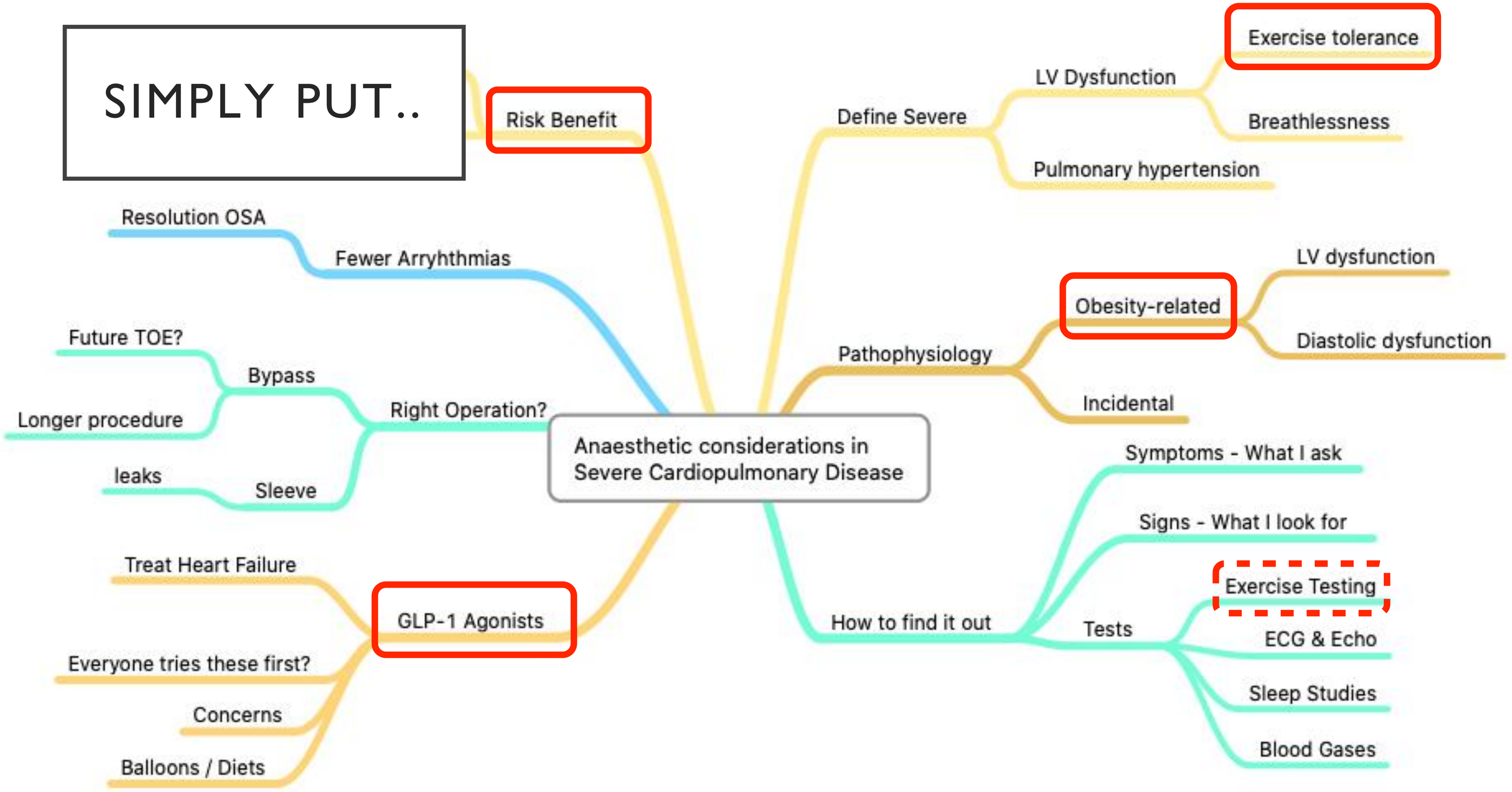
FOCUS OF THIS LECTURE

- ASA Status & Obesity
- The Key Co-morbidities
- Peri-operative Considerations
- Red Flags & Investigations

SIMPLY PUT..


Anaesthetic considerations in Severe Cardiopulmonary Disease
Risk Benefit
Define Severe
LV Dysfunction
Exercise tolerance
Breathlessness
Pulmonary hypertension
Pathophysiology
Obesity-related
LV dysfunction
Diastolic dysfunction
Incidental
How to find it out
Symptoms - What I ask
Signs - What I look for
Tests
Exercise Testing
ECG & Echo
Sleep Studies
Blood Gases
Fewer Arryhthmias
Resolution OSA
Right Operation?
Bypass
Future TOE?
Longer procedure
Sleeve
leaks
GLP-1 Agonists
Treat Heart Failure
Everyone tries these first?
Concerns
Balloons / Diets

OBVIOUS CONTRIBUTORS TO OUTCOME

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

+

Operative Factors
- Anaesth & Surgical
- Complications

…and how are these modifiable??

American Society of Anesthesiologists®

ASA STATUS

- 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 pre-anesthesia medical co-morbidities.
- The classification system alone does not predict the perioperative risks, but used with other factors (eg, type of surgery, acute conditions, level of deconditioning), it can be helpful in predicting perioperative risks.
- However - It's somewhat subjective…

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ASA Status

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

From a UK Bariatric Dataset..

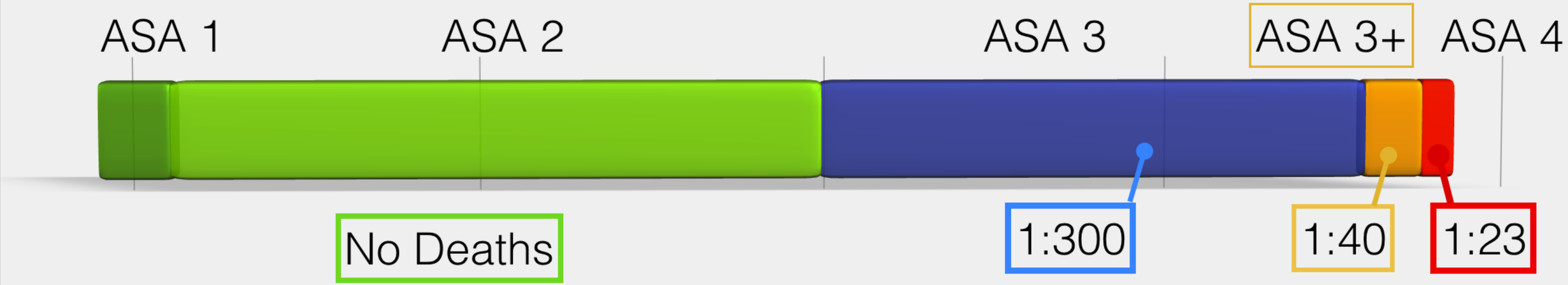
- 4990 procedures recorded, 2001 - 2021. (at time of audit)
  - 4600 at SRH since April 2006 - generally better data
- 14 deaths in total

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

- 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

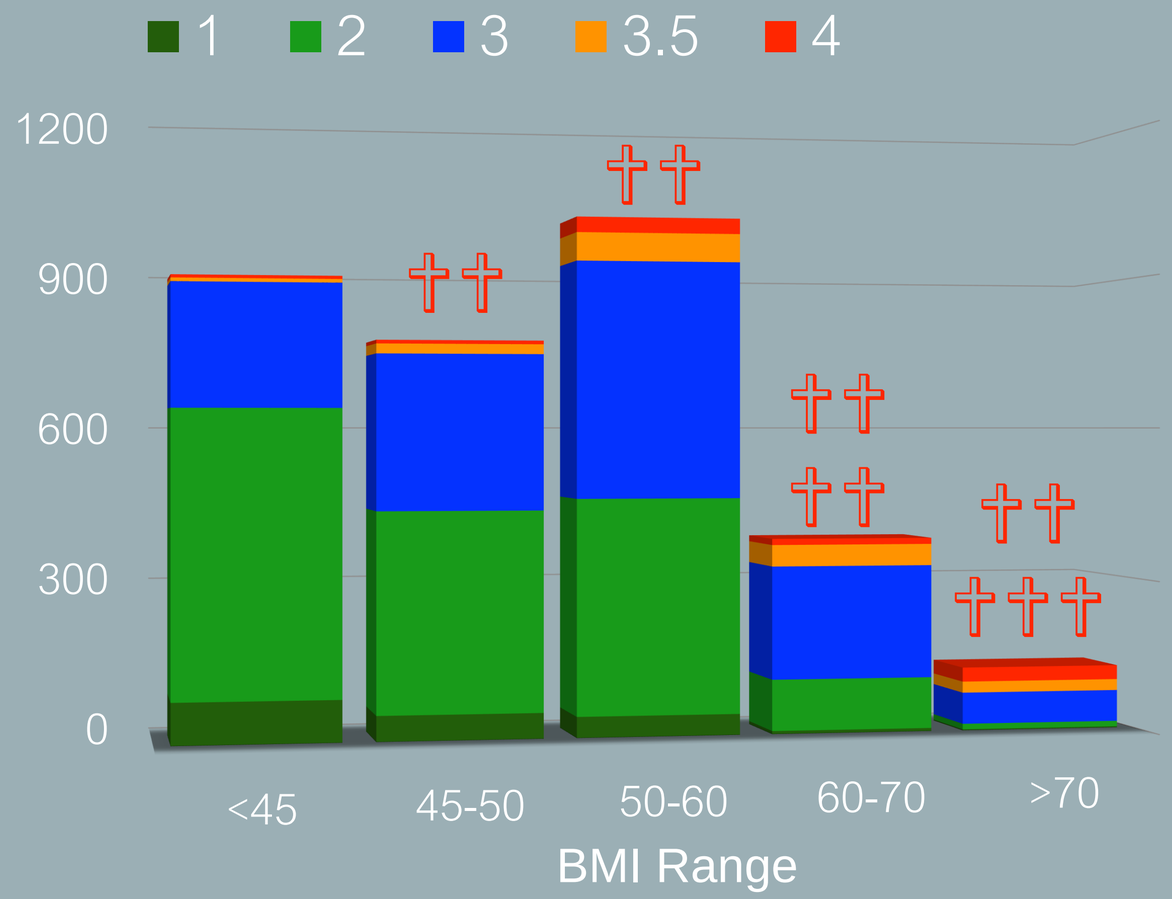
ELECTIVE BARIATRICS - ASA DISTRIBUTION



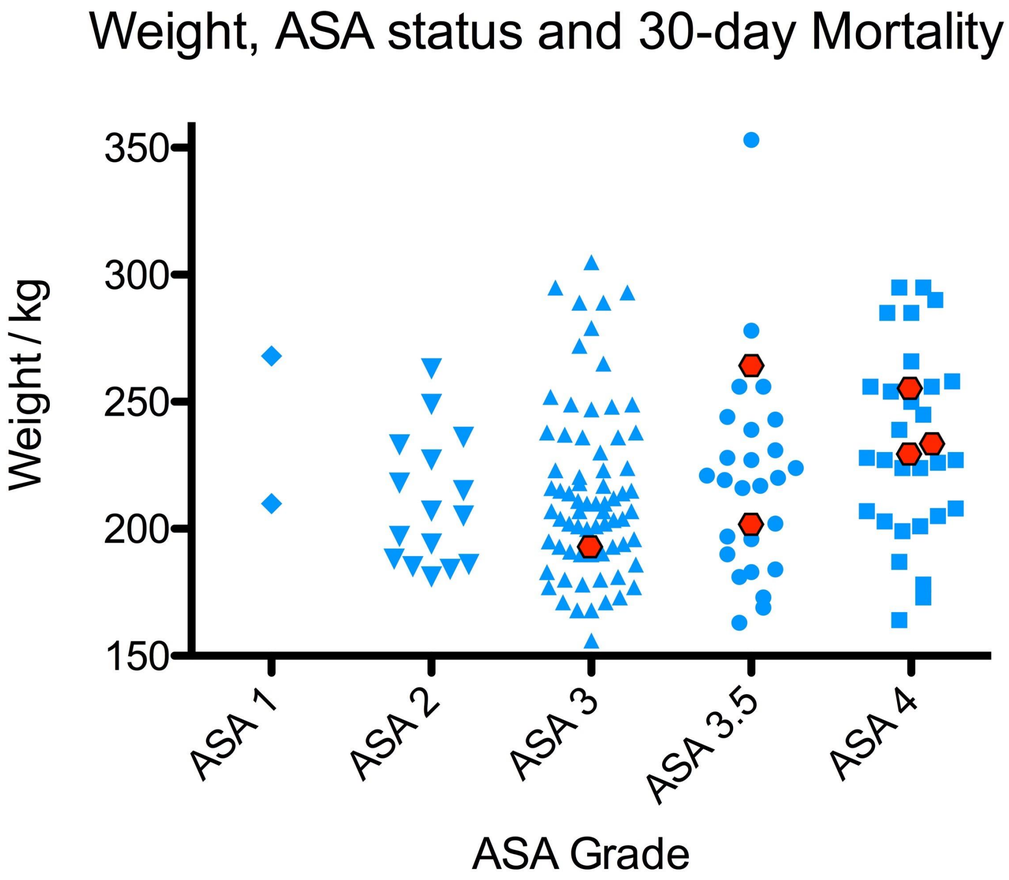
What's an ASA 3+ ??

Not an ASA 4…
An ASA 3 who can't lie flat
An ASA 3 who can't get up stairs

MEASURES OF OBESITY AND ASA STATUS - BARIATRICS



Elective Procedures

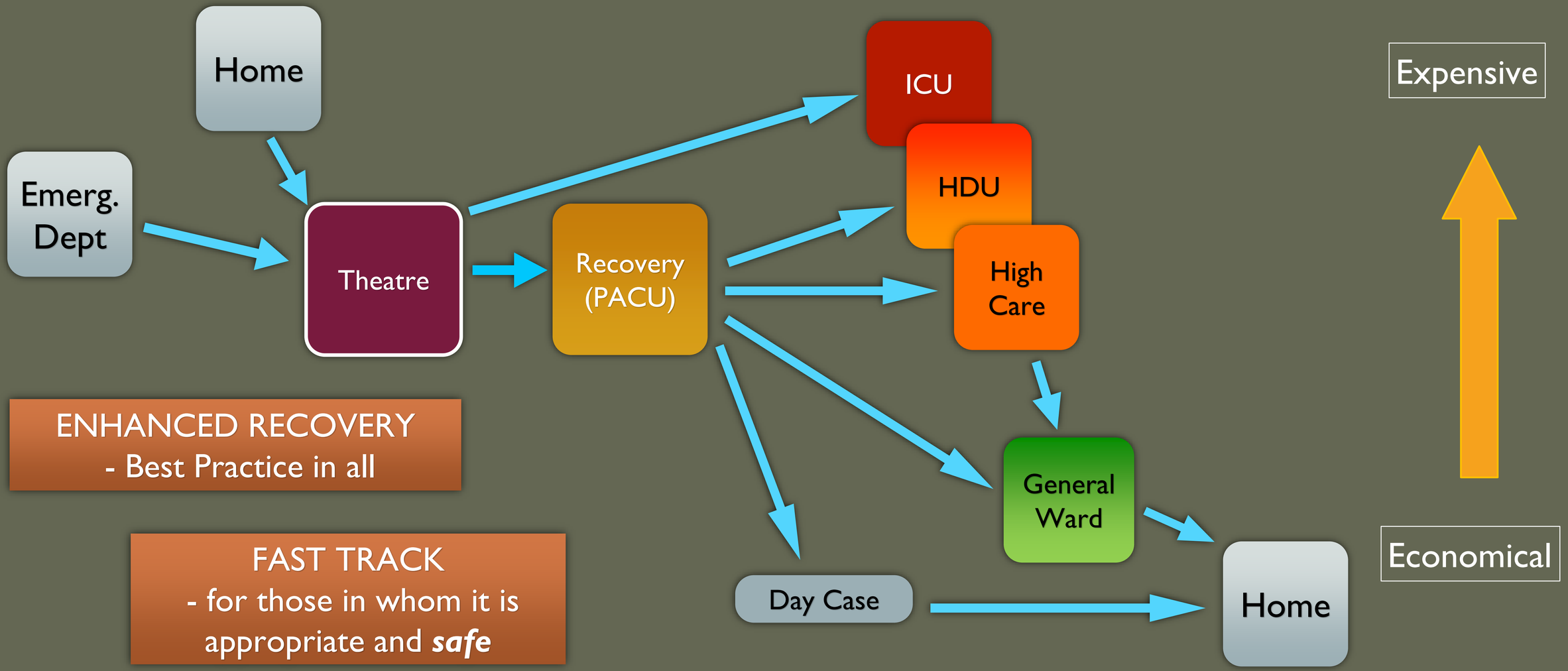


ELECTIVE BARIATRICS - ASA AND RISK

- Suggest - Ignore the BMI when Assessing ASA Status
  - or else 85% of patients become ASA 3 and ...
    discriminatory value of ASA C...
- We tell our ... risk is <1:1,000
- Suggest tell your ASA 3, risk is 1:300
- Tell your high risk ASA 3 (and ASA 4 - if any), that risk is 1:20 to 1:50

Under-promise and over-deliver!

PATIENT PATHWAYS



Mortality amongst patients undergoing Bariatric Surgery: The relative power of ASA status, BMI, Weight, Age and Gender as predictors of 30-day Outcome

Tom Gill[1], Mark Oakey[1], Kanish Amin[1], Lorraine Albon[2], Michael Margarson[1]

Departments of [1]Anaesthesia and [2]Bariatric Medicine, St Richard's Hospital, Chichester UK

Patients who had been approved by the MDT!

	denominator)	***Relative Mortality Risk***
***ASA** 1-3 (5/3498) vs ASA 3+ or 4 (8/249)*	*22.5 P<0.0001*

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]

OBESITY SURGERY MORTALITY RISK SCORE

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

- But only validated in open Gastric Bypass

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

Co-morbidity (n)	Patients (n)	Deaths (n)	Mortality rate (%)
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

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

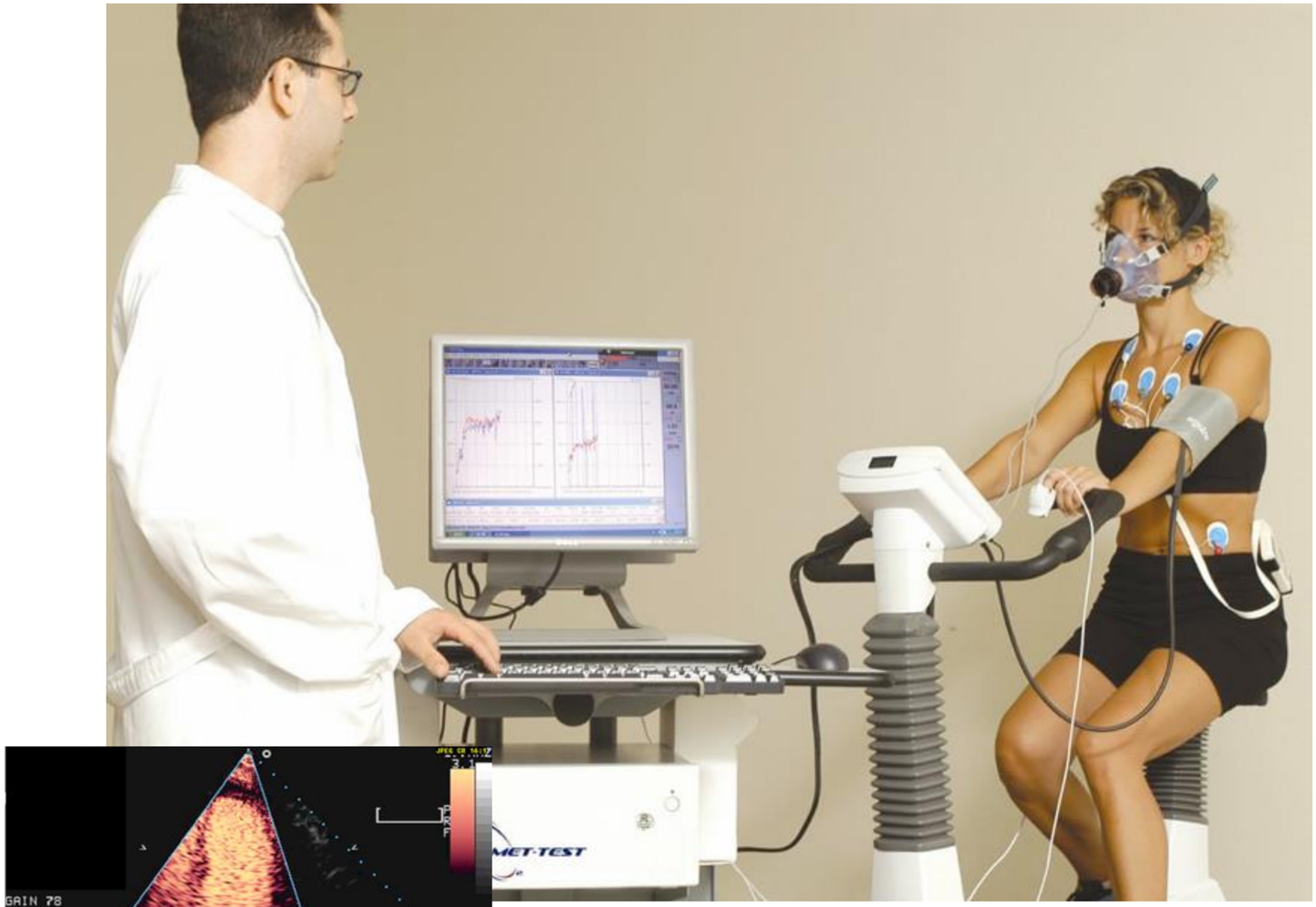
CARDIAC FUNCTION AND ECHO

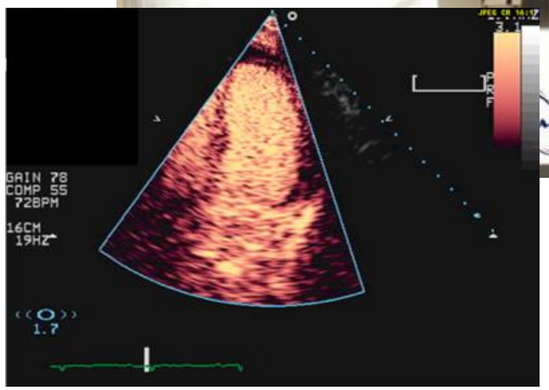
Perioperative cardiopulmonary exercise testing (CPET): consensus clinical guidelines on indications, organization, conduct, and physiological interpretation

D.Z.H. Levett[1,2,10,*], S. Jack[1,2,10], M. Swart[3,10], J. Carlisle[3], J. Wilson[4], C. Snowden[5], M. Riley[6], G. Danjoux[7], S.A. Ward[8], P. Older[9], 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:
IN THEORY





CPET:
IN PRACTICE

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 Warnakulasuriya[1] · David R Yates[1] · Jonathan T. Wilson[1] · Michael Stone[1] · Jonathan Redman[1] · Simon Davies[1]

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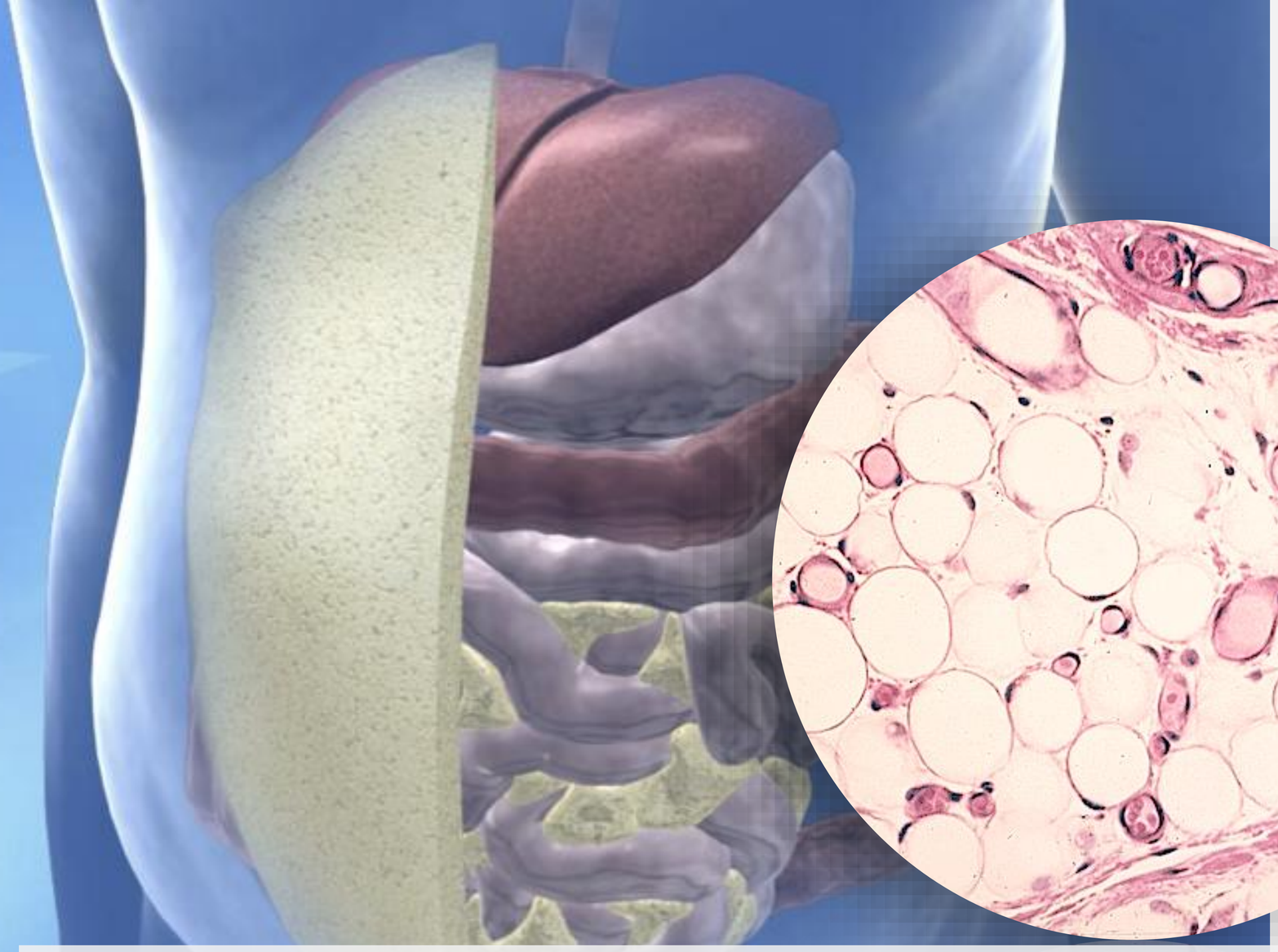
SPECTRUM OF RISK

SAVE THE EFFORT

FOCUS

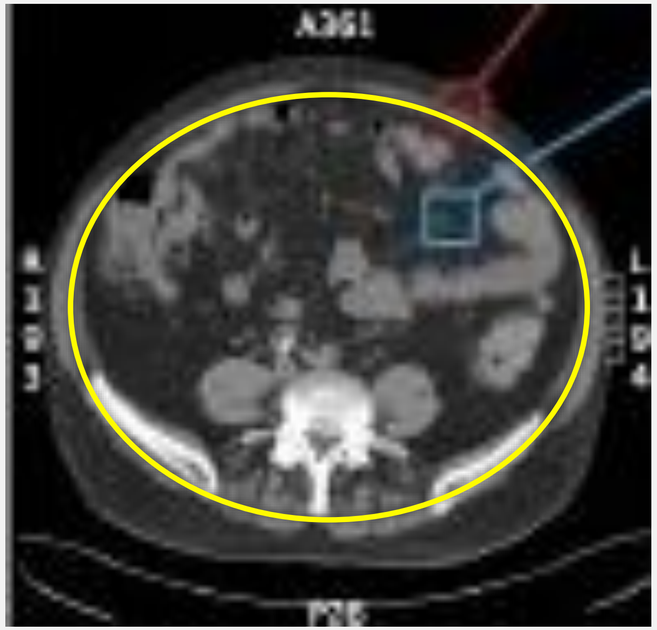


- Leptin
- Adiponectin
- Resistin
- TNF alpha
- PAI-1
- Interleukin 6
- Apo-E

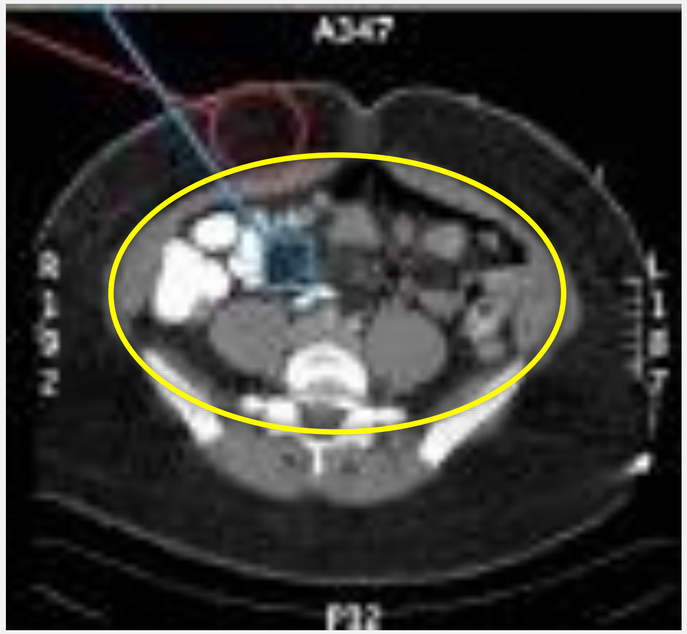
Visceral Fat - Immune & Haemostatic Modulation

Types of Android Obesity

Visceral fat Subcutaneous Fat



Intra-visceral adiposity



Extra-visceral adiposity

THE HIGH-RISK OBESE PATIENT

What makes them
(but its usually a him)

High Risk?

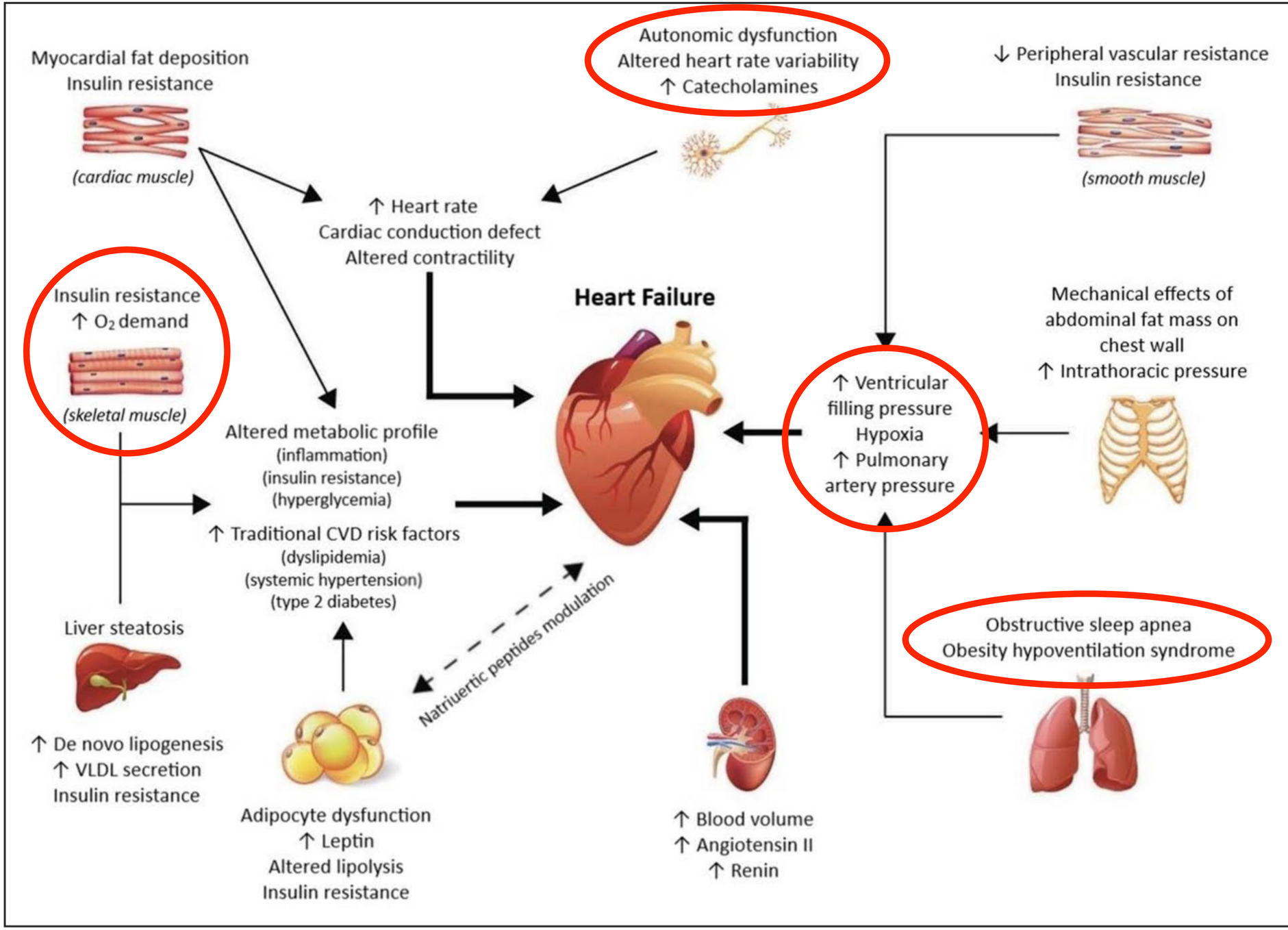
RISK IS DIFFERENT TO DIFFERENT TEAMS!

• Surgeon	• Hostile abdo, ‘tight apple’ shape,
• Anaesthetist	• CV fitness, Airway, Drug issues
• Psychologist	• Alcohol / Drugs / Eating disorders
• Dietician	• Ability to maintain nutrition post op
• Physician	• Accelerated retinopathy, Neuropathy, Exocrine Insufficiency, Bile acid malabsorption, Renal stones

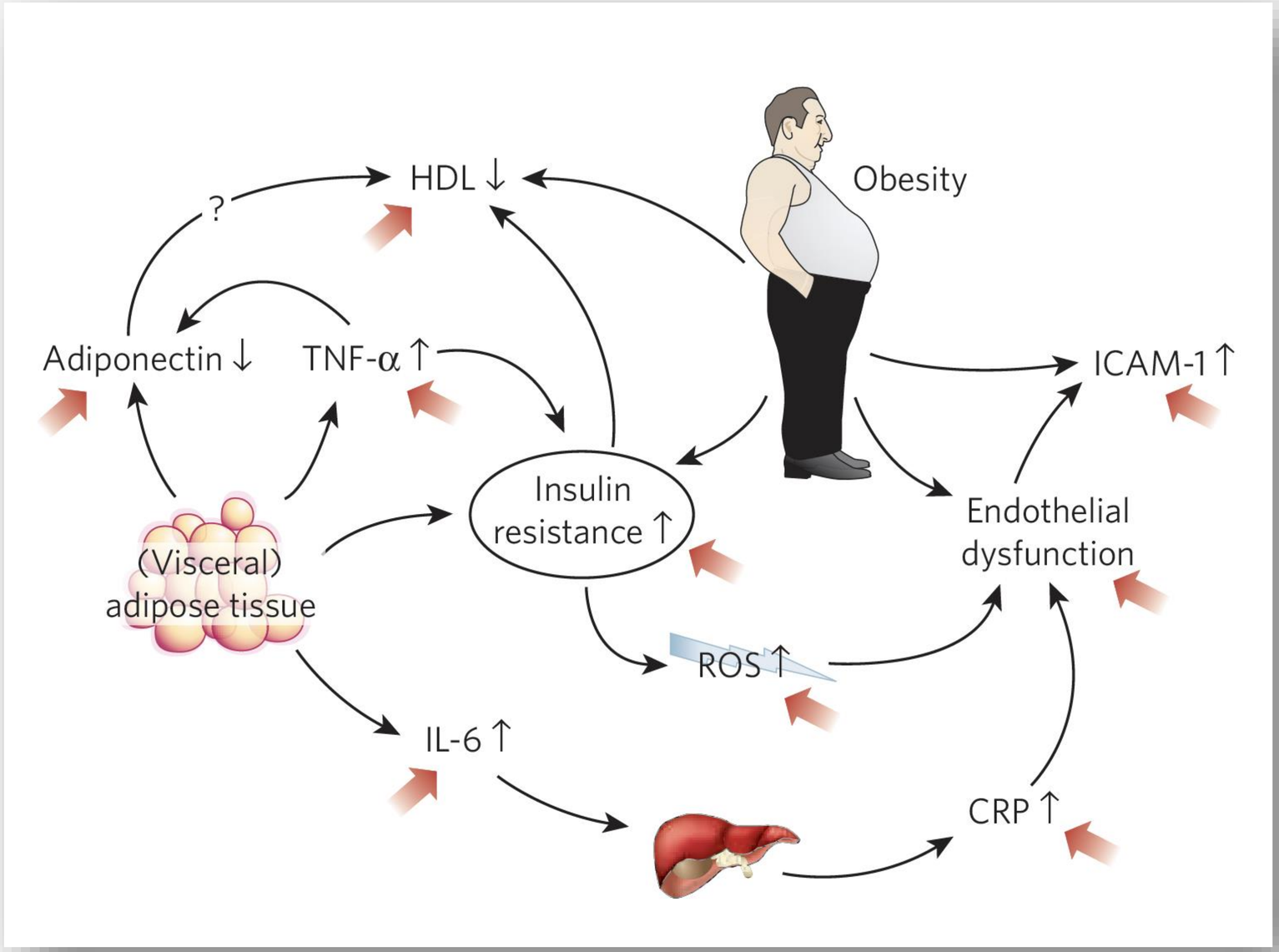
WHAT ARE THE CO-MORBIDITIES THAT KILL?

- 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

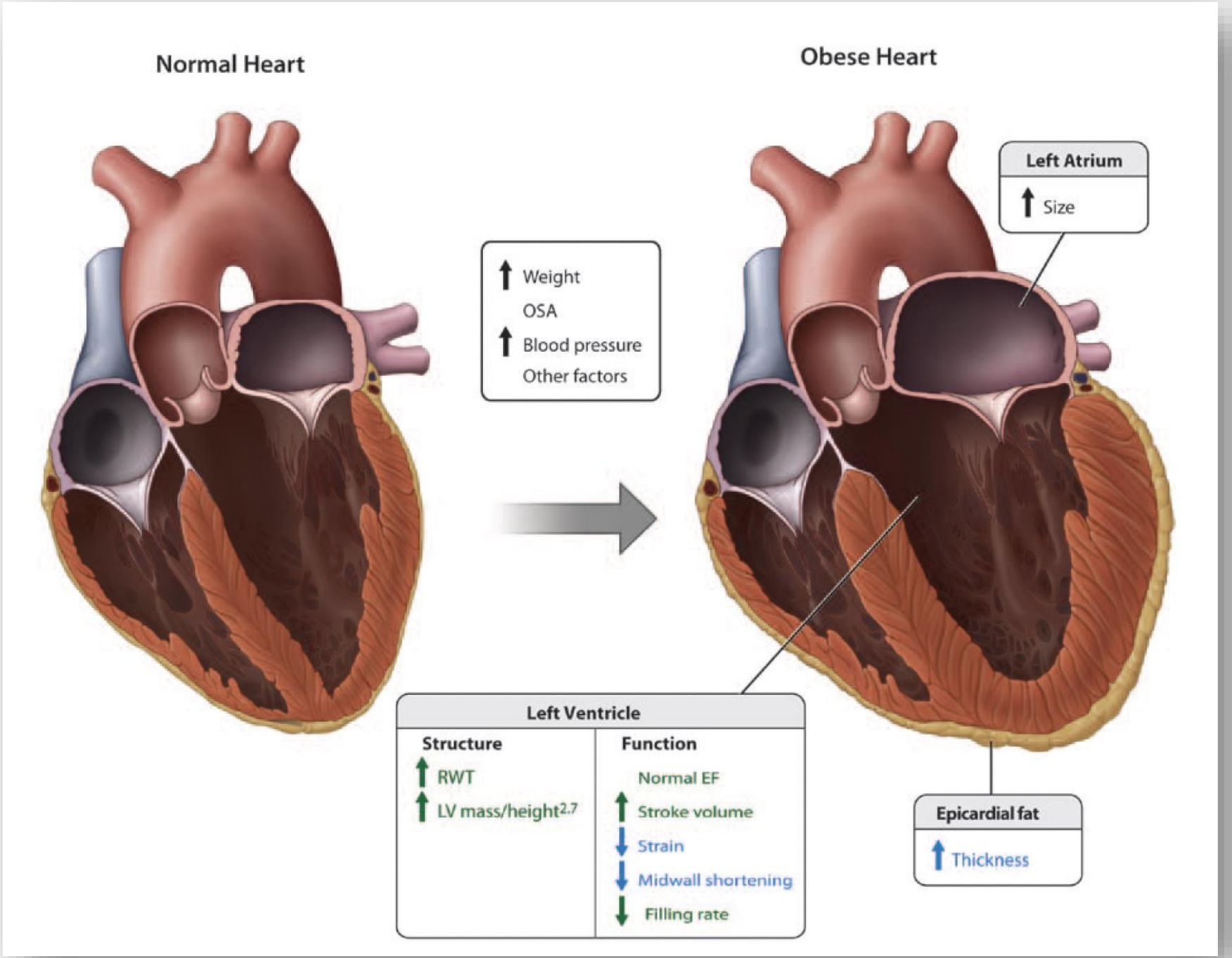
Mechanisms linking obesity with cardiovascular disease Luc F. Van Gaal, Ilse L. Mertens & Christophe E. De Block NATURE Vol 444 14 December 2006

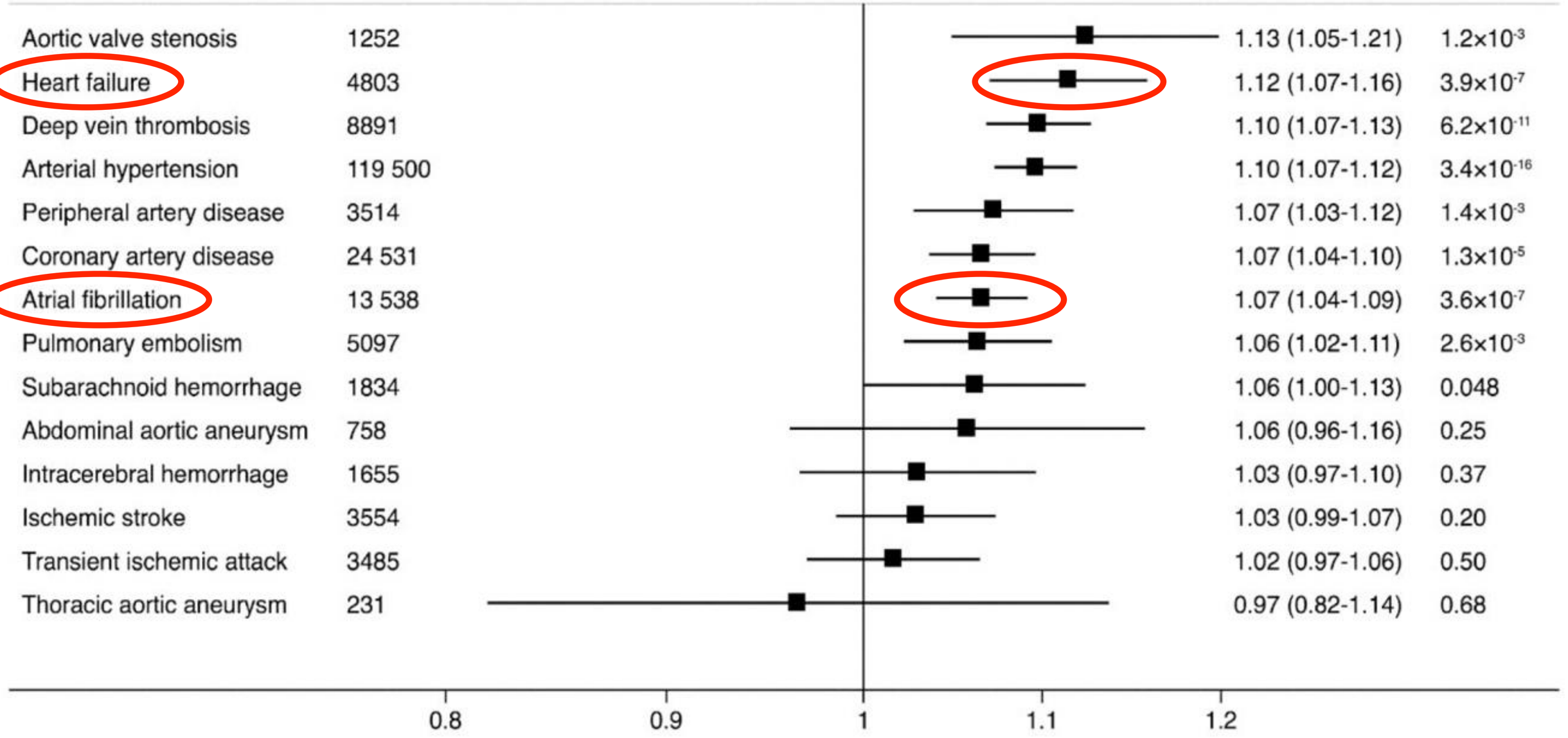
- "Adipokines"
- Pro-inflammatory Cytokines
- Cardiodepressant Interleukins

- Pulmonary Hypertension
- Sympathetic Overdrive (OSA)

- Wall Stress
- Dilatation & Re-modelling
- Fibrosis
- Bi-ventricular Dysfunction

- Atrial Fibrillation



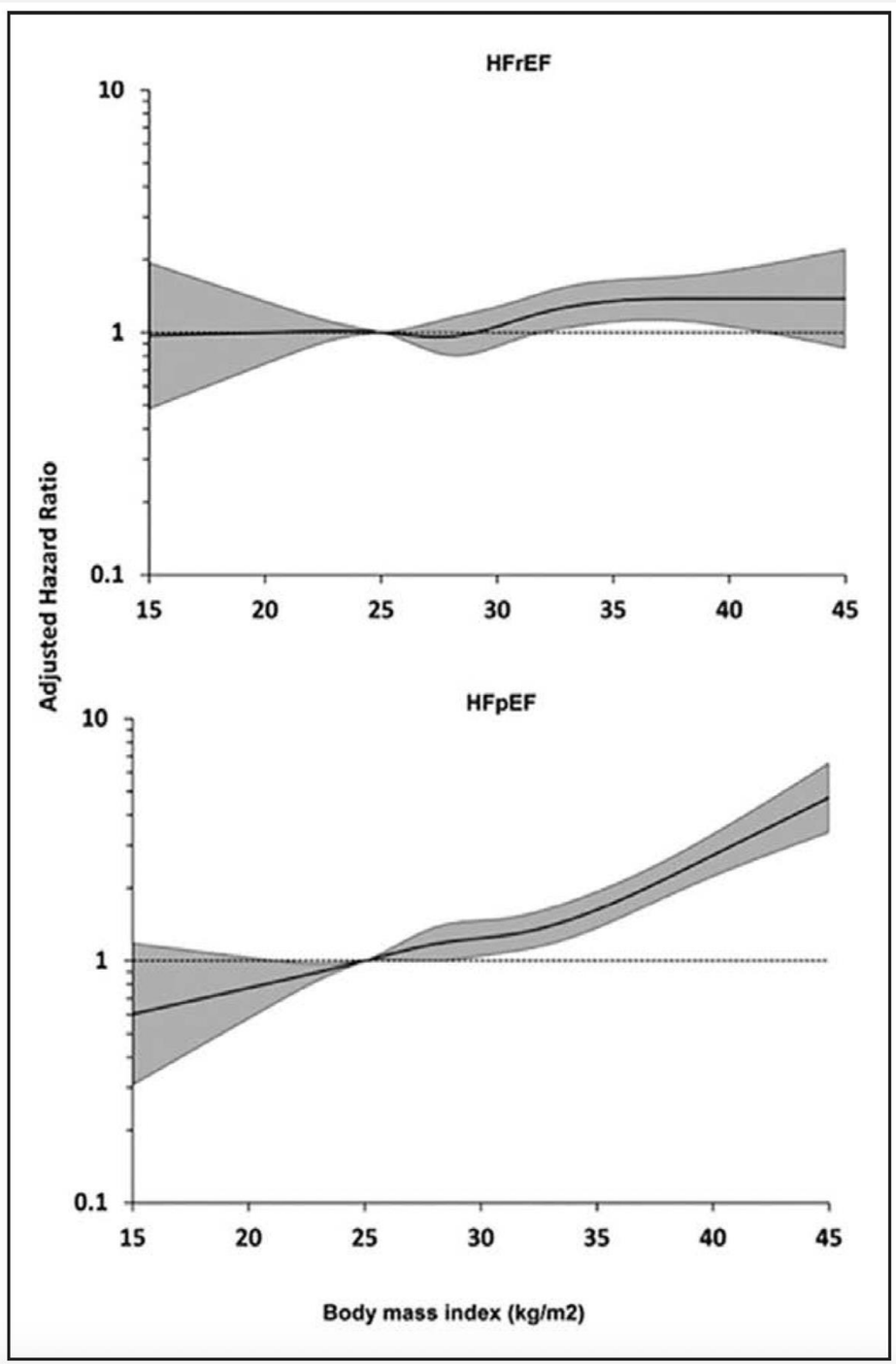


ESPCOP
THE EUROPEAN SOCIETY FOR PERIOPERATIVE CARE OF OBESE PATIENTS

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

euro anaes thesia 2024

MUNICH 25 ▸ 27 MAY



Association between Body Mass Index and risk of;

heart failure with reduced ejection fraction (HFrEF) and

heart failure with preserved ejection fraction (HFpEF)

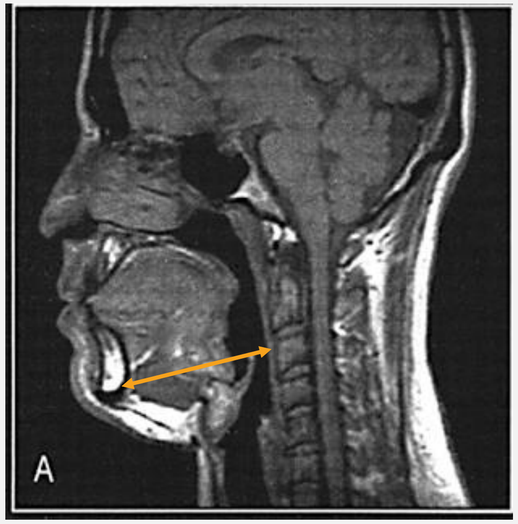
Obesity and Cardiovascular Disease Circulation. 2021;143:e984–e1010

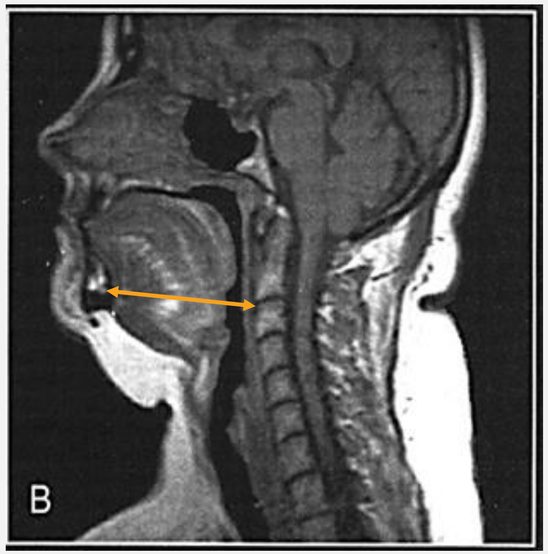
SLEEP-DISORDERED BREATHING

Obstructive Sleep Apnoea
- OSA

Overlap Syndrome
(with COPD)

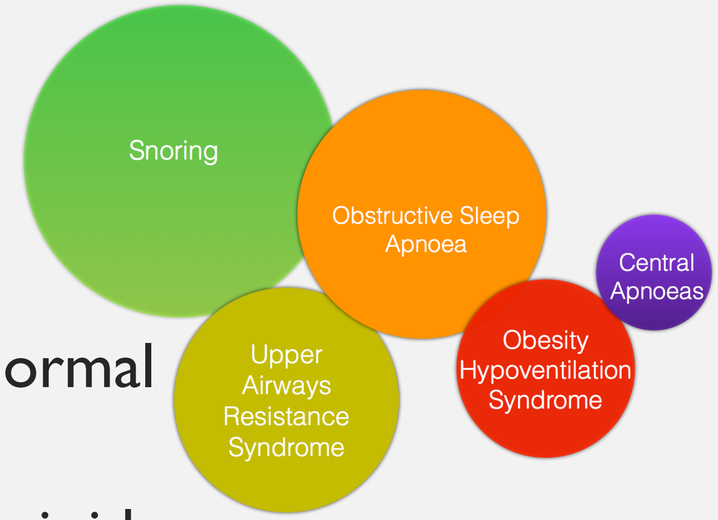
Obesity Hypoventilation Syndrome
- OHS





ADD THE RISKS OF OSA/OHS…

- 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



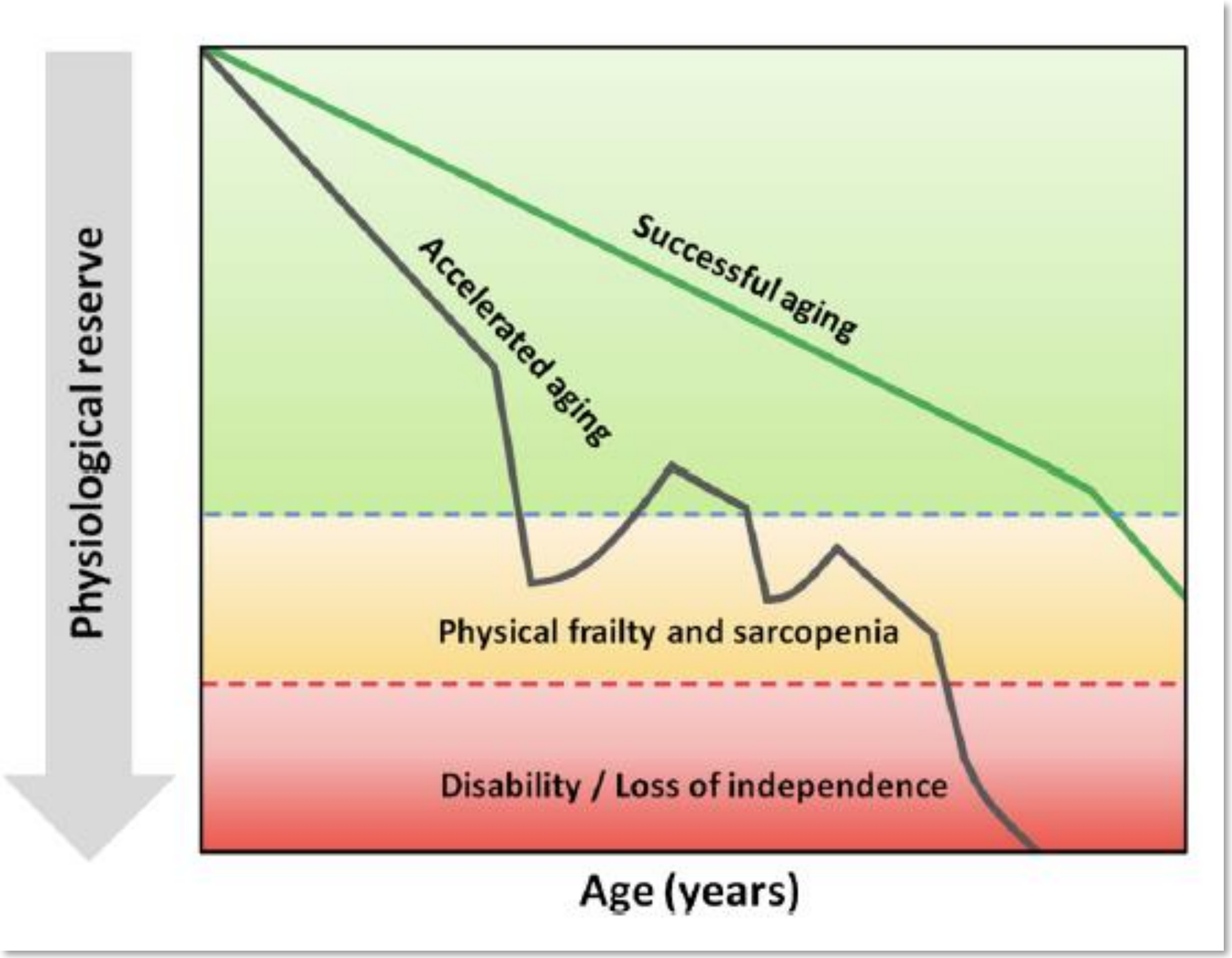
WHAT ARE THE CO-MORBIDITIES THAT KILL?

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

WHAT ARE THE CO-MORBIDITIES THAT KILL?

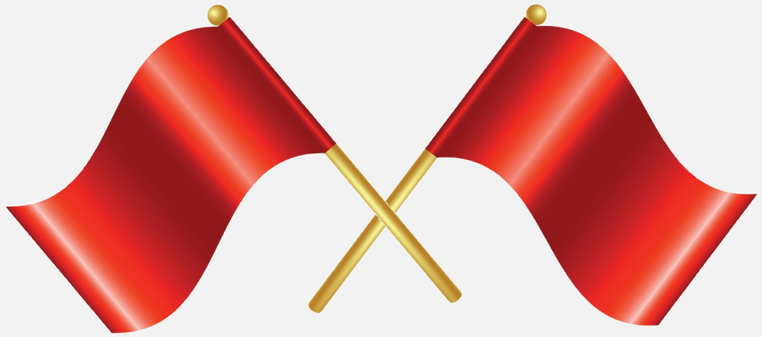
- **CARDIAC DECOMPENSATION**
- Assume poor LV & RV Function
- Assume Pulmonary Hypertension
- Be prepared for AF (K$^+$?? & Watch Dobutamine / Salbutamol!)
- Assume your NIBP won't work (!)
- …and assume you will be ventilating hard to move a heavy chest - with the obvious impacts on Venous Return

PHYSIOLOGICAL RESERVE



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

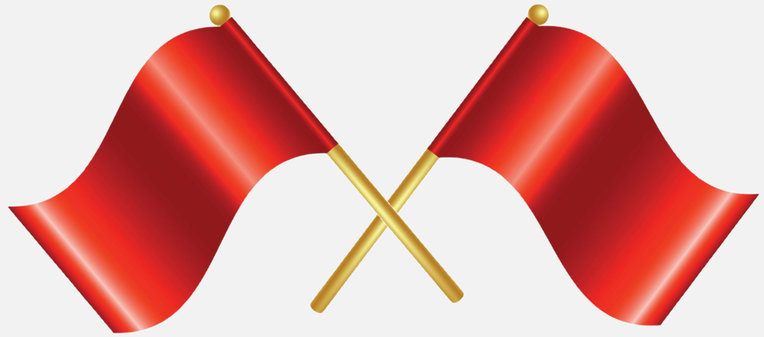
WHAT DO WE ASK?



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

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

RISK-BENEFIT

- 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 ⟷ FOCUS

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