Defining surgical risk

NCEPOD Presentation

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Defining surgical risk

- Challenges from the report “Knowing the Risk”
- Defining risk and allocating care: clinical judgement or objective measurement?
- Understanding the dynamic nature of surgical risk

Challenges from the report

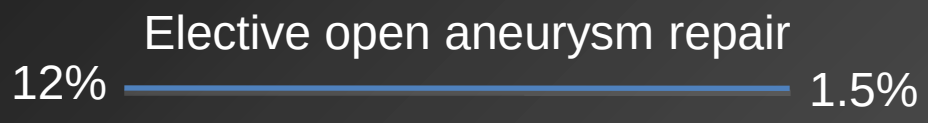
- “The first challenge is to reliably and accurately predict the patient group that is at high-risk of mortality and morbidity……
…. the literature is full of differing descriptions, scoring systems and tests to meet this aim.
- “the difficulty is that the NHS generally does not seem to be rising to the challenge”

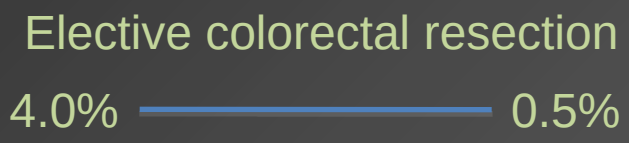
Challenges from the report

- Pre-assessment
  - 16% - no anaesthetic clinic
  - 17% - no surgical clinic
- 20% of high-risk elective patients not seen in pre-assessment clinics (with x7 mortality)
- Mortality estimate given in only 7.5% of high-risk cases

Challenges from the report – defining the risk for the individual

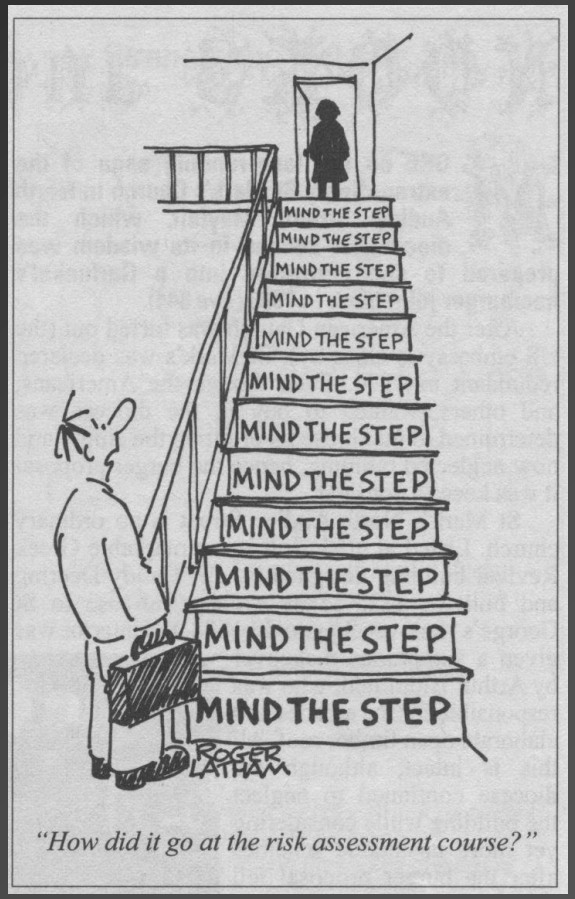
- High-risk procedures
  - vascular / abdominal / thoracic / emergency
- High-risk patients
  - co-morbidities / lack of functional capacity





Challenges from the report – defining the risk for the individual

- Clinical judgement
  - Definition?
- Clinical (objective) measurement
  - Utility?



Co-morbidities

Table 3.6 Outcome at 30 days by comorbidities

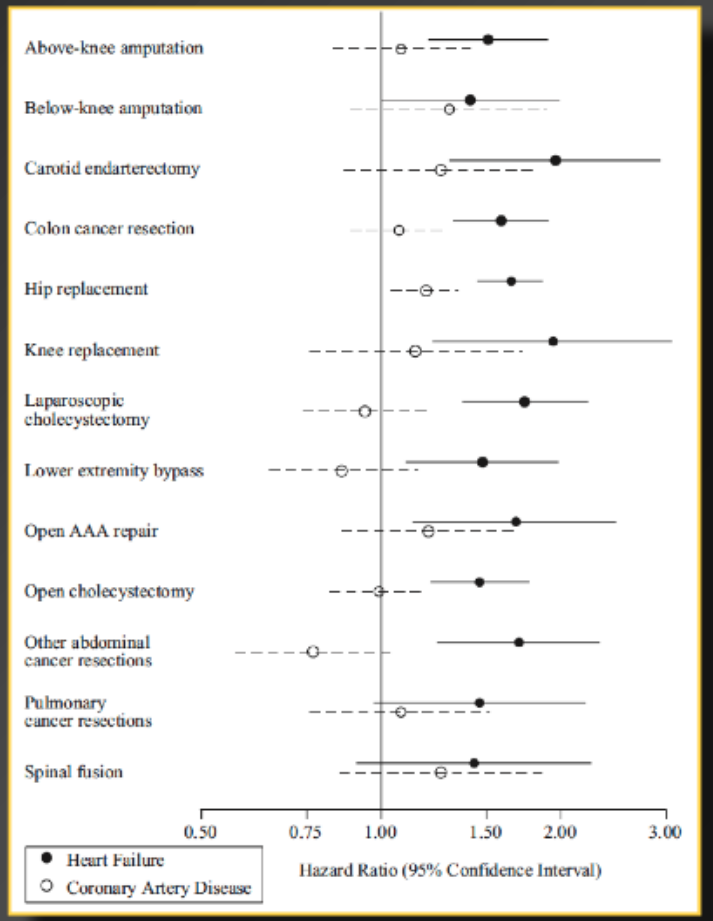
	30 day outcome			
Comorbidities	**Alive**	**Deceased**	**% mortality**	**Total**
Respiratory disease	1743	67	3.7	**1810**
Ischaemic heart disease	1402	55	3.8	**1457**
Cancer	1363	54	3.8	**1417**
Arrhythmia	970	59	5.7	**1029**
Diabetes (non insulin)	976	29	2.9	**1005**
Transient ischaemic attack (TIA)/Stroke	565	26	4.4	**591**
Diabetes (insulin)	370	16	4.1	**386**
Congestive cardiac failure	223	20	8.2	**243**
Documented cirrhosis	112	11	8.9	**123**

Impact of heart failure on patients undergoing major noncardiac surgery

Hammill et al. Anesthesiology 2008; 108: 559-67

- 159,327 procedures
  - Heart failure: 18%
  - Ischaemic heart disease: 34%

Operative mortality	
Heart failure	*8.0%*
IHD	3.1%
Neither	2.4%



Co-morbidities

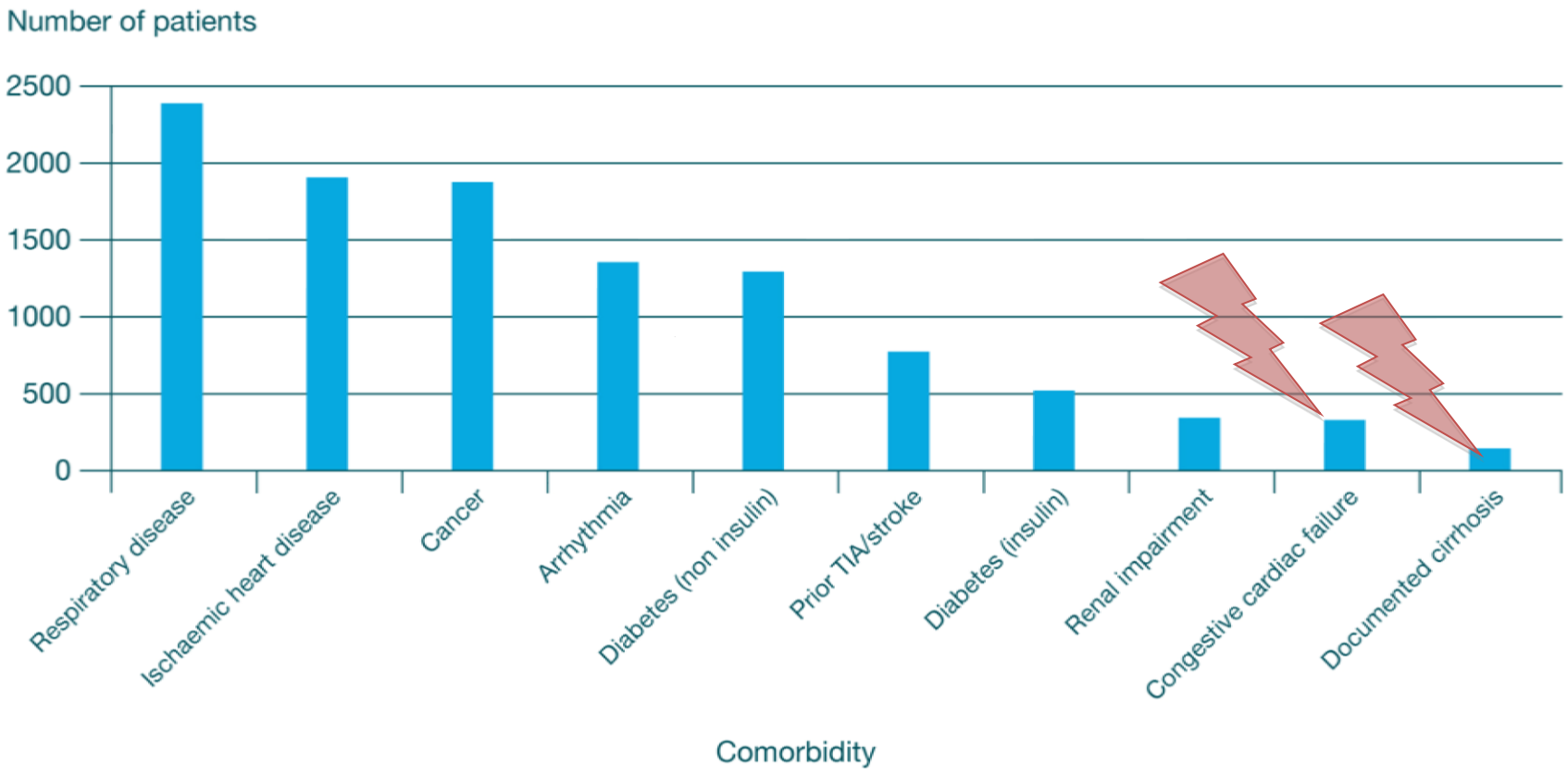


Figure 3.4 Comorbidities

Co-morbidities

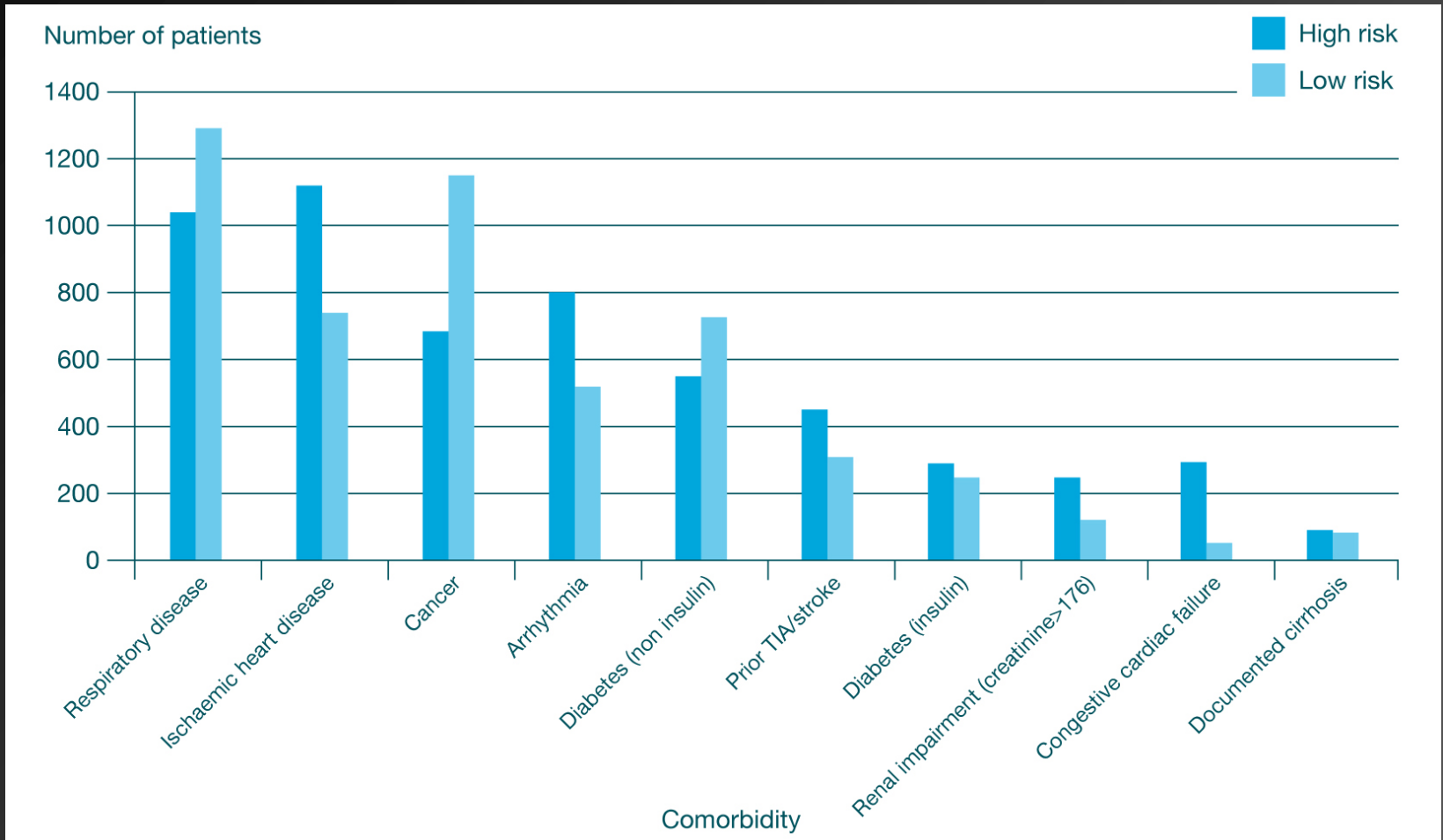


Figure 3.7 Distribution of comorbidities between the high risk and low risk groups

Lee's cardiac risk index

- Risk of cardiac events only
- No consideration of treatment effect
- No estimate of the effect of disease on functional capacity ie ability to perform tasks of daily living

Co-morbidities

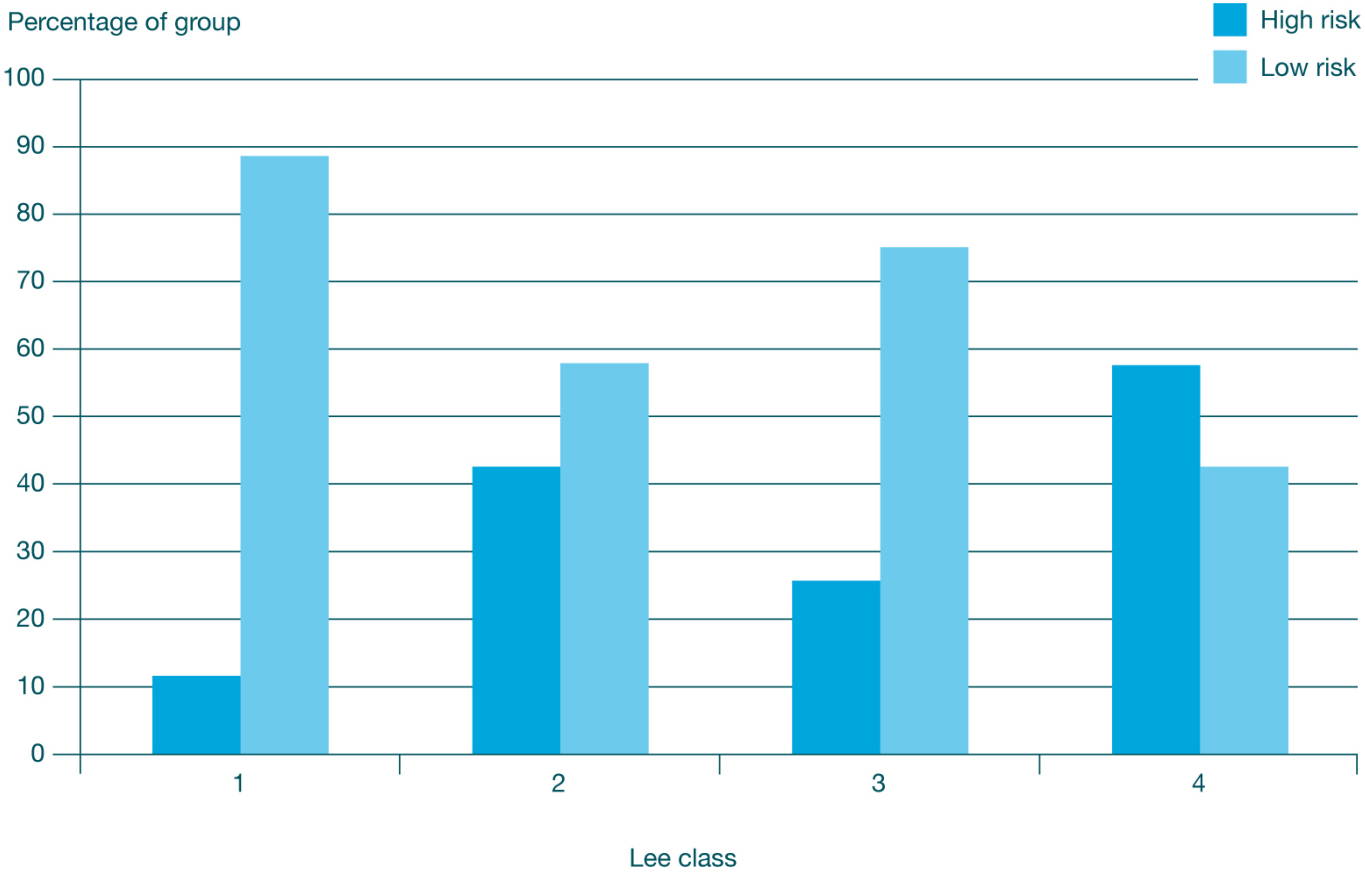
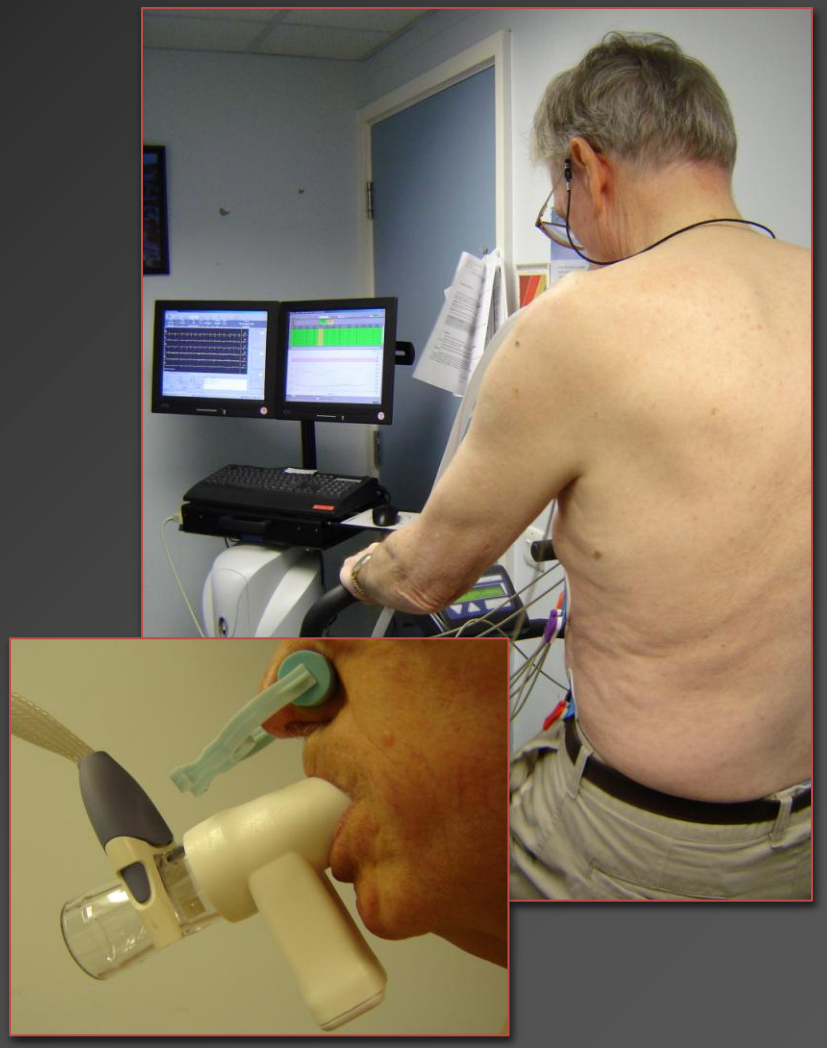


Figure 4.3 Anaesthetists view of risk against Lee class

Cardio-pulmonary exercise testing

- Assessment of functional capacity
- Available in ~ 40% of units (NCEPOD 2011)
- ~ 10 min cycle test with increasing workload
- >90% of elderly surgical patients can do the test

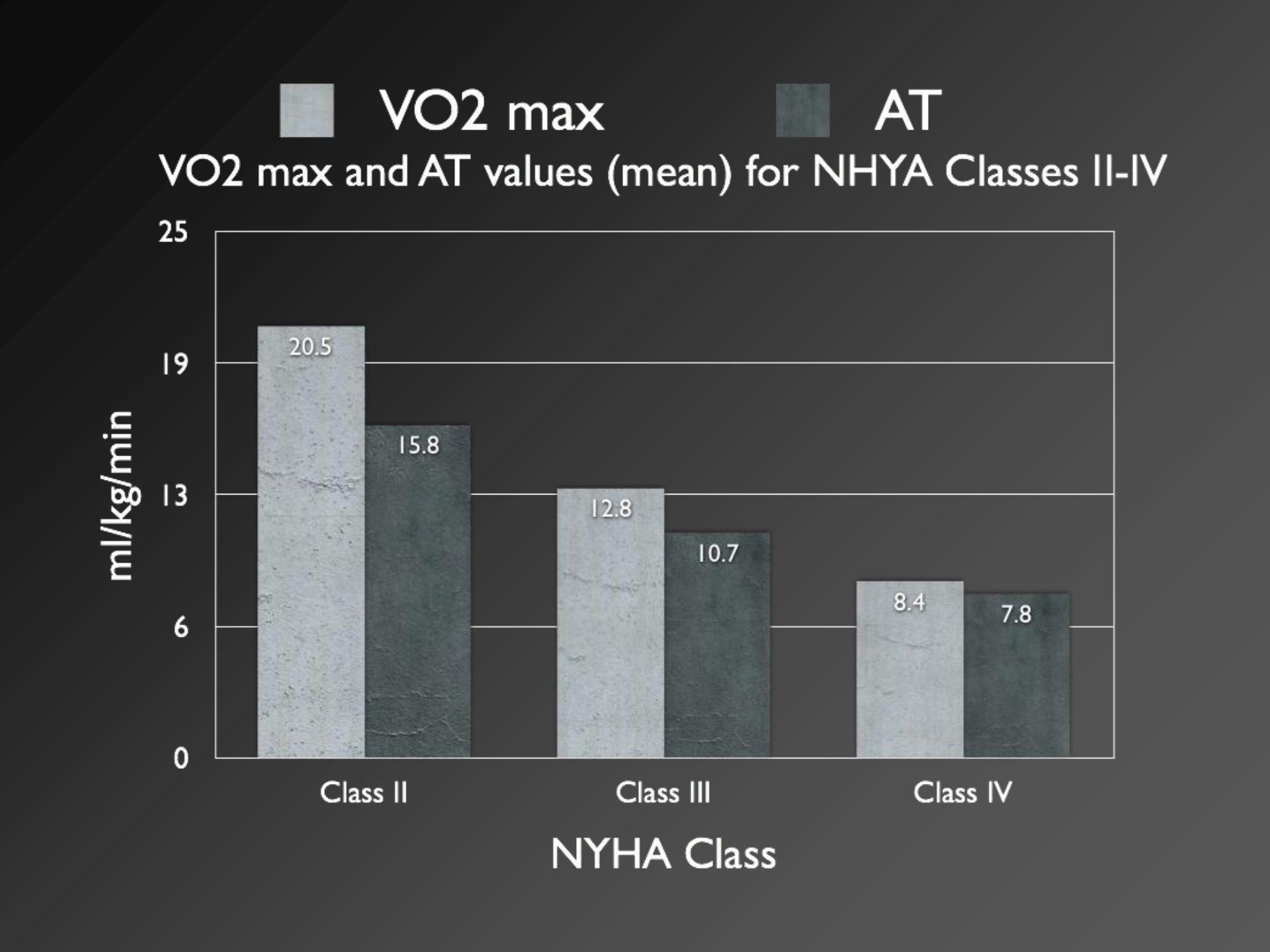


Cardio-pulmonary exercise testing

- Anaerobic threshold (AT)
  - Oxygen consumption at the onset of anaerobic metabolism
  - The **lower** the AT, *the less fit the patient*!
- Ventilatory efficiency (VE/VCO_2)
  - The effort required to get rid of CO_2
  - The **higher** the VE/VCO_2, *the less fit the patient*!

Cardio-pulmonary exercise testing – the risks of dying after surgery

- Anaerobic threshold (AT)
  - *Less than 11 ml/kg/min*: Higher risk
  - Relative risk of hospital death: ***6.8*** *(1.6-29.5)*
- Ventilatory efficiency (VE/VCO_2)
  - *Greater than 34*: Higher risk
  - Relative risk of hospital death: ***4.6*** *(1.4-14.8)*

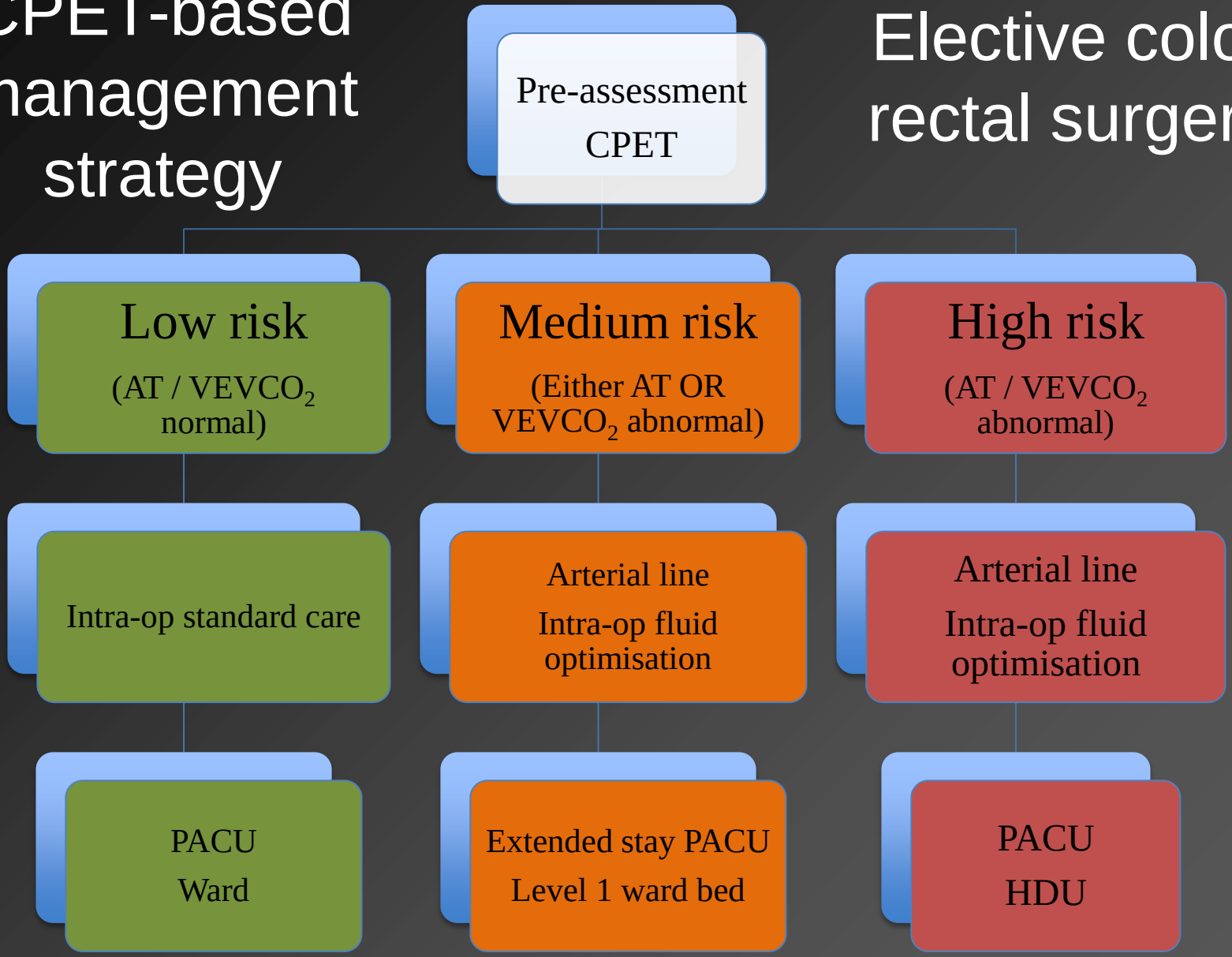

VO2 max
AT
VO2 max and AT values (mean) for NHYA Classes II-IV
25
19
13
6
0
ml/kg/min
20.5
15.8
12.8
10.7
8.4
7.8
Class II
Class III
Class IV
NYHA Class

CPET-based risk stratification for elective colo-rectal surgery (680 patients)

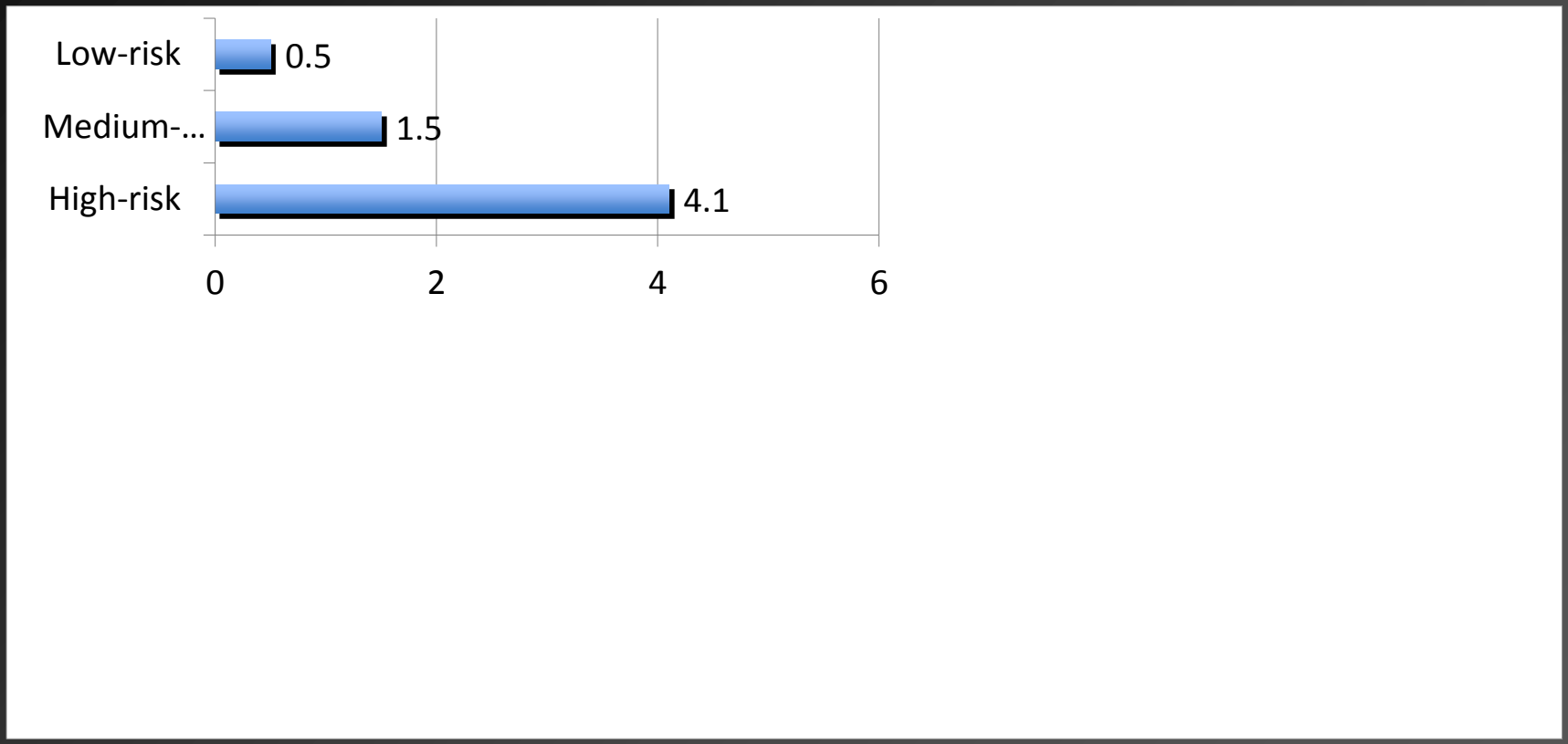
	Anaerobic threshold	Ventilatory efficiency	Number of patients (%)
High risk	Higher risk (AT<11)	Higher risk (VE/VCO_2 >34)	223 (33%)
Medium risk	Higher risk	Lower risk	257 (38%)
	Lower risk	Higher risk	
Low risk	Lower risk	Lower risk	200 (29%)

CPET-based management strategy

Elective colo-rectal surgery



CPET-based risk stratification for elective colo-rectal surgery (680 patients)



Hospital mortality (%)

Lee's-based risk stratification and mortality for elective colo-rectal surgery (680 patients)

- Lees's Clinical Risk factors present: 3.0%
- Lees's Clinical Risk factors **not** present: 1.5%

Lee's-based risk stratification and mortality for elective colo-rectal surgery (680 patients)

- Lees's Clinical Risk factors present: 3.0%
  - 211 patients
  - 6 deaths
- Lees's Clinical Risk factors **not** present: 1.5%
  - 469 patients
  - 7 deaths

Impaired functional capacity is associated with all-cause mortality after major elective intra-abdominal surgery

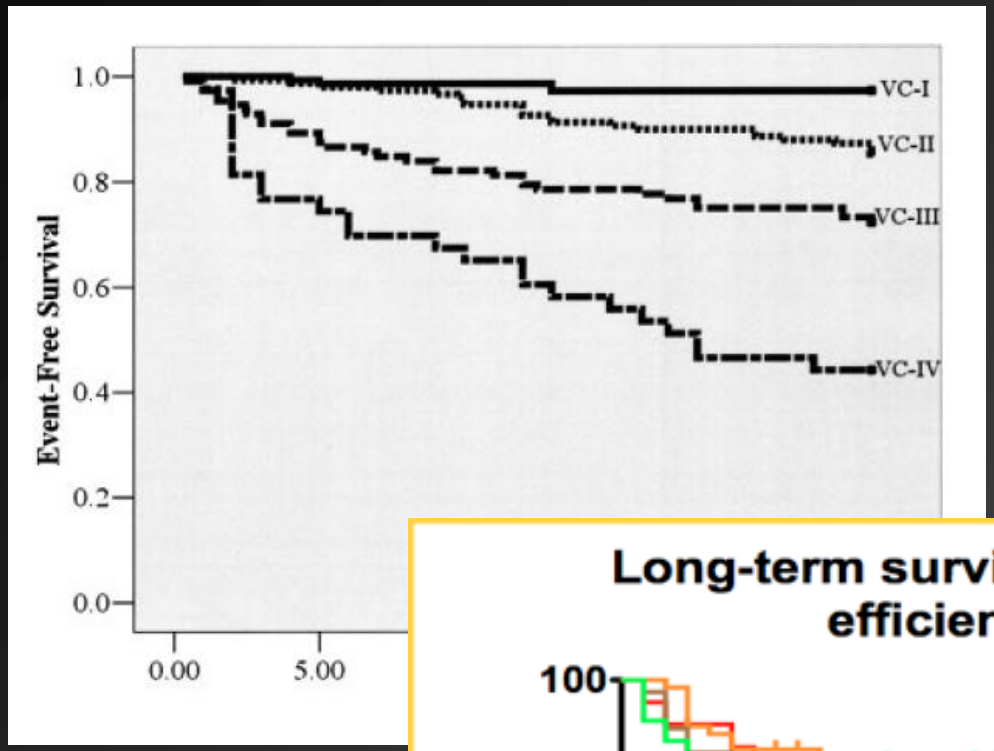
Wilson et al. Br J Anaes 2010

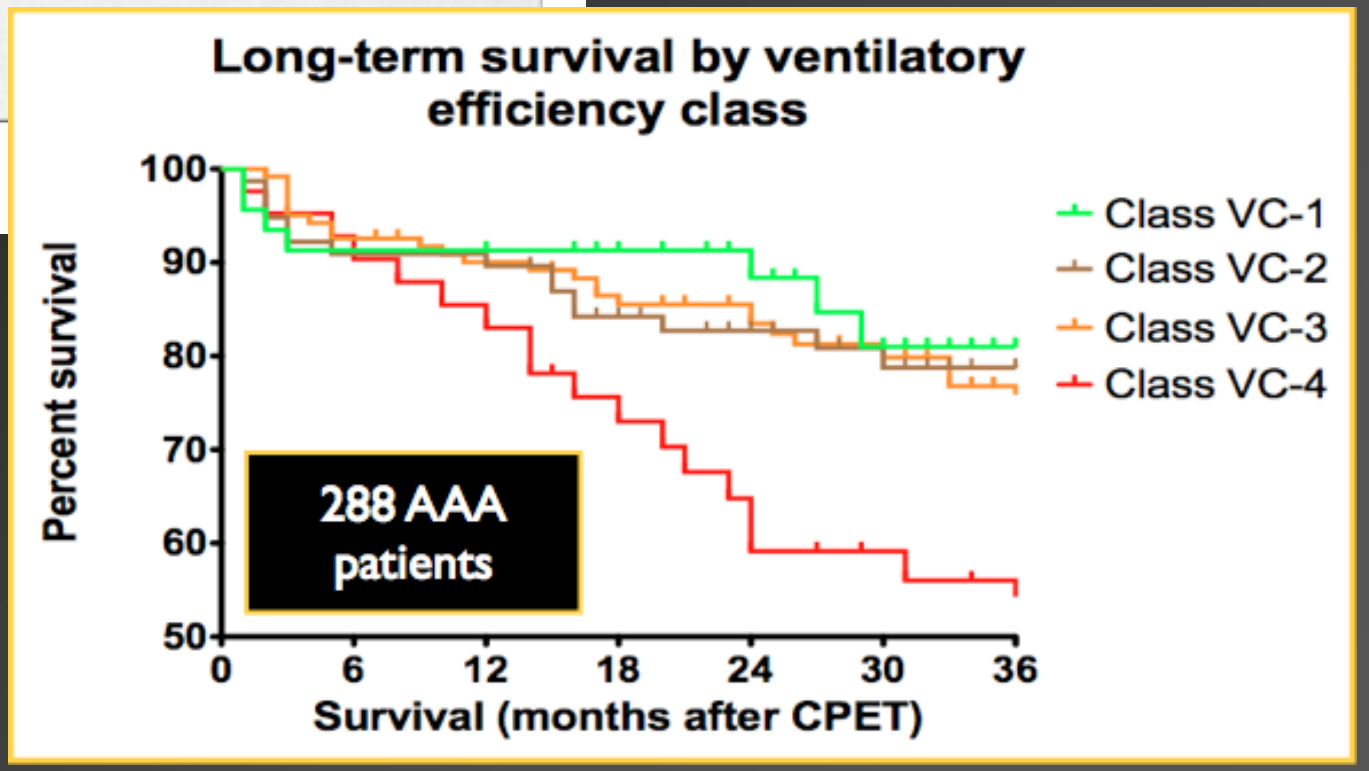
	AT < 11		AT > 11		Relative risk
	Non-survivors	Survivors	Non-survivors	Survivors	
LCRI Present	7	177	1	86	3.3 (0.5-20.6)
LCRI Absent	9	264	1	302	10.0 (1.7-61.0)

Heart failure or deconditioning?

- 30% of patients have parameters of *reduced functional capacity* on CPET that would put them in a *poor prognosis group* if they had a heart failure diagnosis
- Most of these 30% do not have a diagnosis of heart failure
- Whether due to heart failure or deconditioning, *reduced functional capacity matters significantly* when things go wrong after surgery

The risk of not operating?





Understanding the dynamic nature of surgical risk

Case study 3:

"This case demonstrates the need for all parts of the patient care pathway to participate in optimisation if risk is to be reduced"

Scoring systems
CPET
Biomarkers

Before surgery

Surgical APGAR score

During surgery

Physiological measuring:
Lactate
CV O_2 sats%

After surgery

The surgical APGAR score

- An APGAR score for surgery
- Gawande et al
- J Am Coll Surg 2007;204:201-208

The surgical APGAR score

Table 4. A 10-Point Surgical Outcomes Score*

	0 points	1 point	2 points	3 points	4 points
Estimated blood loss (mL)	> 1,000	601–1,000	101–600	≤ 100	—
Lowest mean arterial pressure (mmHg)	< 40	40–54	55–69	≥ 70	—
Lowest heart rate (beats/min)	> 85	76–85	66–75	56–65	≤ 55†

Surgical score = sum of the points for each category in the course of a procedure.
*Based on model 1 from cohort 1.
†Occurrence of pathologic bradyarrhythmia, including sinus arrest, atrioventricular block or dissociation, junctional or ventricular escape rhythms, and asystole also receive 0 pts for lowest heart rate.

3.8% patients had a surgical score ≤ 4 (bad…)

59% had major complications or died within 30 days after surgery

29% patients had a surgical score ≥ 9 (good…)

4% had major complications or died within 30 days after surgery RR 16.1 (7.6-34.0)

Critical need for objective assessment of postsurgical patients

Editorial: Gawande. Anesthesiology 2011

- “a major reason the surgical APGAR score is not used is that surgeons and anaesthesiologists(sic) believe that their *subjective impressions* of patient condition are *accurate*…”

Conclusion

- “There is a need to introduce a UK wide system that allows rapid and easy identification of patients who are at high-risk of postoperative mortality and morbidity”
- Departments of Health in England, Wales and Northern Ireland

Conclusion

- Dynamic, responsive to evolving situation
- Based on evidence, not just on expert opinion
- Where evidence does not exist, supply funding (from NIHR direct) to gather it through research and audit (grassroots not Ivory Tower)
- Give absolute clarity to what should be considered mandatory