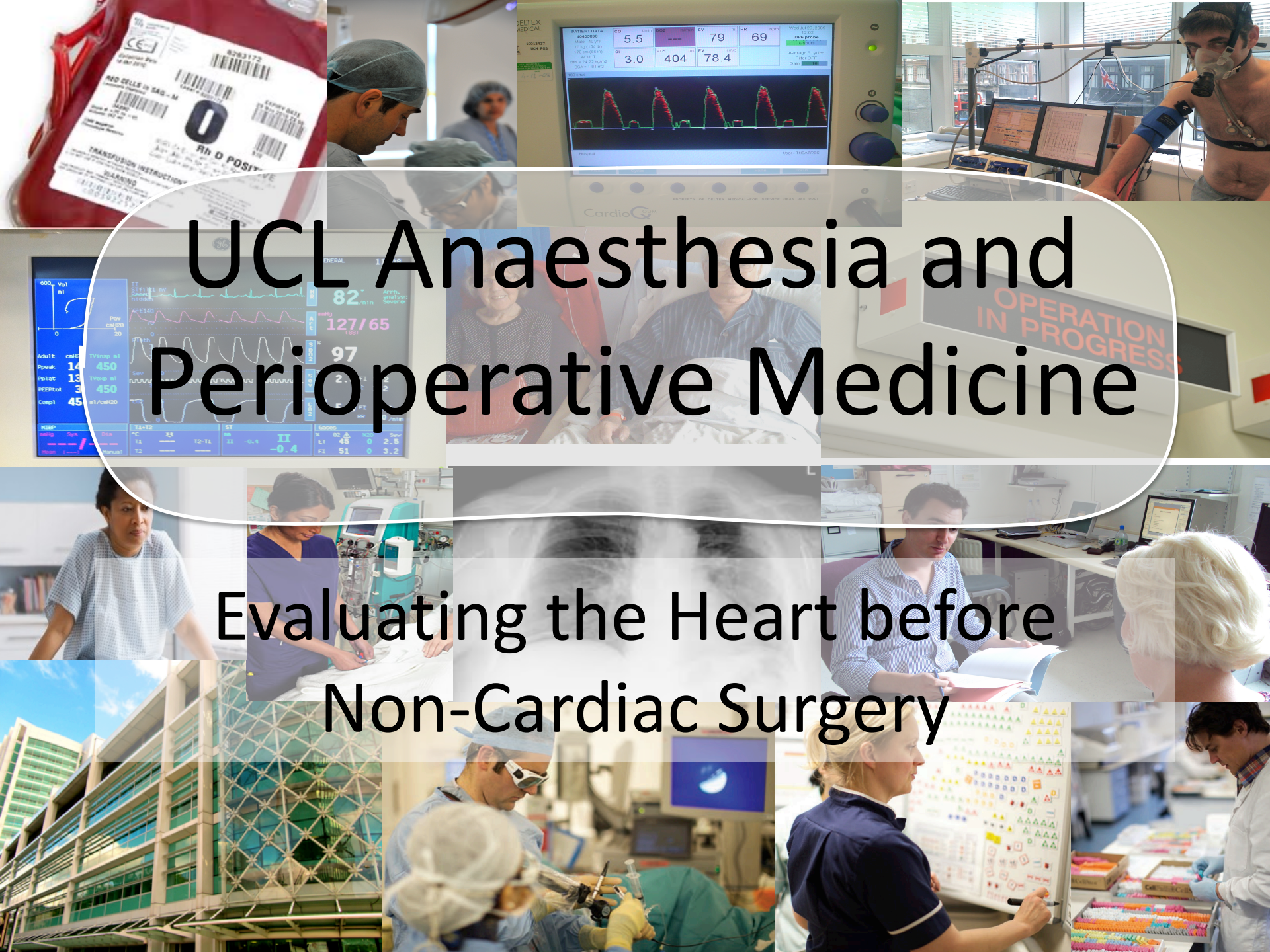

UCL Anaesthesia and Perioperative Medicine

Evaluating the Heart before Non-Cardiac Surgery

UCL DIVISION OF SURGERY
& INTERVENTIONAL SCIENCE

UCL

Study **Perioperative Medicine** MSc / Diploma / Certificate

www.ucl.ac.uk/surgery/periopmed

Evaluating the Heart before Non-Cardiac Surgery

Dr Rob Stephens

Anaesthetist UCLH + UCL

Dr Robert CM Stephens BA MD FRCA FFICM

Consultant in Anaesthesia, UCLH

Associate Professor in Anaesthesia & Perioperative Medicine, UCL

Interests	Education- lead for the year 4 MBBS, 6 SSM, 'Intro to Anaesthesia' course and on the MSc in Perioperative Medicine
	Undergraduate Education in Anaesthesia & Perioperative Medicine
	Innovative Education Methods
	Endotoxin & perioperative inflammation
	Cardiopulmonary Exercise Testing
	Maintaining Centre for Anaesthesia website
	Clinical trials
Selected	Preoperative systemic inflammation and perioperative myocardial injury: prospective observational multicentre cohort

www.ucl.ac.uk/anaesthesia/people/stephens

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Infomed

Assessing the heart for non Cardiac Surgery

Slides from talk

Slides

Guidelines

Canadian Guidelines

US AHA/ACC 2014 Updated Guidelines

European ESC/ESA 2014 Updated Guidelines

European 2009 Guidelines

2021 RCS

Studies

MANAGE Dabigatran Trial 2018

JAMA Systematic Review 2017 on Stents

mins_2014.pdf

2014.pdf

London B Blocker Meta-analysis 2013

VISION Study 2012

Foix & Sear B Blockers 2013

CARP 2004

carp.pdf

cass_c

Cookie settings

diac_surgery_circulation.pdf

www.ucl.ac.uk/anaesthesia/people/stephens

Google UCL Stephens

Contents

- Introduction
- Basic Principles
- Guidelines: Decisions
- Guidelines: Putting it all together
- Which test?
- ECHO
- CPET
- B Block?
- COVID19 = 1 slide!
- Summary

Introduction

- You’re all experts!
- Seems big, complex
- Conflicting, absent and changing evidence!

- Assessing CVS system vs interventions

Introduction

Table 2 Level of evidence

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of Evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

Background: Basic Principles?

Aims

- Assess risk: consent + patient decisions
- Assess risk: specific interventions
- Diagnose conditions : caution = screening?

Cancer surgery: Expidited

Test: what next?

Ischaemia vs Heart Failure vs Death

“Probably”, “reasonable”, “is not well established”

Guidelines 1 History

- Canadian 2017
- 2014 ACC/AHA guideline revision
- 2014 ESC/ESA guideline revision
- ACC/AHA 2007 (small revision 2009)
- ESC 2009
- Royal College Surgeons 2021
- Guidelines - Cardiology
- Fraud of Poldermans
- B Blocker story

- RCoA / AAGBI ?

2014 Guidelines + others

- MINS- Myocardial Injury after Non-Cardiac Surgery
  - Troponin Canadians 2017 for 2-3 days postop
- 'MACE'- Major Adverse Cardiac Event
- Different Order to risk asses
- Risk Asses using
  - NSQIOP *riskcalculator.facs.org*
  - rCRI or 'SORT surgery'
- CPET –'considered for elevated risk procedures in unknown functional capacity'
- Coronary Stent Guidelines
- POISE 2 study – no benefit in adding asprin
- METS study

Moodle... | MBBS Mana... | Tickets and... | SLIDES - Go... | https://www... | CURRENT_R... | History of D... | it's not all d... | it's not all d... | ht

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http://dx.doi.org/10.1016/j.jacc.2014.07.944

CLINICAL PRACTICE GUIDELINE

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Surgeons, American Society of Anesthesiologists, American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Vascular Medicine

Endorsed by the Society of Hospital Medicine

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*Writing committee members are required to recuse themselves from

European Heart Journal (2014) 35, 2383–2431
doi:10.1093/eurheartj/ehu282

ESC/ESA GUIDELINES

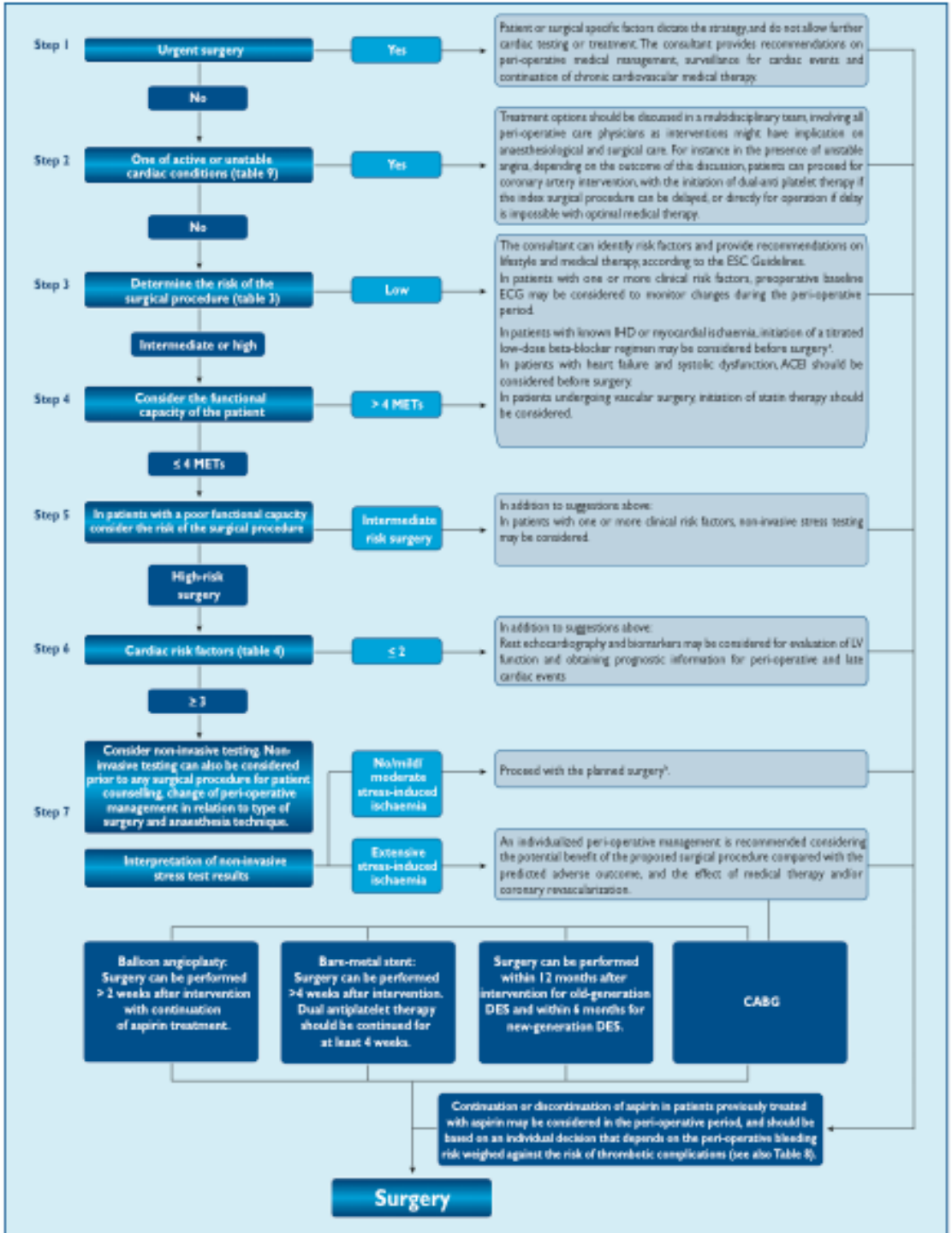
2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management

The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA)

Authors/Task Force Members: Steen Dalby Kristensen* (Chairperson) (Denmark), Juhani Knuuti* (Chairperson) (Finland), Antti Saraste (Finland), Stefan Anker (Germany), Hans Erik Bøtker (Denmark), Stefan De Hert (Belgium), Ian Ford (UK), Jose Ramón Gonzalez-Juanatey (Spain), Bulent Gorenek (Turkey), Guy Robert Heyndrickx (Belgium), Andreas Hoeft (Germany), Kurt Huber (Austria), Bernard Iung (France), Keld Per Kjeldsen (Denmark), Dan Longrois (France), Thomas F. Lüscher (Switzerland), Luc Pierard (Belgium), Stuart Pocock (UK), Susanna Price (UK), Marco Roffi (Switzerland), Per Anton Sirnes (Norway), Miguel Sousa-Uva (Portugal), Vasilis Voudris (Greece), Christian Funck-Brentano (France).

ESC Committee for Practice Guidelines: Jose Luis Zamorano (Chairperson) (Spain), Stephan Achenbach (Germany), Helmut Baumgartner (Germany), Jeroen J. Bax (Netherlands), Héctor Bueno (Spain), Veronica Dean (France), Christi Deaton (UK), Cetin Erol (Turkey), Robert Fagard (Belgium), Roberto Ferrari (Italy), David Hasdai (Israel),

ESC/ESA 2014


Step 1
Urgent surgery
Yes
Patient or surgical specific factors dictate the strategy, and do not allow further cardiac testing or treatment. The consultant provides recommendations on peri-operative medical management, surveillance for cardiac events and continuation of chronic cardiovascular medical therapy.
No
Step 2
One of active or unstable cardiac conditions (table 9)
Yes
Treatment options should be discussed in a multidisciplinary team, involving all peri-operative care physicians as interventions might have implication on anaesthesiological and surgical care. For instance in the presence of unstable angina, depending on the outcome of this discussion, patients can proceed for coronary artery intervention, with the initiation of dual-anti platelet therapy if the index surgical procedure can be delayed, or directly for operation if delay is impossible with optimal medical therapy.
No
Step 3
Determine the risk of the surgical procedure (table 3)
Low
The consultant can identify risk factors and provide recommendations on lifestyle and medical therapy, according to the ESC Guidelines.
In patients with one or more clinical risk factors, preoperative baseline ECG may be considered to monitor changes during the peri-operative period.
In patients with known IHD or myocardial ischaemia, initiation of a titrated low-dose beta-blocker regimen may be considered before surgery[a].
In patients with heart failure and systolic dysfunction, ACEI should be considered before surgery.
In patients undergoing vascular surgery, initiation of statin therapy should be considered.
Intermediate or high
Step 4
Consider the functional capacity of the patient
> 4 METs
≤ 4 METs
Step 5
In patients with a poor functional capacity consider the risk of the surgical procedure
Intermediate risk surgery
In addition to suggestions above:
In patients with one or more clinical risk factors, non-invasive stress testing may be considered.
High-risk surgery
Step 6
Cardiac risk factors (table 4)
≤ 2
In addition to suggestions above:
Rest echocardiography and biomarkers may be considered for evaluation of LV function and obtaining prognostic information for peri-operative and late cardiac events.
≥ 3
Step 7
Consider non-invasive testing. Non-invasive testing can also be considered prior to any surgical procedure for patient counselling, change of peri-operative management in relation to type of surgery and anaesthesia technique.
Interpretation of non-invasive stress test results
No/mild/moderate stress-induced ischaemia
Proceed with the planned surgery[b].
Extensive stress-induced ischaemia
An individualized peri-operative management is recommended considering the potential benefit of the proposed surgical procedure compared with the predicted adverse outcome, and the effect of medical therapy and/or coronary revascularization.
Balloon angioplasty: Surgery can be performed > 2 weeks after intervention with continuation of aspirin treatment.
Bare-metal stent: Surgery can be performed >4 weeks after intervention. Dual antiplatelet therapy should be continued for at least 4 weeks.
Surgery can be performed within 12 months after intervention for old-generation DES and within 6 months for new-generation DES.
CABG
Continuation or discontinuation of aspirin in patients previously treated with aspirin may be considered in the peri-operative period, and should be based on an individual decision that depends on the peri-operative bleeding risk weighed against the risk of thrombotic complications (see also Table 8).
Surgery

Editorial

Pre-operative coronary revascularisation before non-cardiac surgery: think long and hard before making a pre-operative referral

Many of us use the 'American College of Cardiology/American Heart Association (ACC/AHA) 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery', to inform our practice [1]. These guide-

Mythen, Biccard

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 30, 2004 VOL. 351 NO. 27

Coronary-Artery Revascularization before Elective Major Vascular Surgery

Edward O. McFalls, M.D., Ph.D., Herbert B. Ward, M.D., Ph.D., Thomas E. Moritz, M.S., Steven Goldman, M.D., William C. Krupski, M.D.,* Fred Littooy, M.D., Gordon Pierpont, M.D., Steve Santilli, M.D., Joseph Rapp, M.D., Brack Hattler, M.D., Kendrick Shunk, M.D., Ph.D., Connie Jaenicke, R.N., B.S.N., Lizy Thottapurathu, M.S., Nancy Ellis, M.S., Domenic J. Reda, Ph.D., and William G. Henderson, Ph.D.

ABSTRACT

BACKGROUND

The benefit of coronary-artery revascularization before elective major vascular surgery is unclear

From the Minneapolis Veterans Affairs (VA) Medical Center (E.O.M., H.B.W., G.P., S.S.,

CARP

Revascularised vs not before Vascular Surgery

- 5859 patients screened;
- 510 selected revascularization vs not

Postoperative 30 day mortality

- 3.1% vs 3.4%, rev vs not; P = .87

Long term mortality 2.8 years

- 22% vs 24%, rev vs not P = .92

McFalls 2004

Hello, Guest!
MY ALERTS SIGN IN JOIN

Circulation

ARTICLES

Cardiac Risk of Noncardiac Surgery

Influence of Coronary Disease and Type of Surgery in 3368 Operations

Kim A. Eagle, Charanjit S. Rihal, Mary C. Mickel, David R. Holmes, Eric D. Foster, Bernard J. Gersh, for the CASS Investigators, University of Michigan Heart Care Program

DOI https://doi.org/10.1161/01.CIR.96.6.1882
Circulation. 1997;96:1882-1887
Originally published September 16, 1997

Abstract

Background The influence of prior coronary artery bypass surgery (CABG) versus medical

This Issue

Circulation
September 16, 1997,

CASS

Coronary Artery Surgery Study

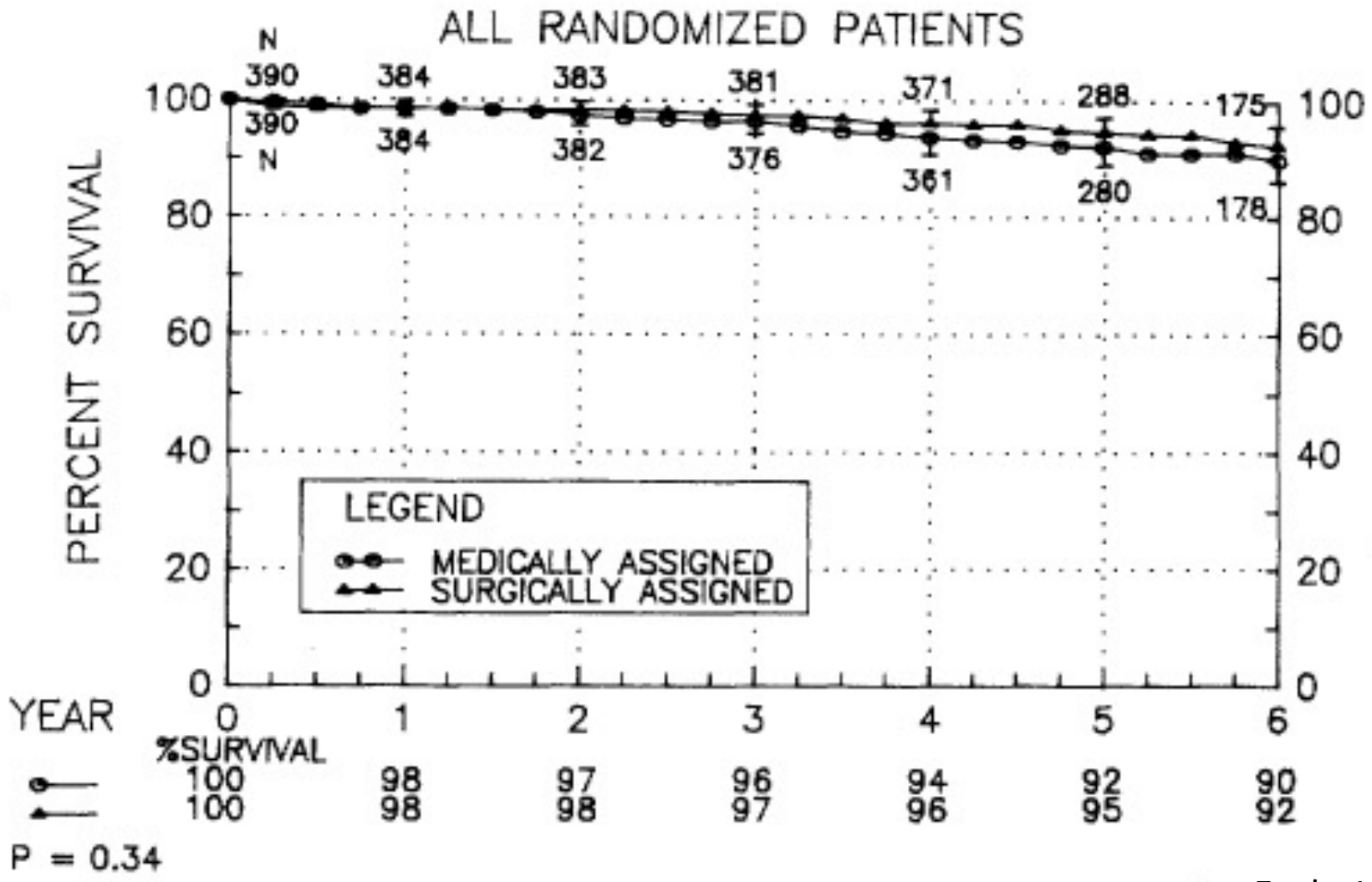
- 24,959 Pts undergoing Coronary Angiogram 1970's
- Pts randomised to CABG vs Medical
- Retrospectively examined

- ~3500 Patients non-cardiac operations in Yr 1
  - Hi risk Thoracic, Abdominal Max Fax
  - vs low risk

Eagle 1997

CASS

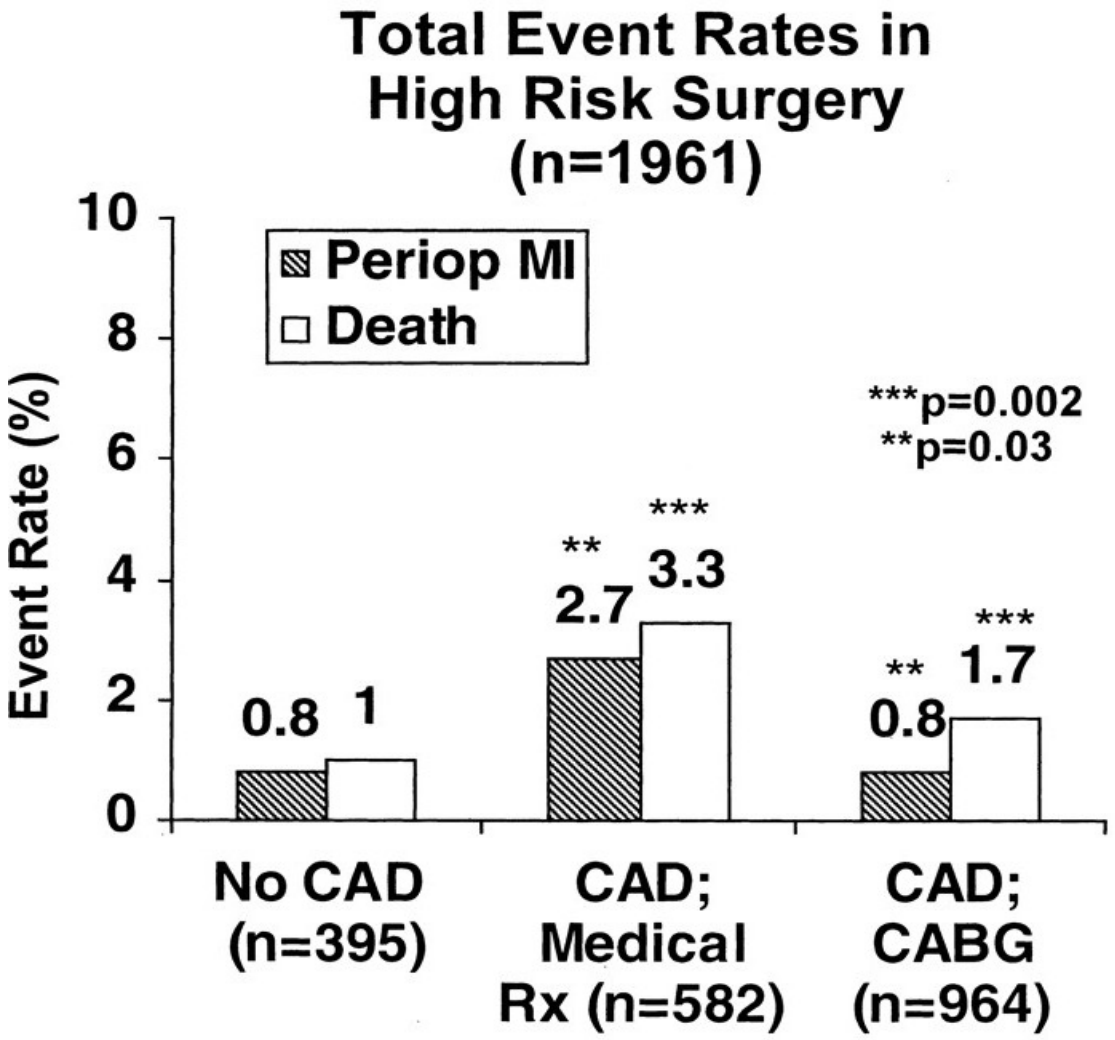
Coronary Artery Surgery Study



Eagle 1997

CASS

But CABG associated deaths excluded !



Eagle 1997

Guideline 2

ACC/AHA and ESC/ESA 2014

- Surgery Urgency
- Active Cardiac Condition
- Patient Exercise Capacity
- Surgery Severity
- Patient Specific risks / Comorbidities

ACC/AHA 214 and ESC/ESA and Canadian 2018

- Biomarkers

Guideline 2

ACC/AHA and ESC/ESA

- **Surgery Urgency**
- Active Cardiac Condition
- Patient Exercise Capacity
- Surgery Severity
- Patient Specific risks / Comorbidities

ACC/AHA 214 and ESC/ESA

- Biomarkers

Guideline 3

Surgery Urgency (US vs NCEPOD)

- **Emergency/ Immediate** proceed

NCEPOD 2004

IMMEDIATE – Immediate life, limb or organ-saving intervention – resuscitation simultaneous with intervention. Normally within minutes of decision to operate.

A) Life-saving
B) Other e.g. limb or organ saving

URGENT – Intervention for acute onset or clinical deterioration of potentially life-threatening conditions, for those conditions that may threaten the survival of limb or organ, for fixation of many fractures and for relief of pain or other distressing symptoms. Normally within hours of decision to operate.

EXPEDITED – Patient requiring early treatment where the condition is not an immediate threat to life, limb or organ survival. Normally within days of decision to operate.

ELECTIVE – Intervention planned or booked in advance of routine admission to hospital. Timing to suit patient, hospital and staff.

Guideline 4

Surgery Urgency

- **Truly Elective** – time to treat / discuss
- Treat/refer broadly as according to non-preoperative guidelines
- warn about possible delay to surgery
- evidence of benefit for subsequent surgery ?

Guideline 5

Surgery Urgency

- **Cancer** - ?Not *truly* Elective!

- Consider effect of Ix +Rx
- Consider
  - lack of benefit from CVS interventions
  - potential delay after CVS intervention
  - coronary stent anticoagulation

Guideline 6

ACC/AHA and ESC/ESA

- Surgery Urgency
- **Active Cardiac Condition**
- Patient Exercise Capacity
- Surgery Severity
- Patient Specific risks / Comorbidities

ACC/AHA 214 and ESC/ESA

- Biomarkers

Guideline 7

- ACC/AHA and ESC/ESA Patient Risk factors
- 3 levels: **Serious** / 'Intermediate ' / 'Minor'
- 'Serious' ; 'active cardiac conditions'
  - Recent MI/Unstable Angina
  - New /Acute Ht Failure
  - Serious abnormal rhythm
  - Severe valve disease

Pause and discuss with teams

Guideline 8

ACC/AHA and ESC/ESA

- Surgery Urgency
- Active Cardiac Condition
- **Patient Exercise Capacity**
- Surgery Severity
- Patient Specific risks / Comorbidities

ACC/AHA 214 and ESC/ESA

- Biomarkers

Guideline 9

Patient Exercise Capacity

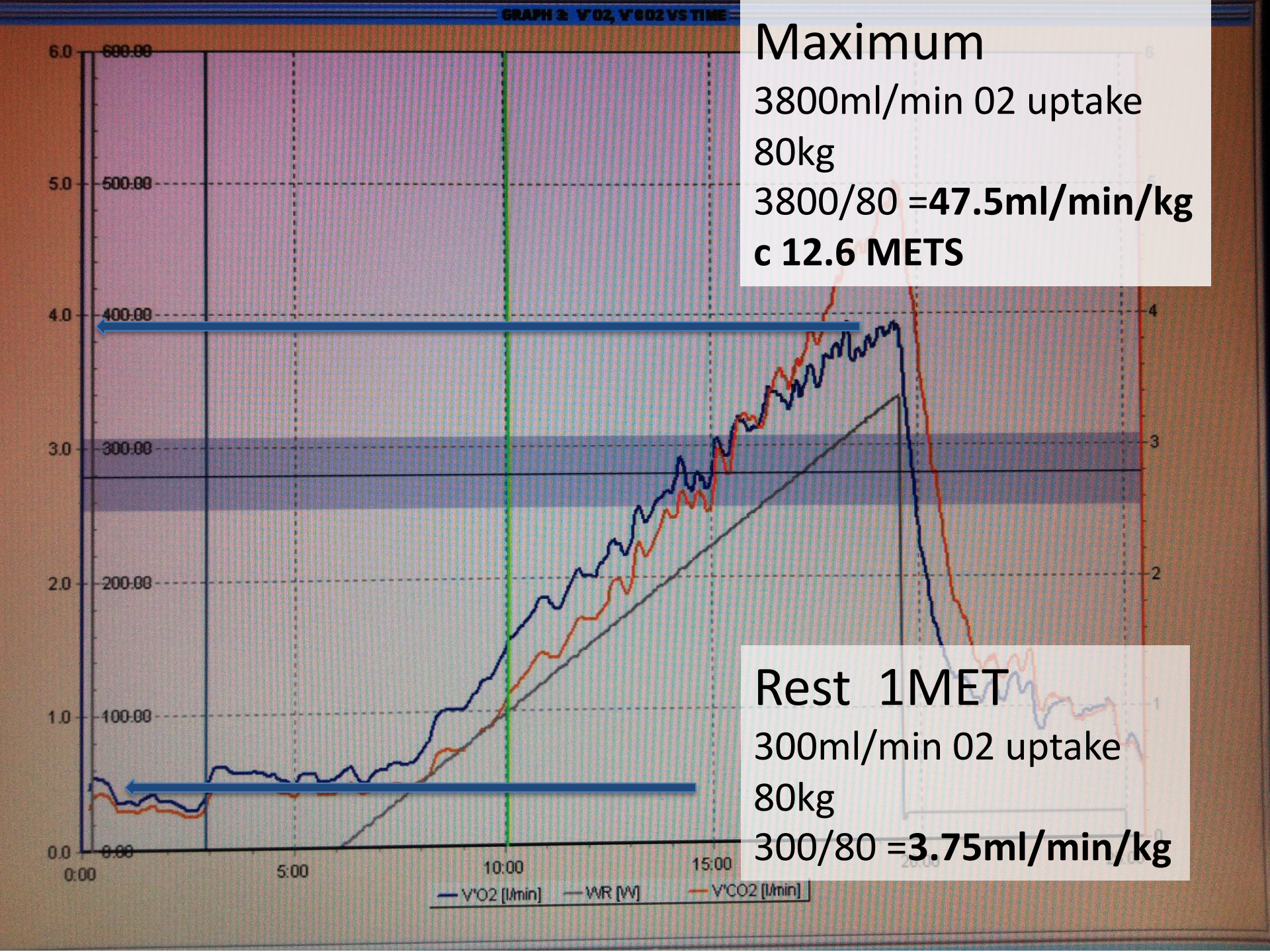
- Metabolic Equivalent of Task - MET
- 1 MET is 0_2 uptake at rest =

C 3.5 ml/min/kg 0_2 uptake

2 METS ~ 2x 0_2 uptake of 1 METS

Easily Quantified by CPEx

Mostly estimated by history


GRAPH 3: V'O2, V'CO2 VS TIME
6.0
5.0
4.0
3.0
2.0
1.0
0.0
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0:00
5:00
10:00
15:00
V'O2 [l/min]
WR [W]
V'CO2 [l/min]
Maximum
3800ml/min 02 uptake
80kg
3800/80 =47.5ml/min/kg
c 12.6 METS
Rest 1MET
300ml/min 02 uptake
80kg
300/80 =3.75ml/min/kg

Guideline 10

Patient Exercise Capacity

2 MET	Strolling
4 MET	Fast flat walking, up 1-2 flight stairs
	?do everything in a normal day
	walking a dog, moderate gardening
6+	Most sports, running
	‘Playing a heavy musical instrument while actively running in a marching band’

Guideline 11

Patient Exercise Capacity

4 METS without significant symptoms

Operations → proceed

Less than 4 METS → consider

Guideline 12

ACC/AHA and ESC/ESA

- Surgery Urgency
- Active Cardiac Condition
- Patient Exercise Capacity
- **Surgery Severity**
- Patient Specific risks / Comorbidities

ACC/AHA 214 and ESC/ESA

- Biomarkers

Guideline 13

Severity of surgery

- Minor → proceed
- Intermediate → consider further
- Major → consider further

Table 3 Surgical risk estimate according to type of surgery or intervention[a,b]

Low-risk: < 1%	Intermediate-risk: 1–5%	High-risk: > 5%
• Superficial surgery • Breast • Dental • Endocrine: thyroid • Eye • Reconstructive • Carotid asymptomatic (CEA or CAS) • Gynaecology: minor • Orthopaedic: minor (meniscectomy) • Urological: minor (transurethral resection of the prostate)	• Intraperitoneal: splenectomy, hiatal hernia repair, cholecystectomy • Carotid symptomatic (CEA or CAS) • Peripheral arterial angioplasty • Endovascular aneurysm repair • Head and neck surgery • Neurological or orthopaedic: major (hip and spine surgery) • Urological or gynaecological: major • Renal transplant • Intra-thoracic: non-major	• Aortic and major vascular surgery • Open lower limb revascularization or amputation or thromboembolectomy • Duodeno-pancreatic surgery • Liver resection, bile duct surgery • Oesophagectomy • Repair of perforated bowel • Adrenal resection • Total cystectomy • Pneumonectomy • Pulmonary or liver transplant

CAS = carotid artery stenting; CEA = carotid endarterectomy.

[a]Surgical risk estimate is a broad approximation of 30-day risk of cardiovascular death and myocardial infarction that takes into account only the specific surgical intervention, without considering the patient's comorbidities.

[b]Adapted from Glance et al.[11]

The objective is to endorse a standardized and evidence-based approach to perioperative cardiac management. The Guidelines recommend a practical, stepwise evaluation of the patient that integrates clinical risk factors and test results with the estimated stress of the planned surgical procedure. This results in an individualized cardiac risk assessment, with the opportunity of initiating medical therapy, coronary interventions, and specific surgical and anaesthetic techniques in order to optimize the patient's perioperative condition.

Compared with the non-surgical setting, data from randomized

both began the process of revising their respective guidelines concurrently. The respective writing committees independently performed their literature review and analysis, and then developed their recommendations. Once peer review of both guidelines was completed, the writing committees chose to discuss their respective recommendations regarding beta-blocker therapy and other relevant issues. Any differences in recommendations were discussed and clearly articulated in the text; however, the writing committees aligned a few recommendations to avoid confusion within the clinical community,

Guideline 14

ACC/AHA and ESC/ESA

- Surgery Urgency
- Patient Exercise Capacity
- Surgery Severity
- **Patient Specific risks / Comorbidities**

ACC/AHA 214 and ESC/ESA

- Biomarkers

Guideline 15

- ACC/AHA and ESC/ESA Patient Risk factors
- 3 levels: **Serious** / 'Intermediate ' / 'Minor'
- 'Serious' ; 'active cardiac conditions'
  - Recent MI/Unstable Angina
  - New /Acute Ht Failure
  - Serious abnormal rhythm
  - Severe valve disease

Pause and discuss with teams

Guideline 16

- ACC/AHA and ESC/ESA Patient Risk factors
- 3 levels: Serious / **'Intermediate** ' / 'minor'
- 'Intermediate'- same as 'Lees rCRI' 0-2 vs ≥3
  - Any Ischaemic Ht Disease
  - Any Ht Failure
  - Any Cerebro-Vascular Disease
  - Diabetes – insulin
  - Renal Injury (Cr 177+)
- Do a risk score: 1% Cardiac risk or more?

obe Reader File Edit View Document Tools Window Help 65% Thu 07:04 Robert Stephens
2014 ESC/ESA guidelines.pdf
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ation with post-operative cardiac events or death.[39] Notably, when functional capacity is high, the prognosis is excellent, even in the presence of stable IHD or risk factors;[40] otherwise, when functional capacity is poor or unknown, the presence and number of risk factors in relation to the risk of surgery will determine pre-operative risk stratification and perioperative management.

3.4 Risk indices

For two main reasons, effective strategies aimed at reducing the risk of perioperative cardiac complications should involve cardiac evaluation, using medical history before the surgical procedure,. Firstly, patients with an anticipated low cardiac risk—after thorough evaluation—can be operated on safely without further delay. It is unlikely that risk-reduction strategies will further reduce the perioperative risk. Secondly, risk reduction by pharmacological treatment is most cost-effective in patients with a suspected increased cardiac risk. Additional non-invasive cardiac imaging techniques are tools to identify patients at higher risk; however, imaging techniques should be reserved for those patients in whom test results would influence and change management. Clearly, the intensity of the preoperative cardiac evaluation must be tailored to the patient's clinical condition and the urgency of the circumstances requiring surgery. When emergency surgery is needed, the evaluation must necessarily be limited; however, most clinical circumstances allow the application of a more extensive systematic approach with cardiac risk evaluation

set, based on patients from 180 hospitals, and was validated with the 2008 data set, both containing >200 000 patients and having predictability. The primary endpoint was intra-operative/post-operative myocardial infarction or cardiac arrest up to 30 days after surgery. Five predictors of perioperative myocardial infarction/cardiac arrest were identified: type of surgery, functional status, elevated creatinine (>130 μmol/L or >1.5 mg/dL), American Society of Anesthesiologists (ASA) class (*Class I*, patient is completely healthy; *Class II*, patient has mild systemic disease; *Class III*, patient has severe systemic disease that is not incapacitating; *Class IV*, patient has incapacitating disease that is a constant threat to life; and *Class V*, a moribund patient who is not expected to live for 24 hours, with or without the surgery), and age. This model is presented as an interactive risk calculator (http://www.surgicalriskcalculator.com/miorcardiacarrest) so that the risk can be calculated at the bedside or clinic in a simple and accurate way. Unlike other risk scores, the NSQIP model did not establish a scoring system but provides a model-based estimate of the probability of myocardial infarction/cardiac arrest for an individual patient. The risk calculator performed better than the Lee risk index, with some reduction in performance in vascular patients, although it was still superior; however, some perioperative cardiac complications of interest to clinicians, such as pulmonary oedema and complete heart block, were not considered in the NSQIP model because those variables were not included in the NSQIP database. By contrast, the Lee index allows estimation of the risk of perioperative pulmonary

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platelet Dr Robert C... Bookings for... ABRSM: Moc... 11th Update... Evaluation of... Inbox (10,42... SE1 7RY - G... 11th Update... https://oup.s... Periopera

Surgical Risk Calculator

Home
Acute Mesenteric Ischemia Perioperative Risk Calculator
Aortic Risk Calculator (Open)
Bariatric Surgery Perioperative Morbidity and Mortality Risk Calculators
Feedback
Infrainguinal Bypass Surgery Perioperative Mortality Risk Calculator
Perioperative Cardiac Risk Calculator
Postoperative Pneumonia Risk Calculator
Postoperative Respiratory Failure (PRF) Risk Calculator
Sitemap

Perioperative Cardiac Risk Calculator

Full methodology in the paper-

Circulation. 2011 Jul 26;124(4):381-7. Epub 2011 Jul 5.

For accompanying editorial, click here

For excel 2007 or above users, you can download the cardiac risk calculator here.

For excel 2003 users, you can download the risk calculator here

To use online, you can click here

For questions or comments, please email me at pgupta5@uthsc.edu or fill out the Feedback form.

Risk calculator

Percentile	Percent Risk
25th percentile	0.05%
50th percentile	0.14%
75th percentile	0.61%
90th percentile	1.47%
95th percentile	2.60%
99th percentile	7.69%

qxmd.com

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Perioperative Cardiac Risk Calculator - Surgical Risk Calculator | Calculate Perioperative Cardiac Risk | QxMD Medical A

Estimate risk of perioperative myocardial infarction or cardiac arrest.

Age: 46

Creatinine: <1.5 mg/dL / 133 µmol/L

ASA Class: ASA 1

ASA 1 = Normal healthy patient
ASA 2 = Patients with mild systemic disease
ASA 3 = Patients with severe systemic disease
ASA 4 = Patients with severe systemic disease that is a constant threat to life
ASA 5 = Moribund patients who are not expected to survive without the operation

Preoperative Function: Totally Independent

Procedure: Intestinal

Submit

Estimate risk of perioperative myocardial infarction or cardiac arrest.

Age: 76

Creatinine: <1.5 mg/dL / 133 µmol/L

ASA Class: ASA 3

ASA 1 = Normal healthy patient
ASA 2 = Patients with mild systemic disease
ASA 3 = Patients with severe systemic disease
ASA 4 = Patients with severe systemic disease that is a constant threat to life
ASA 5 = Moribund patients who are not expected to survive without the operation

Preoperative Function: Totally Independent

Procedure: Intestinal

Submit

Surgical Outcome Risk Tool (SORT)

Main Group

Select procedure group....

Sub Group

Select procedure sub-group....

Procedure Description

Select procedure....

Severity ?

Minor Intermediate Major Xmajor/complex

ASA-PS ?

1 2 3 4 5

Urgency

Elective Expedited Urgent Immediate

Thoracics, gastrointestinal or vascular surgery

Yes No

Cancer ?

Yes No

Age

<65 65-79 >80

Disclaimer:

The SORT uses some information about patient health and the planned surgical procedure to provide an estimate of the risk of death within 30 days of an operation. The percentages provided by the SORT are only estimates taking into account the general risks of the procedure and some information about the patient, but should not be confused with a patient-specific estimate in an individual case. As with all risk prediction tools, not every factor which may affect outcome can be included, and there may well be other patient-specific and surgical factors which may influence the risk of death significantly.

User notes

All values must be present before the calculation can take place.
Surgical severity will be calculated automatically on entry of procedure details.
If the procedure you are searching for is not listed, please use the nearest available procedure for calculation.

About SORT

The SORT is a pre-operative risk prediction tool for death within 30 days of surgery. It has been developed and validated for use in inpatient non-neurological, non-cardiac surgery in adults (aged 16 or over).

This web resource is the result of a collaborative effort between NCEPOD researchers (Karen Protopapa and Neil Smith) and doctors in anaesthesia and intensive care medicine who are part of the SOuRCe team (Ramani Moonesinghe and Jo Simpson).

The UCL/UCLH Surgical Outcomes Research Centre (SOuRCe)
www.uclsource.com

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD)
www.ncepod.org.uk

Further Information

Guideline 17

ACC/AHA and ESC/ESA

- Surgery Urgency
- Patient Exercise Capacity
- Surgery Severity
- **Patient Specific risks / Comorbidities**

ACC/AHA 214 and ESC/ESA

- Biomarkers

Guideline 18

- Biomarkers in ESC Guidelines 2009

  "a characteristic that can be objectively measured that is an indicator of pathology or an abnormal response to treatments"

  Troponin - myocardial cell injury

  BNP - myocardial wall stress increases

  + pro NT BNP

  CRP - liver and smooth muscle

ESC, Biccard, Devereaux 2012

Guideline 19

- Biomarkers in ESC Guidelines 2009 & Canadian 2017

  Troponin

  Postop – small ↑ associated ↑ mortality ‘VISION’

  Preop – predictive, no ideal cut off

  BNP + pro NT BNP

  Ht Failure /IHD / ACS - rises relate to outcome

  Preop – adds predictive ability >48 pg/ml

  CRP – ‘inflammatory marker’

ESC, Biccard, Devereaux 2012

Guideline 20

- Biomarkers in ESC Guidelines 2009

  All higher in patients that have postoperative cardiac events / die

  None recommended for routine screening

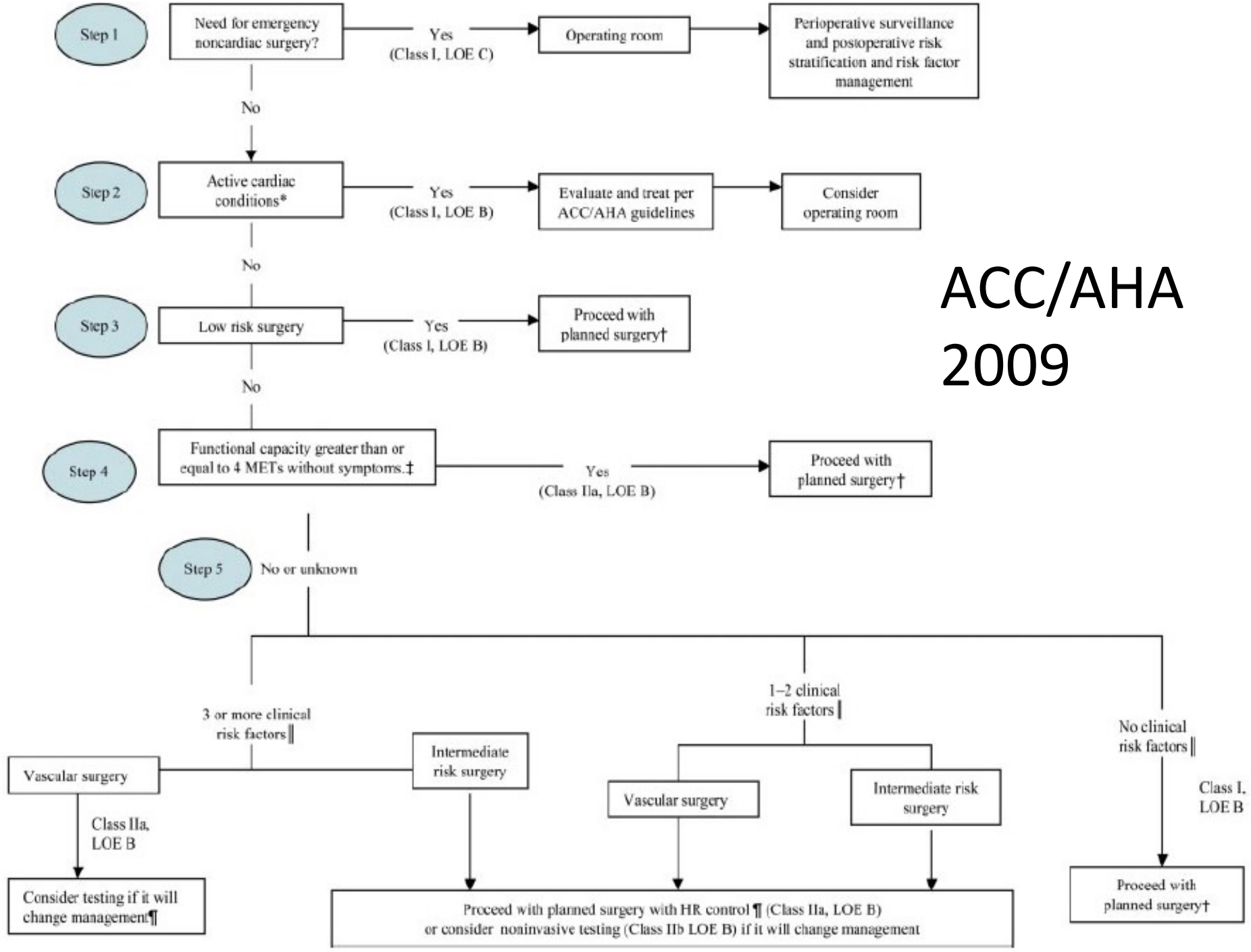
- Canadian use Preop BNP and postop Troponin

  Troponin

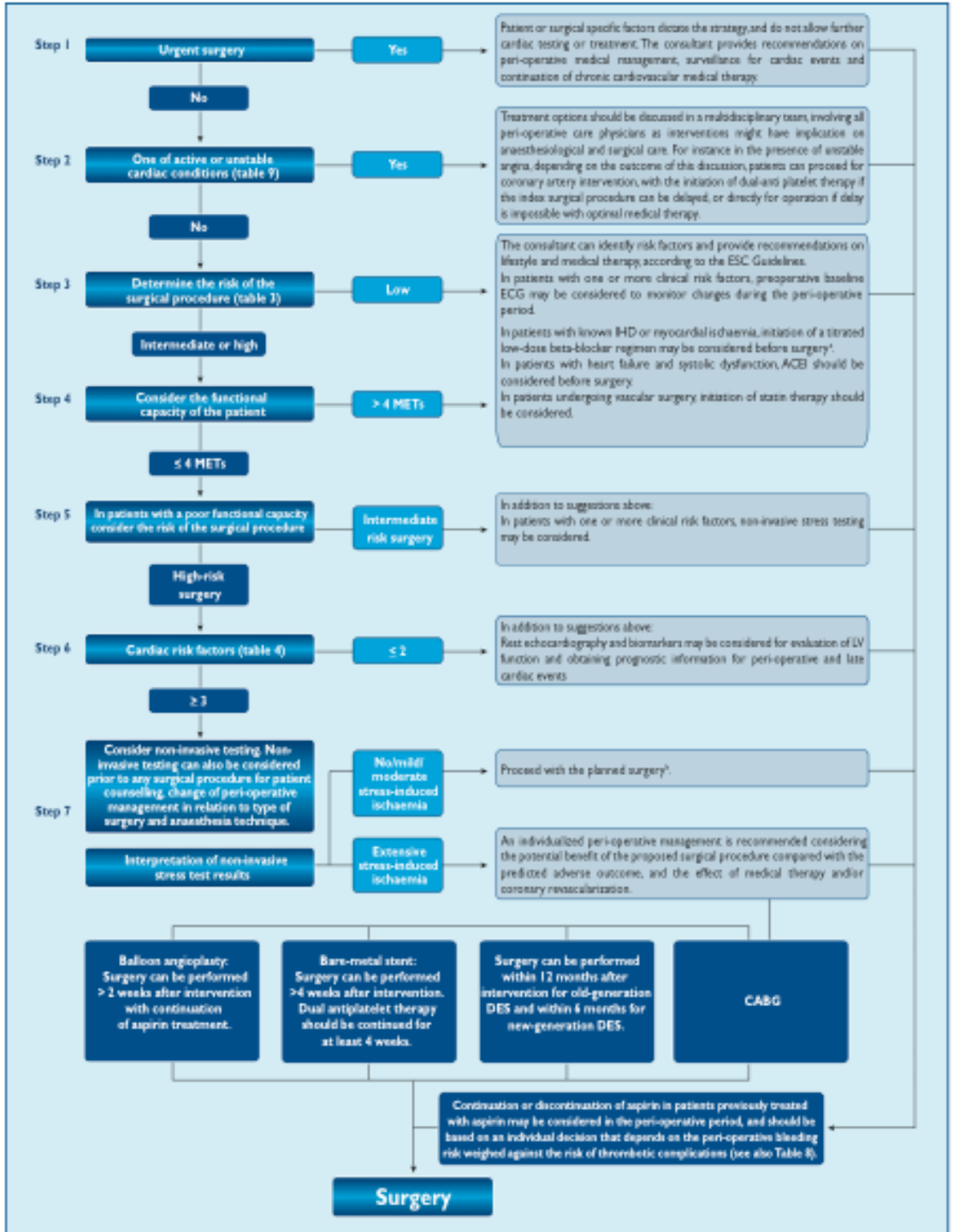
  BNP

  CRP

Assessing CVS disease: Together

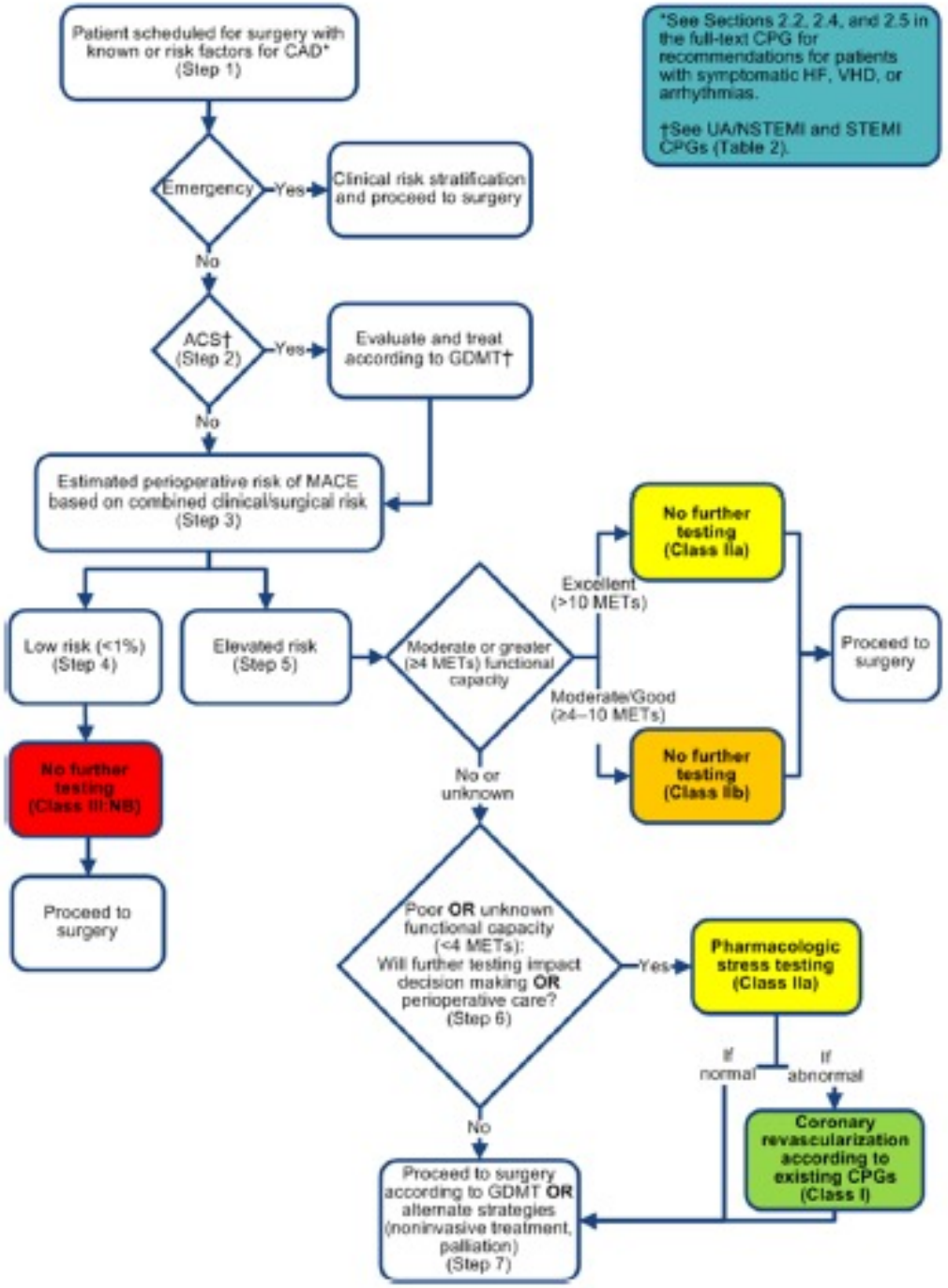

Step 1
Need for emergency noncardiac surgery?
Yes
(Class I, LOE C)
Operating room
Perioperative surveillance and postoperative risk stratification and risk factor management
No
Step 2
Active cardiac conditions*
Yes
(Class I, LOE B)
Evaluate and treat per ACC/AHA guidelines
Consider operating room
No
Step 3
Low risk surgery
Yes
(Class I, LOE B)
Proceed with planned surgery†
No
Step 4
Functional capacity greater than or equal to 4 METs without symptoms.‡
Yes
(Class IIa, LOE B)
Proceed with planned surgery†
Step 5
No or unknown
3 or more clinical risk factors‖
1–2 clinical risk factors‖
No clinical risk factors‖
Vascular surgery
Intermediate risk surgery
Vascular surgery
Intermediate risk surgery
Class IIa, LOE B
Class I, LOE B
Consider testing if it will change management¶
Proceed with planned surgery with HR control ¶ (Class IIa, LOE B)
or consider noninvasive testing (Class IIb LOE B) if it will change management
Proceed with planned surgery†

ACC/AHA 2009


Step 1
Urgent surgery
Yes
Patient or surgical specific factors dictate the strategy, and do not allow further cardiac testing or treatment. The consultant provides recommendations on peri-operative medical management, surveillance for cardiac events and continuation of chronic cardiovascular medical therapy.
No
Step 2
One of active or unstable cardiac conditions (table 9)
Yes
Treatment options should be discussed in a multidisciplinary team, involving all peri-operative care physicians as interventions might have implication on anaesthesiological and surgical care. For instance in the presence of unstable angina, depending on the outcome of this discussion, patients can proceed for coronary artery intervention, with the initiation of dual-anti platelet therapy if the index surgical procedure can be delayed, or directly for operation if delay is impossible with optimal medical therapy.
No
Step 3
Determine the risk of the surgical procedure (table 3)
Low
The consultant can identify risk factors and provide recommendations on lifestyle and medical therapy, according to the ESC Guidelines.
In patients with one or more clinical risk factors, preoperative baseline ECG may be considered to monitor changes during the peri-operative period.
In patients with known IHD or myocardial ischaemia, initiation of a titrated low-dose beta-blocker regimen may be considered before surgery[a].
In patients with heart failure and systolic dysfunction, ACEI should be considered before surgery.
In patients undergoing vascular surgery, initiation of statin therapy should be considered.
Intermediate or high
Step 4
Consider the functional capacity of the patient
> 4 METs
≤ 4 METs
Step 5
In patients with a poor functional capacity consider the risk of the surgical procedure
Intermediate risk surgery
In addition to suggestions above:
In patients with one or more clinical risk factors, non-invasive stress testing may be considered.
High-risk surgery
Step 6
Cardiac risk factors (table 4)
≤ 2
In addition to suggestions above:
Rest echocardiography and biomarkers may be considered for evaluation of LV function and obtaining prognostic information for peri-operative and late cardiac events.
≥ 3
Step 7
Consider non-invasive testing. Non-invasive testing can also be considered prior to any surgical procedure for patient counselling, change of peri-operative management in relation to type of surgery and anaesthesia technique.
Interpretation of non-invasive stress test results
No/mild/moderate stress-induced ischaemia
Proceed with the planned surgery[b].
Extensive stress-induced ischaemia
An individualized peri-operative management is recommended considering the potential benefit of the proposed surgical procedure compared with the predicted adverse outcome, and the effect of medical therapy and/or coronary revascularization.
Balloon angioplasty: Surgery can be performed > 2 weeks after intervention with continuation of aspirin treatment.
Bare-metal stent: Surgery can be performed >4 weeks after intervention. Dual antiplatelet therapy should be continued for at least 4 weeks.
Surgery can be performed within 12 months after intervention for old-generation DES and within 6 months for new-generation DES.
CABG
Continuation or discontinuation of aspirin in patients previously treated with aspirin may be considered in the peri-operative period, and should be based on an individual decision that depends on the peri-operative bleeding risk weighed against the risk of thrombotic complications (see also Table 8).
Surgery

ESC/ESA

2014



AHA 2014

Fleisher, 2014

Guideline 21

- Putting it together: **1 Urgency**
- Emergency → operation
- Elective → consider further
- In between → consider further

Guideline 22

Putting it together: **2 Active Cardiac Condition**

Guideline 23

Putting it together: **2 Active Cardiac Condition**

- **Serious**' = '**active cardiac condition**'
  - Recent MI/Unstable Angina
  - Acute LVF
  - Serious abnormal rhythm
  - Severe valve disease

Guideline 24

Putting it together: **2 Active Cardiac Condition**

Yes

- Emergency → operation and Rx
- Elective → pause & refer/Ix/Rx
- In between → pause & consider refer

No

- Elective → consider further
- In between → consider further

Guideline 25

Putting it together: **3 Operation risk**

?Low risk surgery

Intermediate or higher

Table 3 Surgical risk estimate according to type of surgery or intervention[a,b]

Low-risk: < 1%	Intermediate-risk: 1–5%	High-risk: > 5%
• Superficial surgery • Breast • Dental • Endocrine: thyroid • Eye • Reconstructive • Carotid asymptomatic (CEA or CAS) • Gynaecology: minor • Orthopaedic: minor (meniscectomy) • Urological: minor (transurethral resection of the prostate)	• Intraperitoneal: splenectomy, hiatal hernia repair, cholecystectomy • Carotid symptomatic (CEA or CAS) • Peripheral arterial angioplasty • Endovascular aneurysm repair • Head and neck surgery • Neurological or orthopaedic: major (hip and spine surgery) • Urological or gynaecological: major • Renal transplant • Intra-thoracic: non-major	• Aortic and major vascular surgery • Open lower limb revascularization or amputation or thromboembolectomy • Duodeno-pancreatic surgery • Liver resection, bile duct surgery • Oesophagectomy • Repair of perforated bowel • Adrenal resection • Total cystectomy • Pneumonectomy • Pulmonary or liver transplant

CAS = carotid artery stenting; CEA = carotid endarterectomy.

[a]Surgical risk estimate is a broad approximation of 30-day risk of cardiovascular death and myocardial infarction that takes into account only the specific surgical intervention, without considering the patient's comorbidities.

[b]Adapted from Glance et al.[11]

The objective is to endorse a standardized and evidence-based approach to perioperative cardiac management. The Guidelines recommend a practical, stepwise evaluation of the patient that integrates clinical risk factors and test results with the estimated stress of the planned surgical procedure. This results in an individualized cardiac risk assessment, with the opportunity of initiating medical therapy, coronary interventions, and specific surgical and anaesthetic techniques in order to optimize the patient's perioperative condition.

Compared with the non-surgical setting, data from randomized

both began the process of revising their respective guidelines concurrently. The respective writing committees independently performed their literature review and analysis, and then developed their recommendations. Once peer review of both guidelines was completed, the writing committees chose to discuss their respective recommendations regarding beta-blocker therapy and other relevant issues. Any differences in recommendations were discussed and clearly articulated in the text; however, the writing committees aligned a few recommendations to avoid confusion within the clinical community,

Guideline 26

Putting it together: **3 Operation risk**

?Low risk surgery

Elective → operation

In between → operation

Intermediate or higher

Elective → consider further

In between → consider further

Guideline 27

Putting it together: **4 Exercise capacity > 4 METS** without symptoms……'probably'

Elective → operation

In between → operation

Less than 4 METS or can't tell

Elective → consider further

In between → consider further

Guideline 28

Putting it together: **5 Intermediate risk factors**

Guideline 29

Putting it together: **5 Intermediate risk factors**

3 levels: Serious / '**Intermediate** ' / 'minor'

- 'Intermediate'- same as rCRI
  - Any Ischaemic Ht Disease
  - Any Ht Failure
  - Any Cerebro-Vascular Disease
  - Diabetes – insulin
  - Renal Injury (Cr 177+)

Guideline 30

Putting it together: **5 Intermediate risk factors**

No intermediate risk factors → proceed

Any intermediate risk factors →

More factors increases risk

proceed +/- 'B Blockade' or

'consider testing if changes management'

Do risk score- more than 1% ?

Guideline 31

Always in the context of 'what next?' ie

'will/should it change management?'

? Calculate Cardiac Risk

"Consider testing" ACC/AHA

- Stress ECHO
- Myocardial Perfusion Scan
- CPET – includes Exercise ECG
- Exercise ECG
- MRI or CT

RCS 2021 COVID-19

Patients should be/have

- Assessed for impact of comorbidities on
  - function, perioperative pathways and surgical outcome
- Individualised risk assessed using objective measures
  - eg SORT Surgery combined with senior clinical judgement
  - with >5% risk consider postoperative critical care
- Screened for ▼ functional capacity using eg Duke Activity Status Index
  - Patients with ▼ fitness screening undergo eg CPET or simpler alternative methods
- Advised to improve fitness before surgery

Next

- ECHO
- CPET
- B Blockers

ECHO Evidence

- Valves, Function, estimates Pulmonary pressures
- Degree of dysfunction, regional wall motion abn
- LVEF <40% - 2x higher risk
  - sensitivity 43%
  - positive predictive 13%
- "resting LV function was not found to be a consistent predictor of perioperative ischemic events or death"
- But ECHO enthusiasts in preassessment..
  - 30% new CVS disease, ↑Mx 20% Mx ↓34%

Halm, Rofdhe, Canty

ECHO indication

Routine Evaluation – NO

Dyspnea of unknown origin – reasonable

Ht Failure with ↑symptoms (1 yr) - reasonable

New murmur - reasonable

Ht Failure / Valves clinically stable –

‘not well established’

ACC/AHA 2009

CPET Background

Functional assessment

Population data – survival

Heart Failure Classification

VO_2 peak, AT, VE/VCO_2, ECG ischaemia etc

But

Associations with outcome and complications

Most studies unblinded, small

Await results of only RCT

'Prehabilitation' studies awaited

Older, Hennis, Snowden, O'Doherty

CPET Background

n=548

Lower anaerobic threshold worse: higher mortality
Raised Respiratory Equivalent: higher mortality

	Mortality
AT more 14 ml/min /kg	0%
AT more 11 ml/min /kg but other badness	1.7%
AT less 11 ml/min /kg	4.6%

Older 1999

CPET Background

Complication on day 7	**AT < 10.1 n= 51**	**AT > 10.1 n=65**	**p=**
Pulmonary	57%	15%	<0.0001
Renal	40%	11%	0.0004
GI	33%	11%	0.005
Infective	27%	11%	0.003
Cardiovascular	25%	3%	0.0005
Neurological	10%	5%	0.29
Hematology	8%	0	0.04
Pain	8%	0	0.04
Wound	4%	0	0.2

Snowden 2010

CPET use

“Cardiopulmonary exercise testing may be considered for patients undergoing elevated risk procedures in whom functional capacity is unknown” AHA/ACC 2014

- Use very variable, increasing
- Enthusiasts vs sceptics
- Probably best not to emphasise single value
  - VO_2 peak, AT, VE/VCO_2, ECG ischaemia
- ATS/ACCP 2001

  “helpful in objectively assessing the adequacy of CV reserve and in predicting CV risk in elderly”
- ESC 2009’

  “not established role in preoperative assessment”

UCL CENTRE FOR AN

www.ucl.ac.uk/anaesthesia/research/CPET

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A A A

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CARDIO PULMONARY EXERCISE TEST: CPET

Aims: to accurately measure exercise capacity for clinical use and research

What is CPET ?

Cardio pulmonary Exercise Testing (CPET) is a non-invasive simultaneous measurement of the cardiovascular and respiratory system during exercise to assess a patient's exercise capacity.

How to refer

Please download + print/email this referral form to ucl-tr.CPXref@nhs.net

Mobile Number 07849 016074

Landline 020 3447 2838

Why do a CPET ?

CPET is used for many specific reasons, but in general it can

- help estimate risk for patients undergoing surgery
- be useful in investigating breathlessness
- be used in exercise programmes to increase fitness

Patients: What does it involve for you ?

Patients please click here to see our YOU tube guide!

Before the test- please don't eat for 2 hours and drink no coffee or tea for 4 hours. Take all your normal medicines as usual.

When you arrive we will ask you about your medical history and what exercise you're normally able to do, and ask your permission to record your data for research and audit use.

We take baseline observations and a blood test. You wear a mask to allow us to measure the gas you breathe in and out.

Once seated on the bike, we ask you to start cycling. The bike then gets harder to cycle-

B Block? background

- B blockers – in community
  - reduce adrenergic activity + myocardial 0_2 use
  - associated with survival
- RCT Perioperative studies

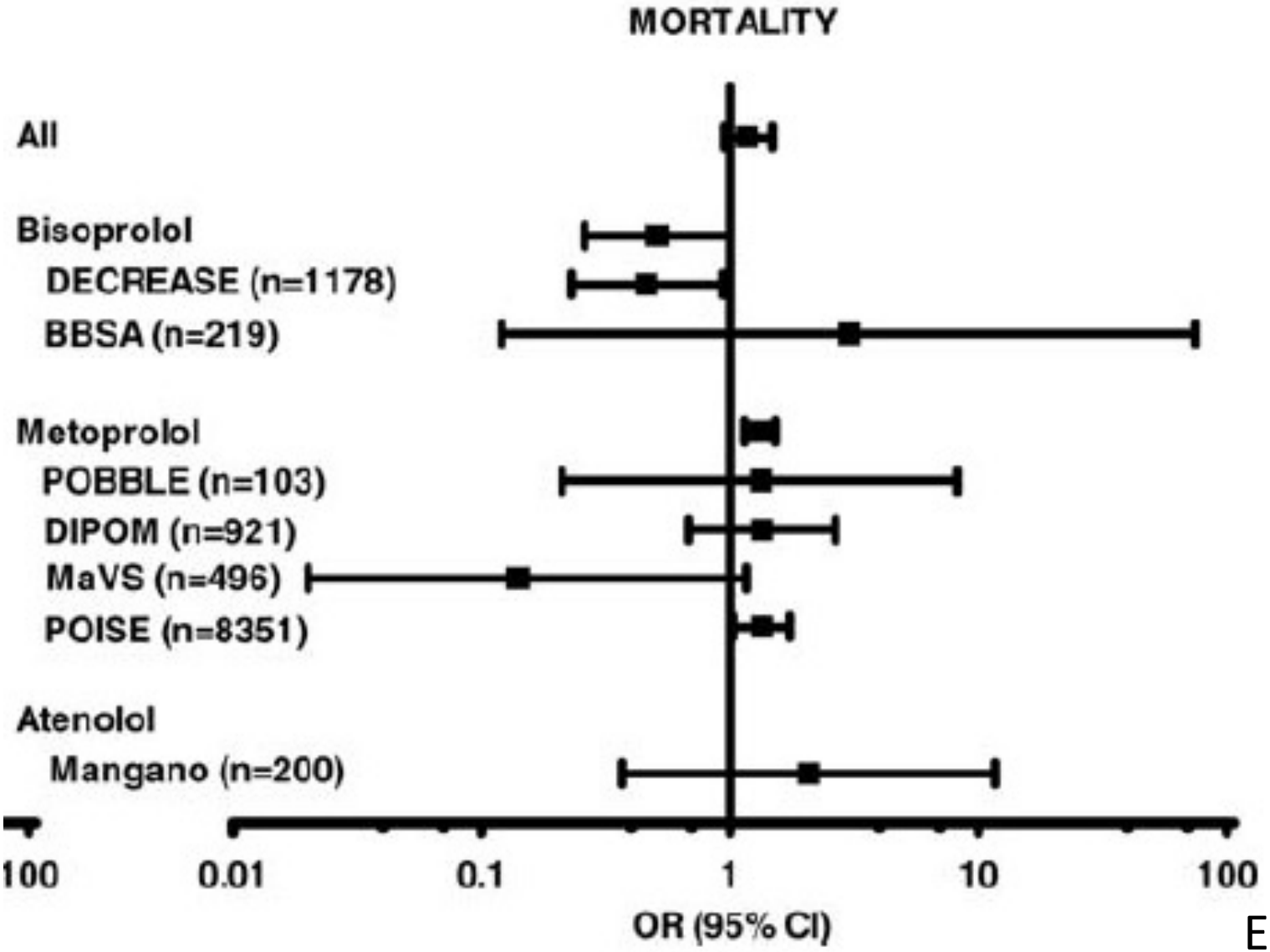
  Mangano

  POISE

  DECREASE, Others
- Observational perioperative data
- US and European Perioperative Guidelines

Mangano, London, Sear, Devereaux, Bouri

B Block?



ESC 2009

Table 5 Summary of randomized, controlled trials evaluating the effect of peri-operative beta-blockade on post-operative mortality and non-fatal myocardial infarction

Study	n	Vascular Surgery (%)	Beta-blocker				Patient selection according to cardiac risk	30-day mortality, n/N (%)		30-day rate of non-fatal MI, n/N (%)	
			Type	Onset (before Surgery)	Duration (days after surgery)	Dose Titration		Beta-blocker	Control	Beta-blocker	Control
Mangano et al.[83]	200	40	Atenolol	30 min	7	No	IHD or ≥2 risk factors	5/99 (5.1[a])	10/101 (9.9[a])	-	-
POBBLE[83]	103	100	Metoprolol tartrate	<24 h	7	No	No	3/55 (5.4)	1/48 (2.1)	3/55 (5.5)	5/48 (10.4)
MaVS[80]	496	100	Metoprolol succinate	2 h	5	No	No	0/246 (0)	4/250 (1.6)	19/246 (7.7)	21/250 (8.4)
DIPOM[81]	921	7	Metoprolol succinate	12 h	8	No	Diabetes	74/462 (16.0)	72/459 (15.7)	3/462 (0.6)	4/459 (0.9)
BBSA[79]	219	5	Bisoprolol	>3 h	10	Yes	IHD or ≥2 risk factors	1/110 (0.9)	0/109 (0)	0/110 (0)	0/109 (0)
POISE[78]	8351	41	Metoprolol succinate	2–4 h	30	No	IHD or atherosclerosis or major vascular surgery or ≥3 risk factors	129/4174 (3.1)[b]	97/4177 (2.3)	152/4174 (3.6)[c]	215/4177 (5.1)

BBSA = Beta-Blocker in Spinal Anesthesia; DIPOM = Diabetic Postoperative Mortality and Morbidity; IHD = ischaemic heart disease; MaVS = Metoprolol after Vascular Surg
MI = myocardial infarction; POBBLE = PeriOperative Beta-BlockadE; POISE = PeriOperative ISchemic Evaluation.
[a]At 6 months and including in-hospital deaths.
[b]$P = 0.0317$.
[c]$P = 0.0008$.

B Block?: Endpoints important!

POISE Lancet 2008

- 8351 patients
- with/at risk of, atherosclerotic disease
- non-cardiac surgery
- B Block 24 hrs preoperatively – 30 days postop

Metoprolol vs Placebo

MI	4·2% *vs* 5·7%	0·84	p=0·002
Deaths	3·1% *vs* 2·3%	1·33	p=0·03
Stroke	1·0% *vs* 0·5%	2·17	p=0·005
↓BP	15.0% vs. 9.7%		p < 0.0001
Bradycardia	6.6% vs. 2.4%		p < 0.0001

Devereaux

Betablockers 'have caused 800,000 deaths'

At least 800,000 deaths worldwide have been caused by drugs used to cut the risk of a heart attack after surgery, experts have claimed.

By Laura Clout
12:06AM BST 14 May 2008

Patients taking beta blockers, the cornerstone of treatment for heart disease since the 1970s, are a third more likely to die within a month of surgery and twice as likely to suffer a stroke, a study found.

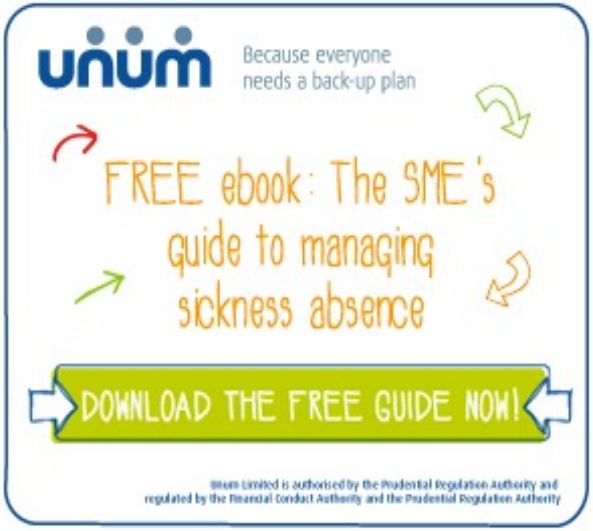
Dr PJ Devereaux, a cardiologist and epidemiologist at McMaster University in Hamilton, Canada, who led the research, which was published in the Lancet, said the drugs had cost more lives than they had saved and their use in surgery patients was based on inadequate research.

Guidelines established in 1996 by the American College of Cardiology recommend that beta blockers be used in all operations, except those on the heart. The advice was adopted worldwide but Dr Devereaux claimed that the guidelines were based on the findings of two small studies.

He said: "On a conservative estimate, if 10 per cent of physicians acted

World News
News »

In World News



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lift rockets 31 floors in 15 seconds

Homeopathy Safe Medicine

Searching for safe medicine. Exposing dangerous drugs and vaccines.

Friday, 31 January 2014

Beta Blockers kill 800,000 patients in 5 years!

"Beta Blocker drugs are well tolerated".

This is what my doctor told me in May 2007, meaning that they have few side-effects or adverse reactions. I wrote a blog about this here in 2010, and this is what I wrote at the time.

"Now, Beta Blockers have been found to cause fatal heart attacks, alongside SSRI drugs like Prozac, and Cox-2 pain-killers (research conducted by University of Rochester, New York, and reported in the magazine What Doctors Don't Tell You, April 2010). So I was being offered the usual ConMed deal - swap an illness with a more serious disease, and perhaps even death".

I declined the 'deal', and fought for homeopathic treatment instead. Now my heart palpitations are a thing of the past. Had I not done so it is more than likely that I would still be taking these drugs.

What concerned me at the time was that the NHS were not telling patients about the DIEs (disease/death inducing effects) of their drugs, or perhaps not even aware of them, even though Beta Blocking drugs had been around since the early 1960's.

"I will leave you to decide which is worse - that they (doctors) know about the DIEs and don't tell us; or they don't know or understand the workings of their own drugs after several decades!

Now, new research (mentioned in this WDDTY article, click here, and taken from the European Heart

Blog Archive

- ▼ 2014 (40)
  - ► May (7)
  - ► April (1)
  - ► March (3)
  - ► February (19)
  - ▼ January (10)
    - Beta Blockers kill 800,000 patients in 5 years!
    - Peanut Allergy Treatment - another success for Hom...
    - Statins. From 'wonder' drug to 'killer' drug?
    - The Ages of Conventional Medical Drugs
    - Mastitis. Why Homeopathy?
    - Menstruation: comparison of conventional and homeo...
    - Child Protection and Medical 'Experts'
    - Hay Fever. Why Homeopathy?
    - "First do no harm". A test Conventional Medicine r...
    - Militant Skepticism and Homeopathy: what do they h

B Block

- Maintain current B Blockade
- Treat concomitant anaemia
- Meta-analysis / prospective studies don't support

- Use in 'high risk' people only
  - Those that may be on B Blockers anyway
  - rCRI >1
- ?Atenolol or Bisoprolol
- Start /titrate to rate of 60-80 bpm
- ?7+ days before

COVID

- COVIDSurg Collaborative, GlobalSurg Collaborative.
  Timing of surgery following SARS- CoV-2 infection
  - Mortality back to baseline if 7+ weeks delay

  Early in the epidemic, International Study (COVID Surg Collaborative Lancet)
  - 1128 adults with a COVID-19 diagnosis having surgery
  - COVID19 + postoperatively in 71·5%
  - 30 day mortality at = 23·8%
  - Others:
    - Chinese studies (Nahshon 2020),
    - UK Orthopaedic (Price 2020)

  Smaller London Study (Kasivisvanathan 2020)
  - 500 adults having planned surgery
  - 2% patients diagnosed with postop COVID-19
  - 0% 30-day mortality from COVID-19

Contents

- Introduction
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- Guidelines: Decisions + Putting it all together
- Which test?
- ECHO
- CPEx
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- Surgery Urgency
- Patient Exercise Capacity
- Surgery Severity
- Patient Specific risks / Comorbidities

?

- Biomarkers

Thank you

For listening

Please Google ‘stephens UCL’ for website

- This full talk
- All Guidelines
- Some References