Best Perioperative Care for AAA Patients

NCEPOD Report

Regents Park College, London

Anthony J Cunningham

Royal College of Surgeons in Ireland

NCEPOD - Changing Medical Practice

- NCEPOD 2001 - Changing the Way We Operate
- NCEPOD 2002 - Functioning as a Team
- NCEPOD 2003 - Who Operates When
- NCEPOD 2004 - Scoping our Practice
- NCEPOD 2005 - An Acute Problem (Medical Admissions into Intensive Care)

NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery

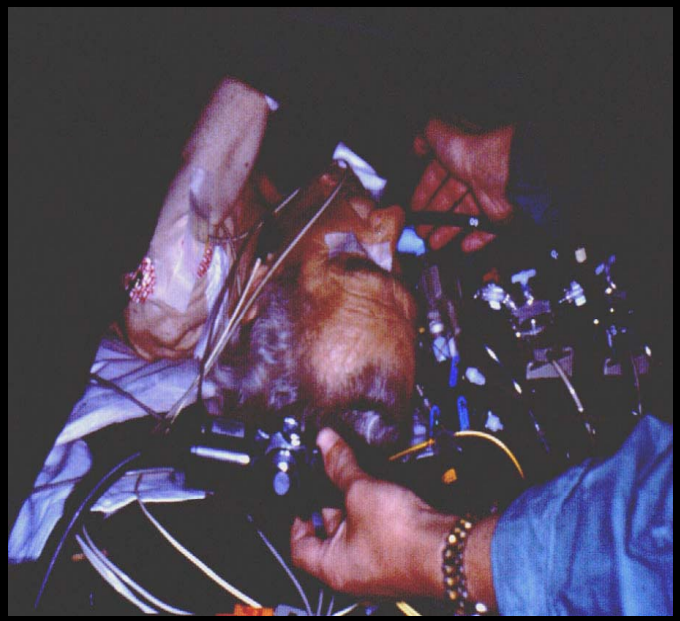
- Vascular Society of Great Britain and Ireland (VSGBI)
- Vascular Anaesthesia Society of Great Britain and Ireland (VASGBI)
- Royal College of Radiologists

Presentation

- Conventional wisdom
  - UK outcome studies
  - Best practice
- NCEPOD
  - Anaesthesia findings
- Limitations of study
- Recommendations
  - Personal reflections

Outcome Following AAA Repair

- Patient factors
  - Age
- Co-existing disease states
  - Cardiac
  - Respiratory
  - Renal
- Surgical factors
  - Elective/Urgent/Rupture
  - AOD vs. AAA
    Open vs. endovascular repair
- Institution case load



Global Haemodynamic Responses to Abdominal Aortic Cross Clamp

Gelman S :Anesthesiology 1995; 82: 1026-60

- Afterload increased

  Arterial pressure SVR
  LVESWS
- Preload Blood volume redistribution
  CVP/PCWP
- Heart rate
- Myocardial contractility

Factors Affecting Haemodynamic Changes

- Pre-existing
  - Blood volume
  - Coronary blood flow
  - LV function
- Surgical
  - Site
  - Duration
  - Metabolic
  - Humeral
- Anaesthetic technique

Global Haemodynamic Responses to Abdominal Aortic Unclamp

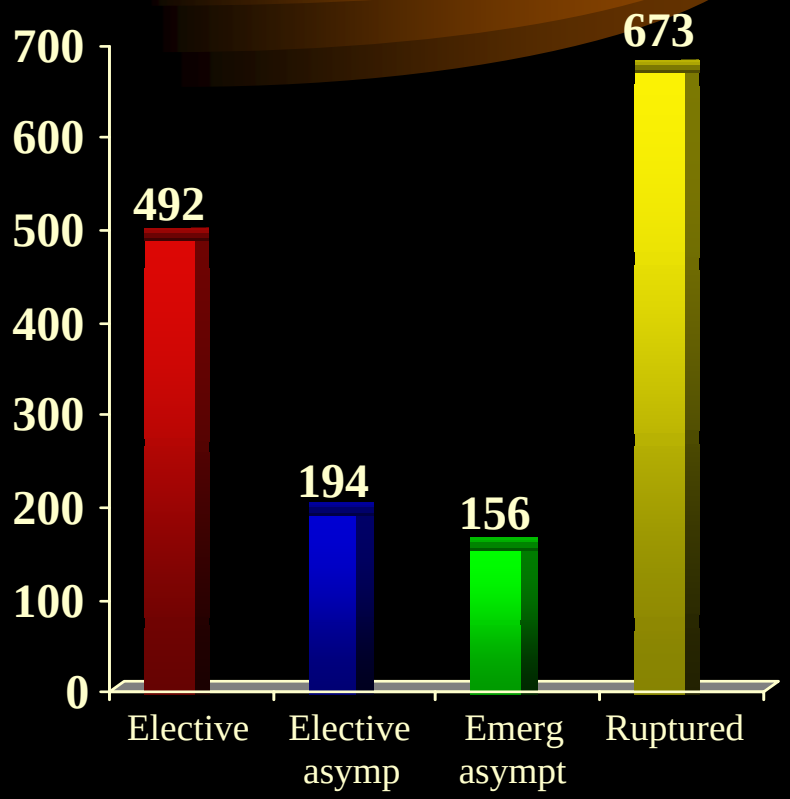
- Reactive hyperaemia
- Decreased arterial pressure
- Decreased systemic vascular resistance
- Decreased left ventricular end-diastolic pressure
- Cardiac output

Br J Surg 1998; 85: 645-7

A 21-year Experience of Abdominal Aortic Aneurysm Operations in Edinburgh

Bradbury AW, Adam DJ, Makhoomi KR et al:

- Infrarenal AAA
- Prospective
- 1976-96
- 1515 patients
- 492 elective asymptomatic
- 194 elective symptomatic
- 156 emerg non-ruptured
- 673 ruptured



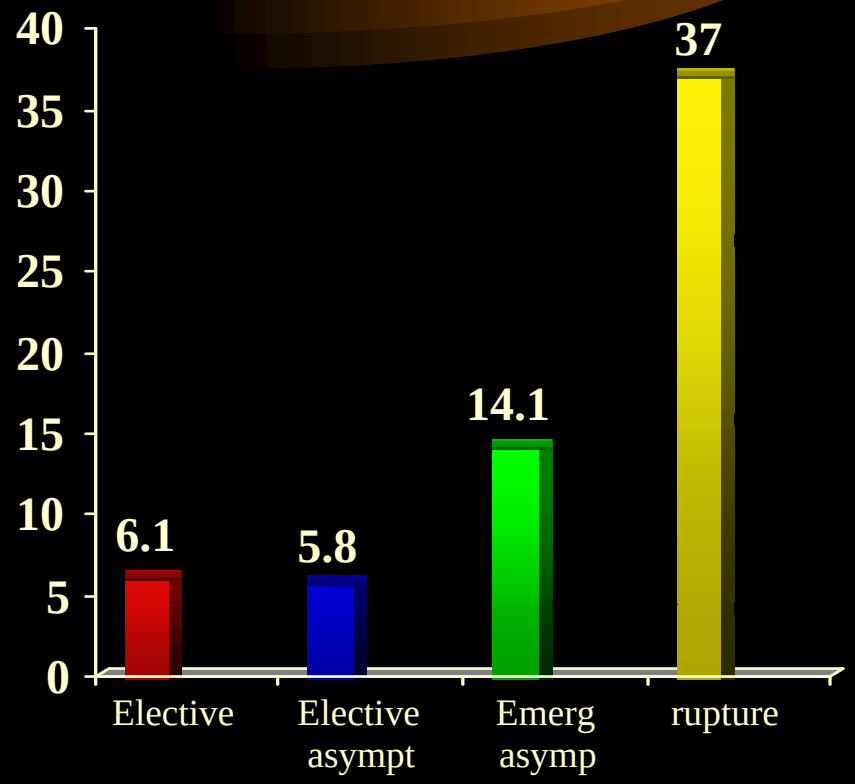
Br J Surg 1998; 85: 645-7

A 21-year Experience of Abdominal Aortic Aneurysm Operations in Edinburgh

Bradbury AW, Adam DJ, Makhoomi KR et al:

30 day mortality

- Elective - 6.1%
- Elective asymp -5.8%
- Emerg asympt -14.1%
- Ruptured -37%
- Increased operative mortality
- Increased patient age
- Increased coexisting disease



Br J Surg 2000 ; 87: 742-9

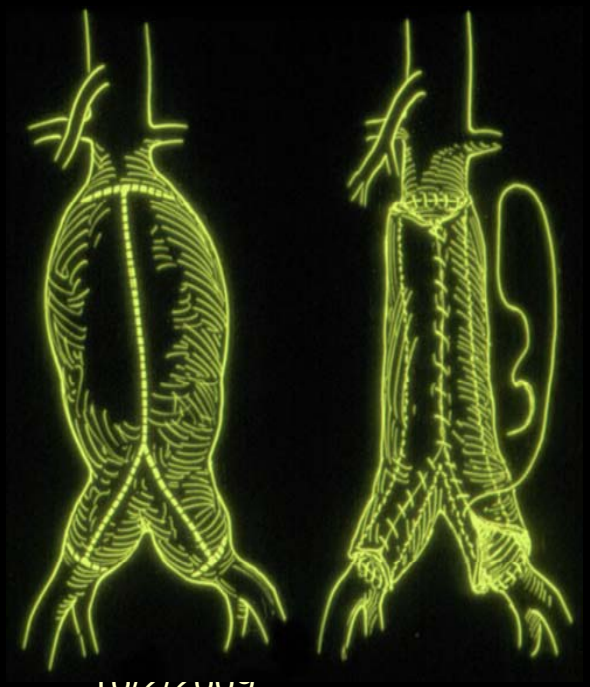
Risk Factors for Postoperative Death Following Elective Surgical Repair of Abdominal Aortic Aneurysm: Results from the UK Small Aneurysm Trial

- MRC Clinical Trials Unit
- Identification of preoperative risk factors
- Elective infra-renal AAA
- 820 patients
- 30 day mortality - 5.6 %
- Mortality related to
  - Age
  - Renal impairment - increased s. creatinine
  - Lung disease - reduced FEV-1

NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery

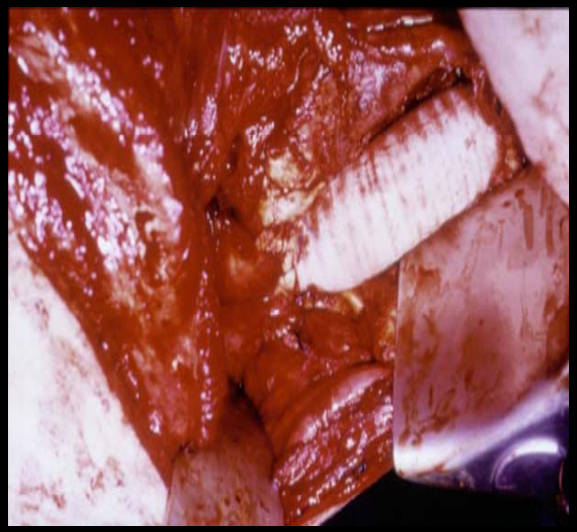
- Population
  - Adults
  - AAA repair
  - Elective/emergency
  - Open/endovascular
- Hospitals
  - England
  - Wales
  - Northern Ireland
- Data Collection
  - 2 months - February / March 2004

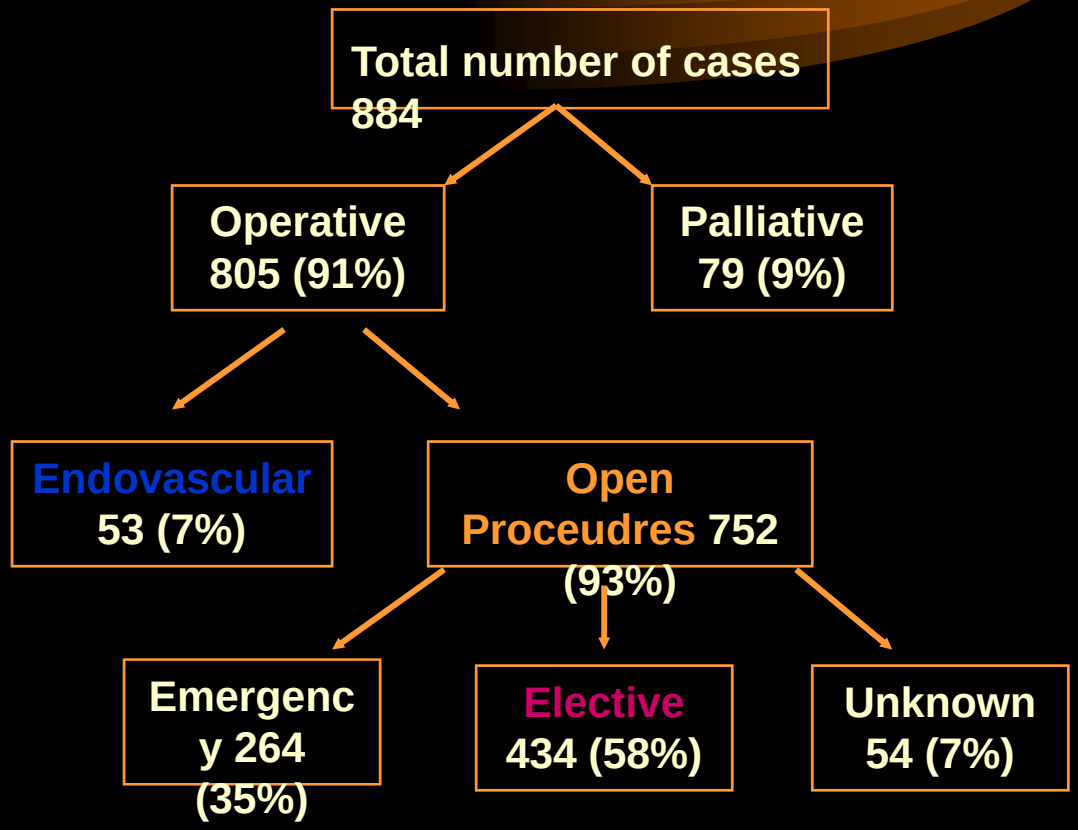
Anaesthesia



- Preoperative
  - Management
    - Beta blockade
    - Statins
    - Investigations
- Intraoperative
  - Personnel
    - Grade
    - VASGBI
  - Management
    - Blood loss
    - Monitoring
    - Vasopressors
- Postoperative
  - EAA
  - Destination

NCEPOD AAA - Findings





Improved Long-term Survival

- Preoperative assessment
  - optimization of medical therapy
- Modification of anaesthetic technique
  - EAA -
  - monitoring into postoperative period
- Prophylactic therapy
  - sympatholytic effects - alpha 2 agonists
  - vasodilators - nitrates / calcium channel entry blockers
  - Control of heart rate - beta blockers
  - Lipid lowering - statins

NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery

- Preoperative Drug Therapy

Beta Blockers

Anesthesiology 1998; 88: 2-5

PROPHYLACTIC ATENOLOL REDUCES POSTOPERATIVE MYOCARDIAL ISCHEMIA.

McSPI Research Group

Arthur Wallace, Beth Layug, Ida Tateo, Juliet Li, Milton Hollenberg, Warren Browner, Denis Mangano
Multicenter Study of Preioperative Ischemia Research Group

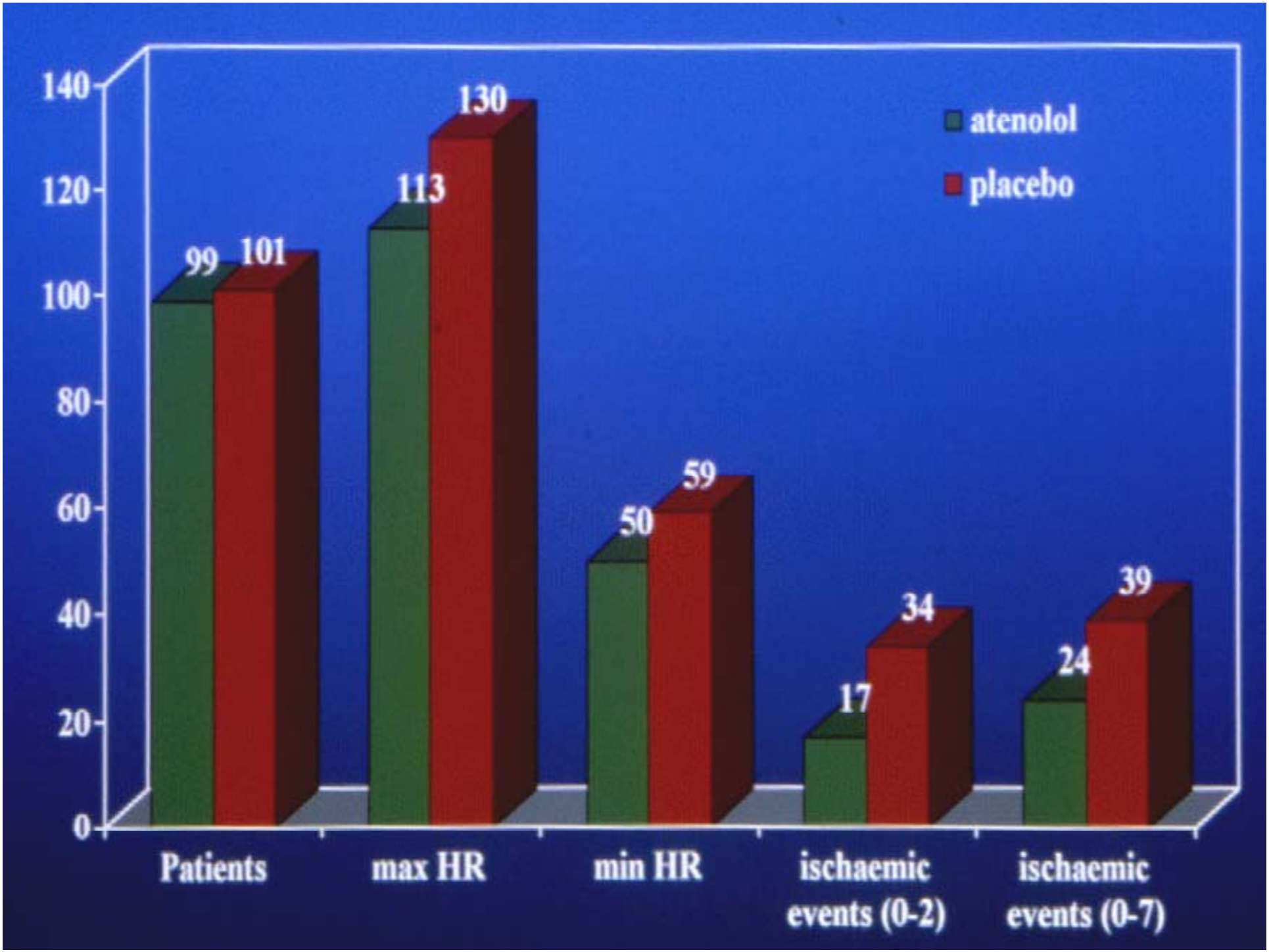
10/2/2009

Prophylactic Atenolol reduces postoperative myocardial ischaemia

Wallace A. et al (McSpi Research Group)

Anesthesiology 1998; 88: 7 - 17.

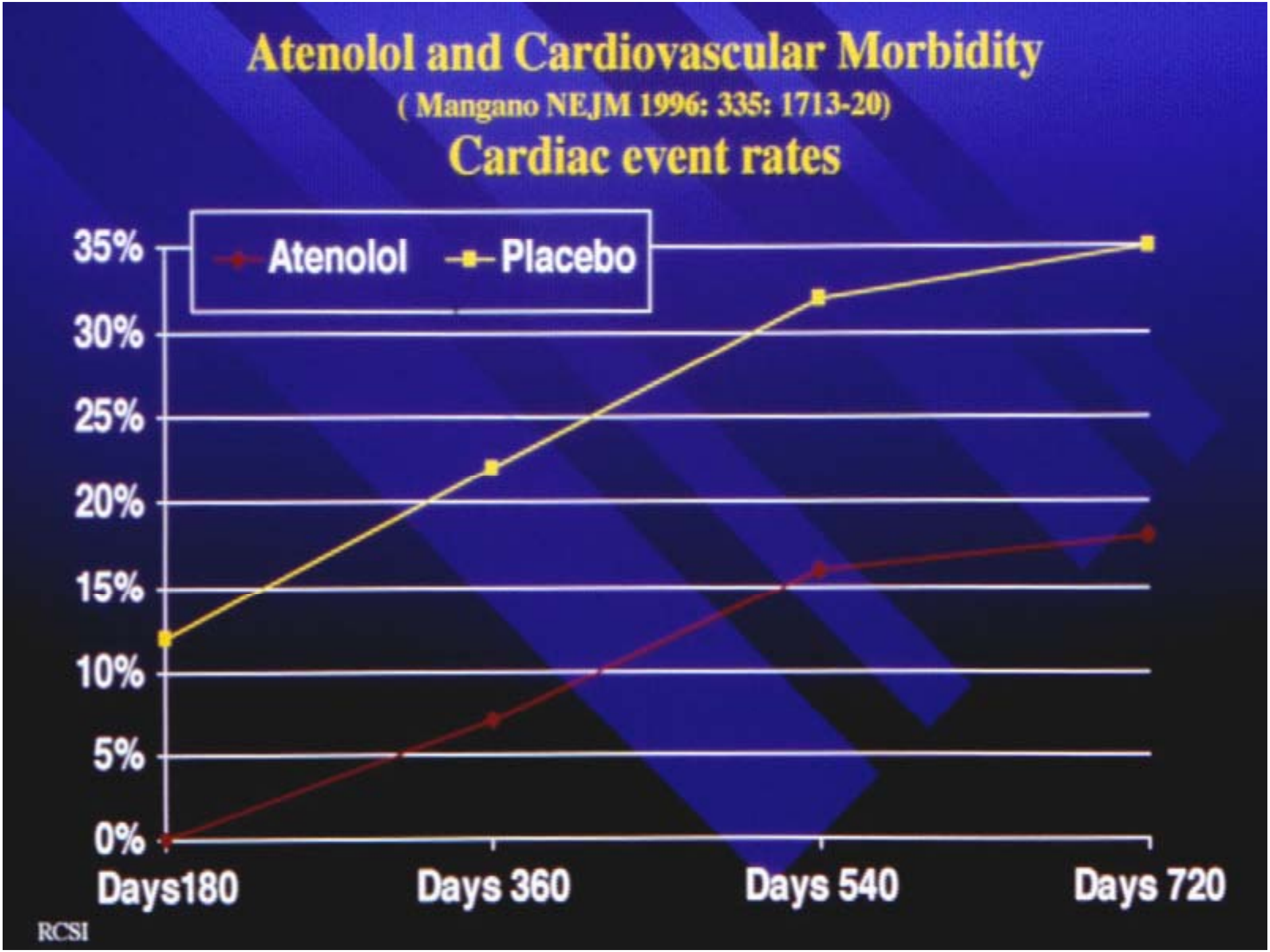
- 200 patients
- elective non cardiac surgery
- coronary artery disease / > 2 risk factors
- Atenolol
  - 5 - 10 mg IV pre op
  - 50 - 100 mg PO post op
- placebo x 7 days


140
120
100
80
60
40
20
0
atenolol
placebo
99
101
113
130
50
59
17
34
24
39
Patients
max HR
min HR
ischaemic events (0-2)
ischaemic events (0-7)

Atenolol and Cardiovascular Morbidity

(Mangano NEJM 1996: 335: 1713-20)

Cardiac event rates



RCSI

Anesthesiology 1998; 88: 2-5

PROPHYLACTIC ATENOLOL REDUCES POSTOPERATIVE MYOCARDIAL ISCHEMIA.

- Patients only followed after discharge
- 4 deaths in hospital group
- 8 patients in placebo group on beta blockers - discontinued
- Placebo group - more severe cardiac disease
- 40% did not tolerate dose

NEJM 1999; 341: 1789-94

The Effect of Bisoprolol on Perioperative Mortality and Myocardial Infarction in High -Risk Patients Undergoing Vascular Surgery

Don Poldermans, Eric Boersma, Ian R Thompson et al and the Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress

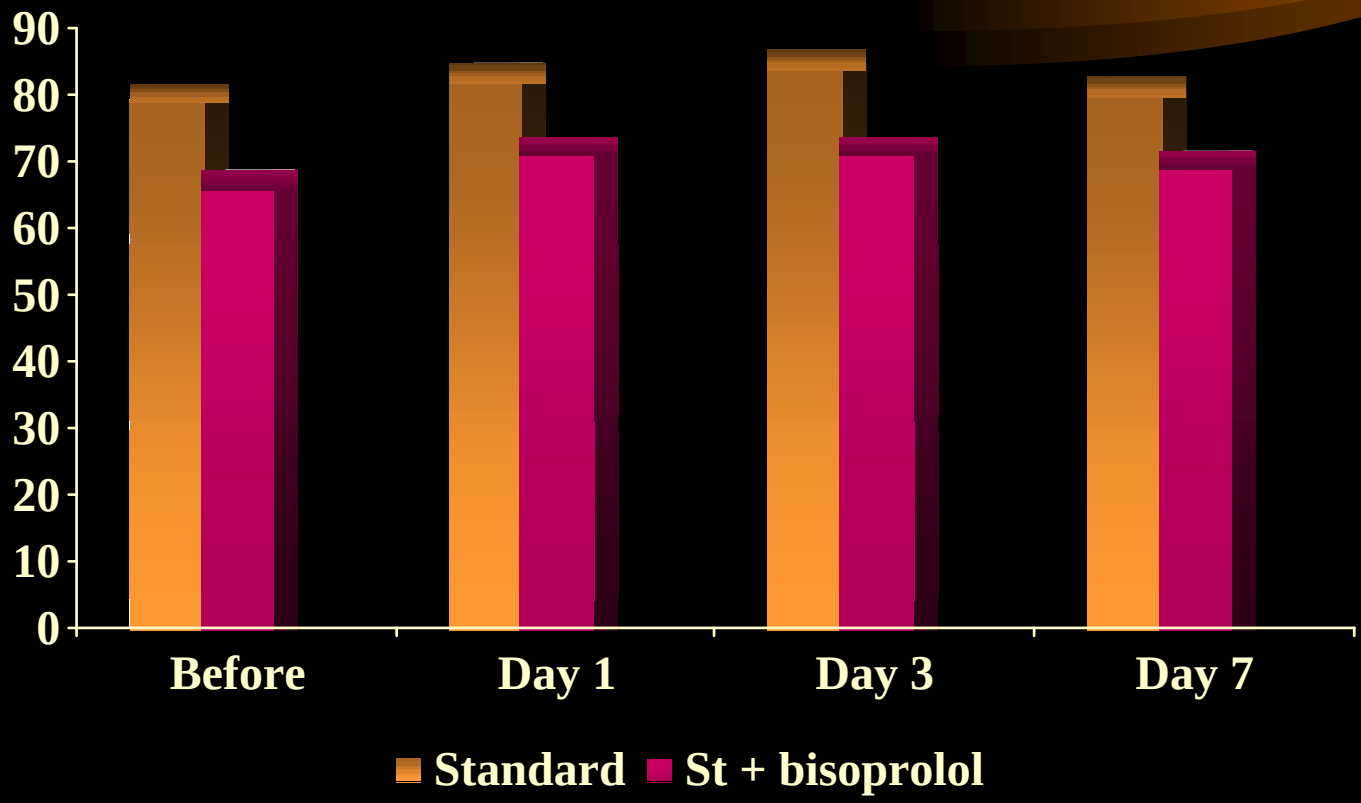
Echocardiography Study

10/2/2009

Study Design

- Prospective 1996-9
- 7 centres
- Elective abdominal aortic or infrainguinal arterial reconstruction
- Clinical risk evaluation
- Dobutamine echocardiography
- Randomized standard perioperative care
- Standard perioperative care + bisoprolol 5 mg oral -1 week
- Heart rate > 60 bpm
- Postoperative 30 days
- 12 lead ECG and CK-MB

Mean Heart Rate



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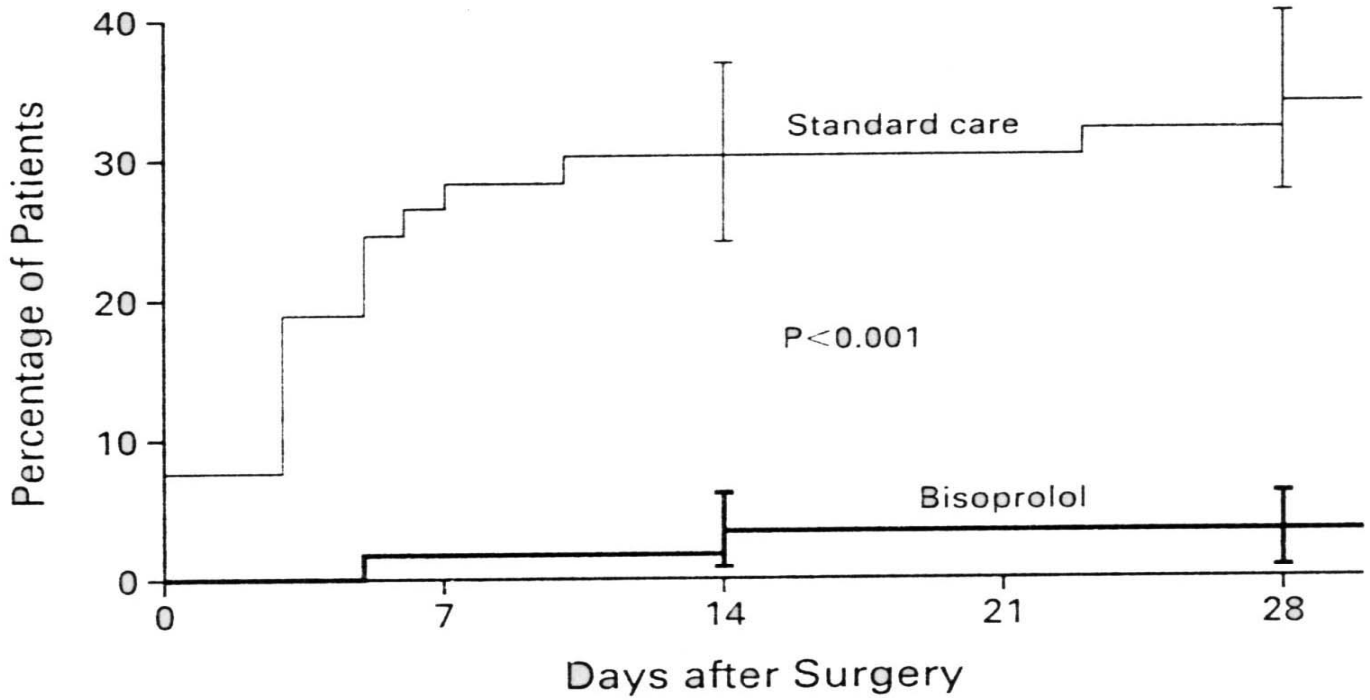
Cardiac Deaths/ Non Fatal MI



No. at Risk					
Standard care	53	38	37	37	35
Bisoprolol	59	58	57	57	57

Figure 1. Kaplan–Meier Estimates of the Cumulative Percentages of Patients Who Died of Cardiac Causes or Had a Nonfatal Myocardial Infarction during the Perioperative Period.

I bars indicate standard errors. The difference between groups was significant ($P<0.001$ by the log-rank test).

NEJM 1999; 341: 1789-94

The Effect of Bisoprolol on Perioperative Mortality and Myocardial Infarction in High -Risk Patients Undergoing Vascular Surgery

- Non blinded
- Highly selected patient population
- Trial terminated early
- High complication rate in placebo
- 80-90% treatment effect - unrealistic?

Preoperative Drug Therapy

- Beta blockade

Elective

Yes - 35%

No - 65%

Emergency

Yes - 26%

No - 74%

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- Preoperative Drug Therapy

Statins

Reduction in Cardiovascular Events after Vascular Surgery with Atorvastatin: A Randomized Trial

Anai E Durazzo, Fabio Machado, Dimas T Ikeoka

J Vasc Surg 2004; 39: 967-76

Lipid - lowering Therapy and In - Hospital Mortality following Major Noncardiac Surgery

Peter K Lindenauer, Penelope Pekow, Kaijun Wang

JAMA 2004; 291: 2092-2099

10/2/2009

Perioperative Drug Therapy

- Statins

Elective

Yes - 53%

No - 47%

Emergency

Yes - 31%

No - 69%

Investigations

- Standard

  History

  Physical examination

  Chest X ray

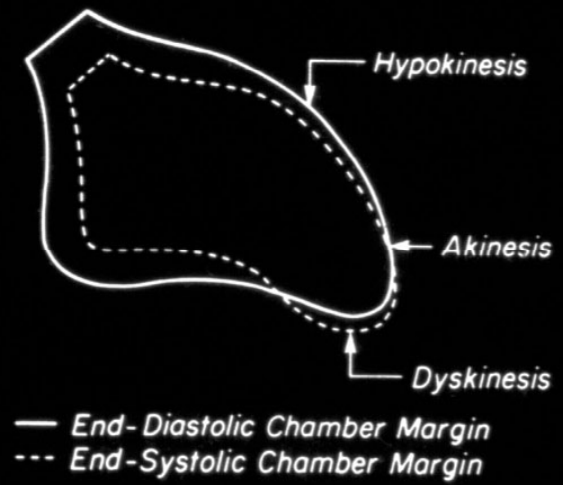
  ECG

- Transthoracic echocardiography

  60%

- Cardiology review

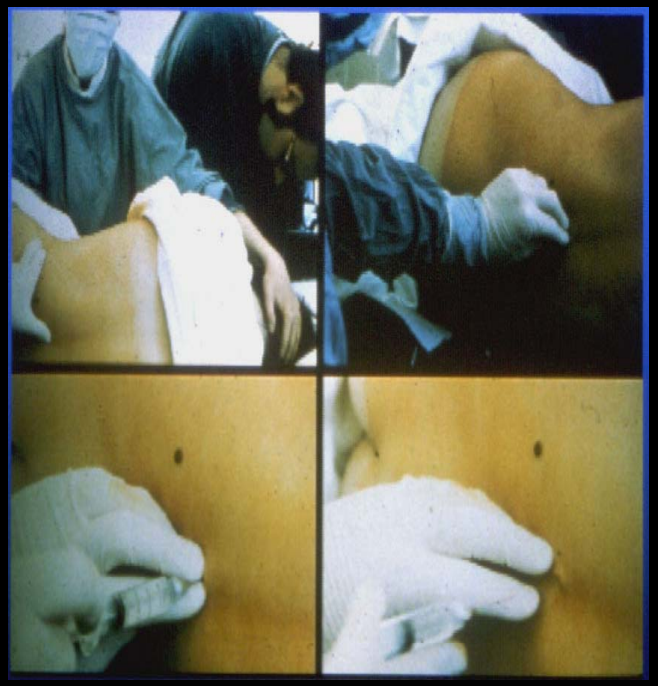
  22%



Intraoperative Factors

- Blood
  - 20% preoperative autologous blood donation
- Cell Saver
  - 55% Intraoperative salvage

Epidural Anaesthesia

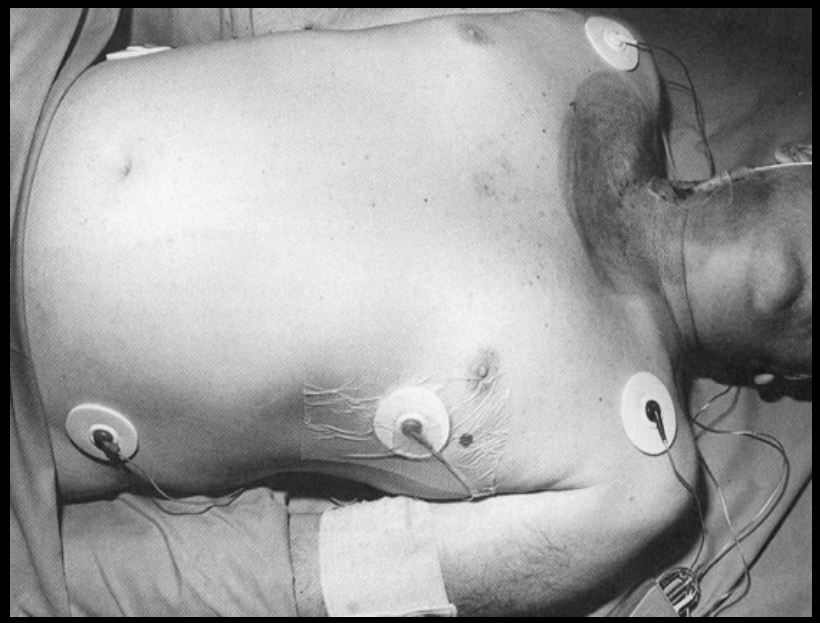


- Elective AAA - 92%
- Emergency - 73%
- ASA therapy - 38%
- Fractionated heparin < 12 hours - 14%

Anaesthetists

- Consultant at start elective open AAA - 93%
- Emergency - 85%
- Audit - 49% no IT or logbook
- < 5 / year - 22% elective
- < 5/ year - 61% emergency

Postoperative



Destination

- Level 3 - ICU - 56%
- Level 2 HDU - 33%
- Recovery - 9%

Ventilated

- Elective - 42%
- Emergency - 78%

NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery ?

Limitations

- Denominator uncertain
- Non contributors 38 - 226 hospitals
- Incomplete data return
- Retrospective
- Descriptive statistical analysis
- No statistical hypothesis testing

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Recommendations

- Service provision
  - Equal priority - diagnosis/investigations/treatment
  - Major elective surgery - all elements in place
  - Concentration in fewer hospitals
- Preoperative care
  - Appropriate grades for preoperative assessment clinics
  - More Level 2 HDU beds - less ICU bed needs and cancellations
- Postoperative care
  - Elelective surgery - level 2 HDU
  - Care of epidural catheters - documentation
- Department organization
  - Logbook IT - audit and appraisal
  - Review list allocation - higher volume elective/emergency

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Mortality rates

Elective open AAA repair - 6.2%

Emergency - 36%

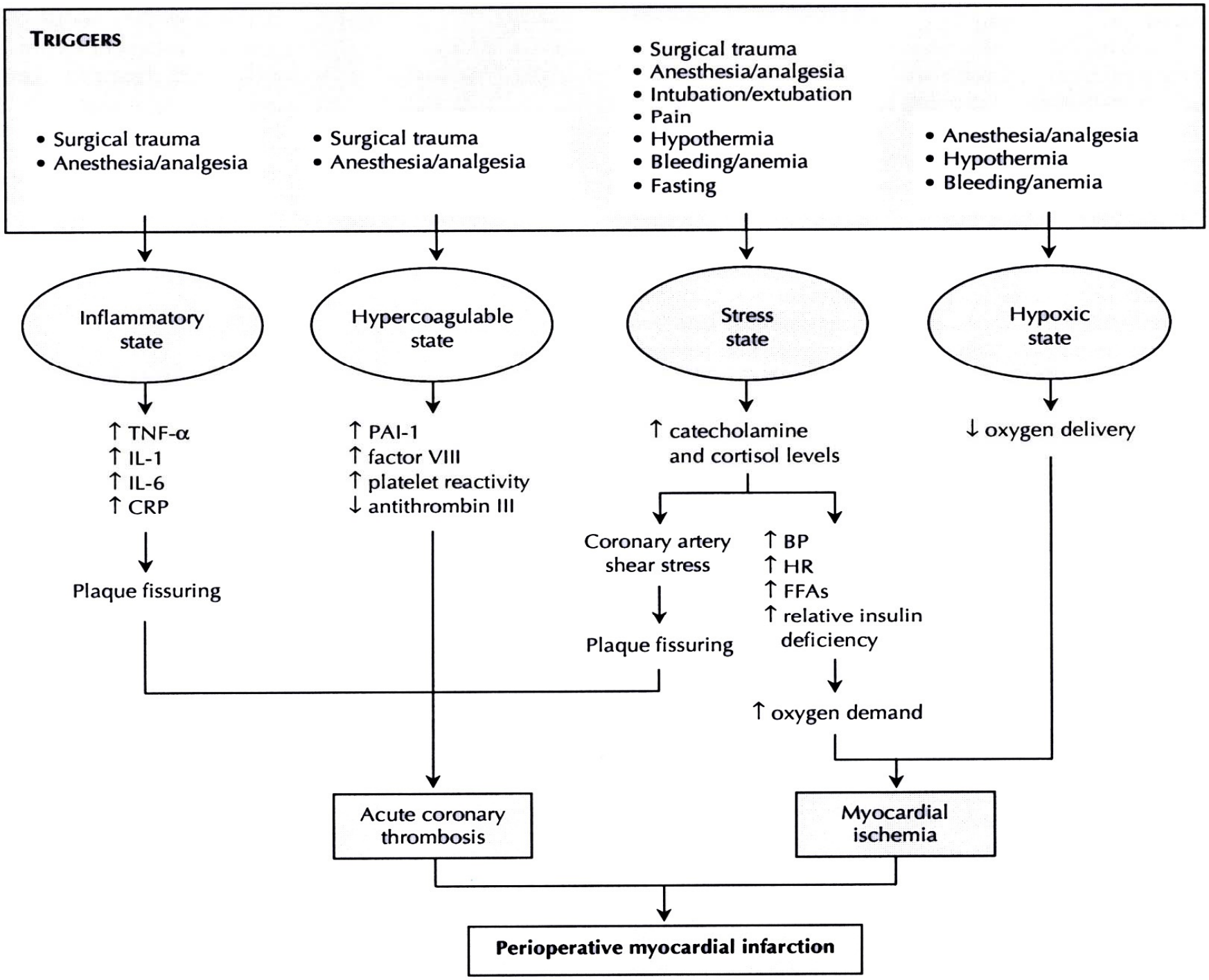
NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery ?

- Preoperative care

  Appropriate grades for preoperative assessment clinics

  More Level 2 HDU beds - less ICU bed needs and cancellations

Patient preparation


TRIGGERS
• Surgical trauma
• Anesthesia/analgesia
• Surgical trauma
• Anesthesia/analgesia
• Surgical trauma
• Anesthesia/analgesia
• Pain
• Hypothermia
• Bleeding/anemia
• Fasting
• Anesthesia/analgesia
• Hypothermia
• Bleeding/anemia
Inflammatory state
Hypercoagulable state
Stress state
Hypoxic state
↑ TNF-α
↑ IL-1
↑ IL-6
↑ CRP
↑ PAI-1
↑ factor VIII
↑ platelet reactivity
↓ antithrombin III
↑ catecholamine and cortisol levels
↓ oxygen delivery
Plaque fissuring
Coronary artery shear stress
Plaque fissuring
↑ BP
↑ HR
↑ FFAs
↑ relative insulin deficiency
↑ oxygen demand
Acute coronary thrombosis
Myocardial ischemia
Perioperative myocardial infarction

B-adrenergic -Blocking Drugs. (Editorial)

Incredibly Useful, Incredibly Undereutilized

Anesthesiology 1998; 88:2-4

- Attenuates endogenous sympathetic activity
- Decreases heart rate
- Improves myocardial O_2 supply/demand
- Redistribution of myocardial blood flow
- Increases subendocardial perfusion
- Anti-ischaemic properties

- Misrepresentation risk/benefit
- Bradycardia
- Conduction defects
- Reactive airways
- Peripheral vascular disease

How strong is the evidence for the use of perioperative B blockers in non-cardiac surgery? Systemic review and meta-analysis of randomised controlled trials.

PJ Devereaux, W Scott Beattie, Peter T-L Choi

BMJ 2005

Study or sub-category	β blocker (n/N)	Control (n/N)	Weight (%)	Relative risk (99% CI)
Jakobsen 1997[30]	1/18	0/18	5.29	3.00 (0.05 to 185.13)
Wallace[31]	3/99	5/101	16.38	0.61 (0.10 to 3.88)
Bayliff[32]	2/49	3/50	12.74	0.68 (0.07 to 6.74)
Poldermans[33]	2/59	18/53	16.27	0.10 (0.02 to 0.64)
Raby[34]	0/15	1/11	5.36	0.25 (0.00 to 14.93)
Zaugg[35]	0/43	3/20	5.98	0.07 (0.00 to 3.15)
Urban[36]	1/60	3/60	9.08	0.33 (0.02 to 6.29)
Yang[37]	19/246	22/250	28.90	0.88 (0.41 to 1.90)
Total	589	563	100.00	0.44 (0.16 to 1.24)

Total events: 28 (β blocker), 55 (control)

Test for heterogeneity: χ^2=12.07, df=7, P=0.10, I^2=42.0%

Test for overall effect: z=2.05, P=0.04

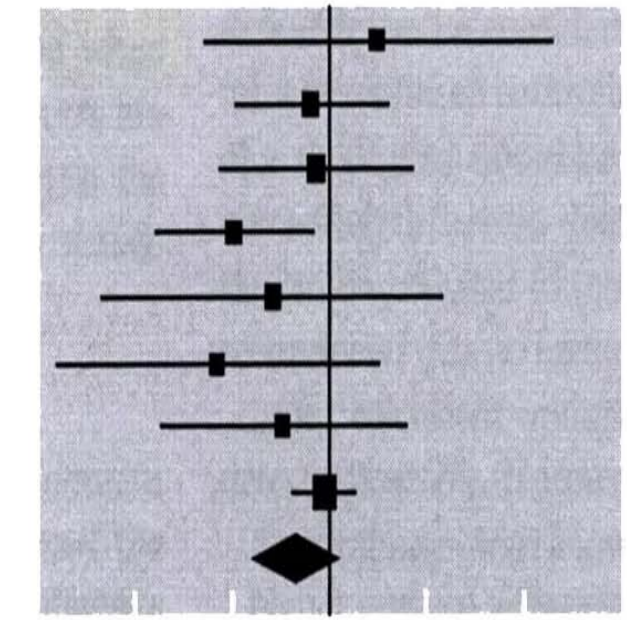


Fig 3 Relative risks for major perioperative cardiovascular events (cardiovascular death, non-fatal myocardial infarction, or non-fatal cardiac arrest)

How strong is the evidence for the use of perioperative B blockers in non-cardiac surgery? Systemic review and meta-analysis of randomised controlled trials.

PJ Devereaux, W Scott Beattie, Peter T-L Choi

BMJ 2005

- ***" The evidence that perioperative B blockers reduce major cardiovascular events is encouraging but too unreliable to allow definitive conclusions to be drawn"***

Statins decrease perioperative cardiac complications in patients undergoing noncardiac vascular surgery.

Kristin o'Neil- Callahan, George Katsimaglis, Michah Tepper

J Am Coll Cardiol 2005; 45: 336-42

- ***" Use of statins was highly protective (9.9% vs 16.5 % controls) against perioperatice cardiac complications in this retrospective study of 1,163 patients."***

Effect of Clonidine on Cardiovascular Morbidity and Mortality after Noncardiac Surgery

Arthur Wallace, Daniel Galindez, Ali Salahieh

Anesthesiology 2004; 101: 284-93

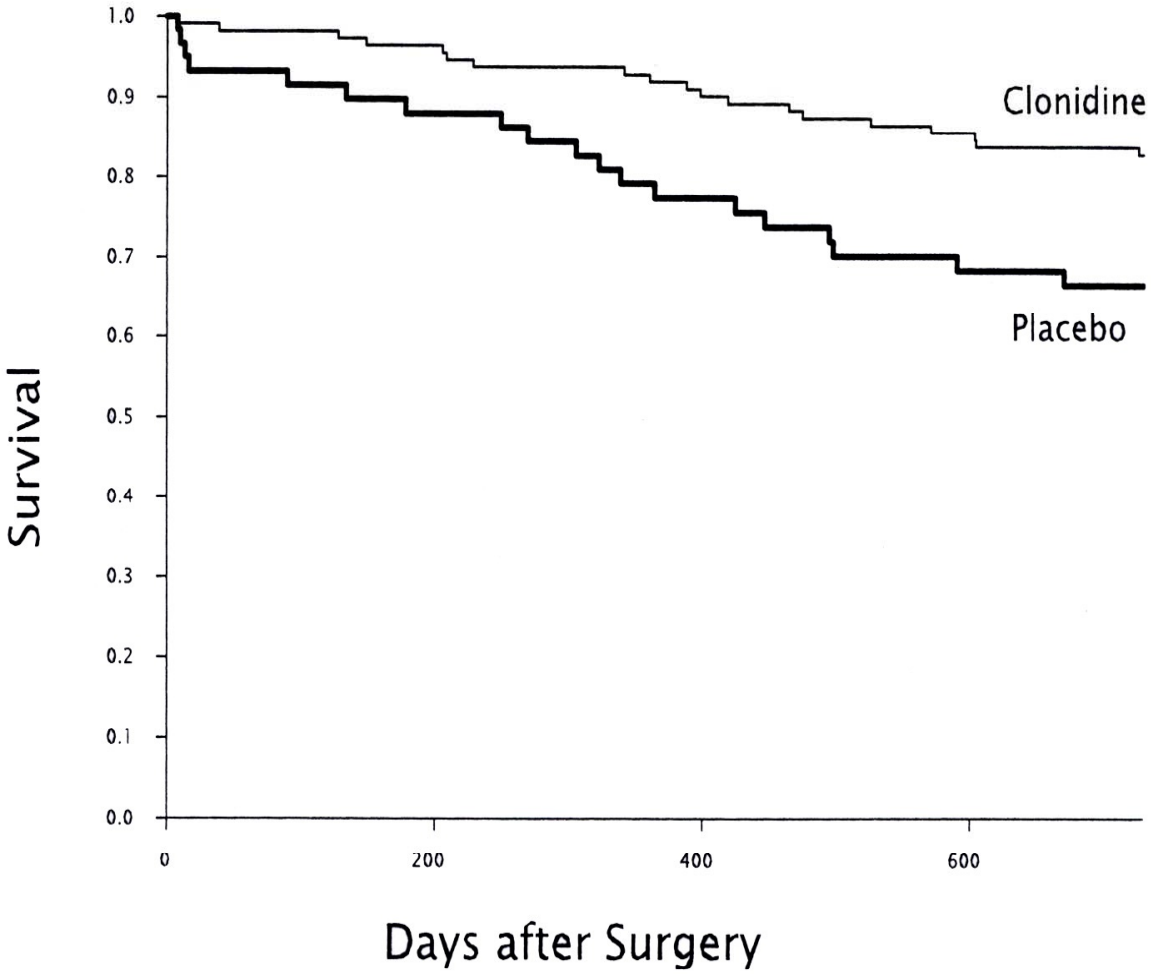


Fig. 1. Survival for clonidine-treated *versus* placebo-treated patients. Survival curves for 2 yr after surgery for patients treated with clonidine (n = 125) and placebo (n = 65). Clonidine reduced the incidence of death ($P = 0.01$ by log-rank test and $P = 0.01$ by Wilcoxon test).

NCEPOD 2005 - Abdominal Aortic Aneurysm: A Service in Need of Surgery ?

Consolidation and Development of Expertise

- Preoperative care

  Preoperative assessment clinics - patient preparation

  Service provision

  Concentration in fewer hospitals

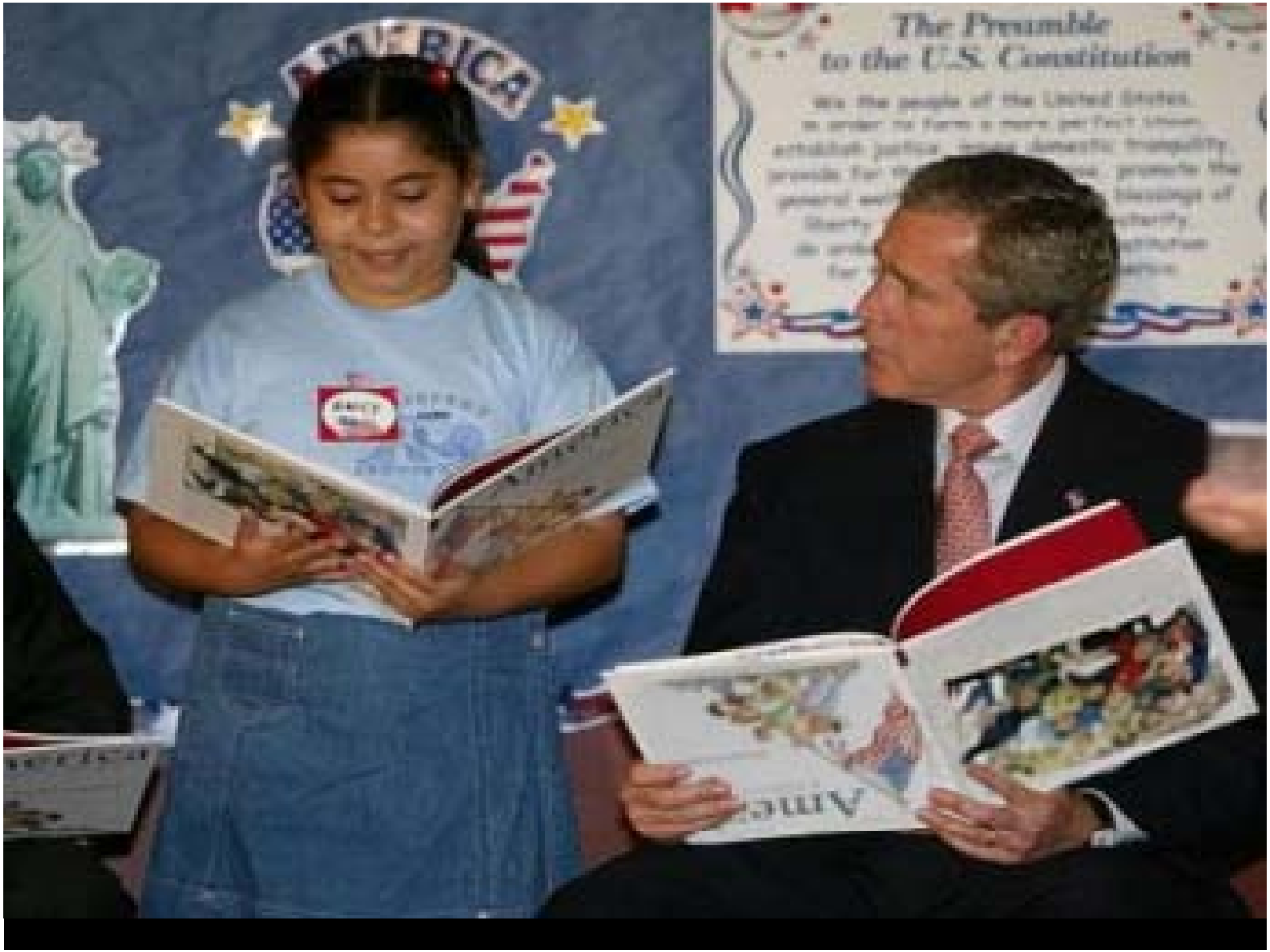
- Postoperative care

  Elelective surgery - level 2 HDU

- Department organization

  Review list allocation - higher volume elective/emergency


SANTA CLAUS
1836 - 2000


The Preamble
to the U.S. Constitution