



University
of Glasgow



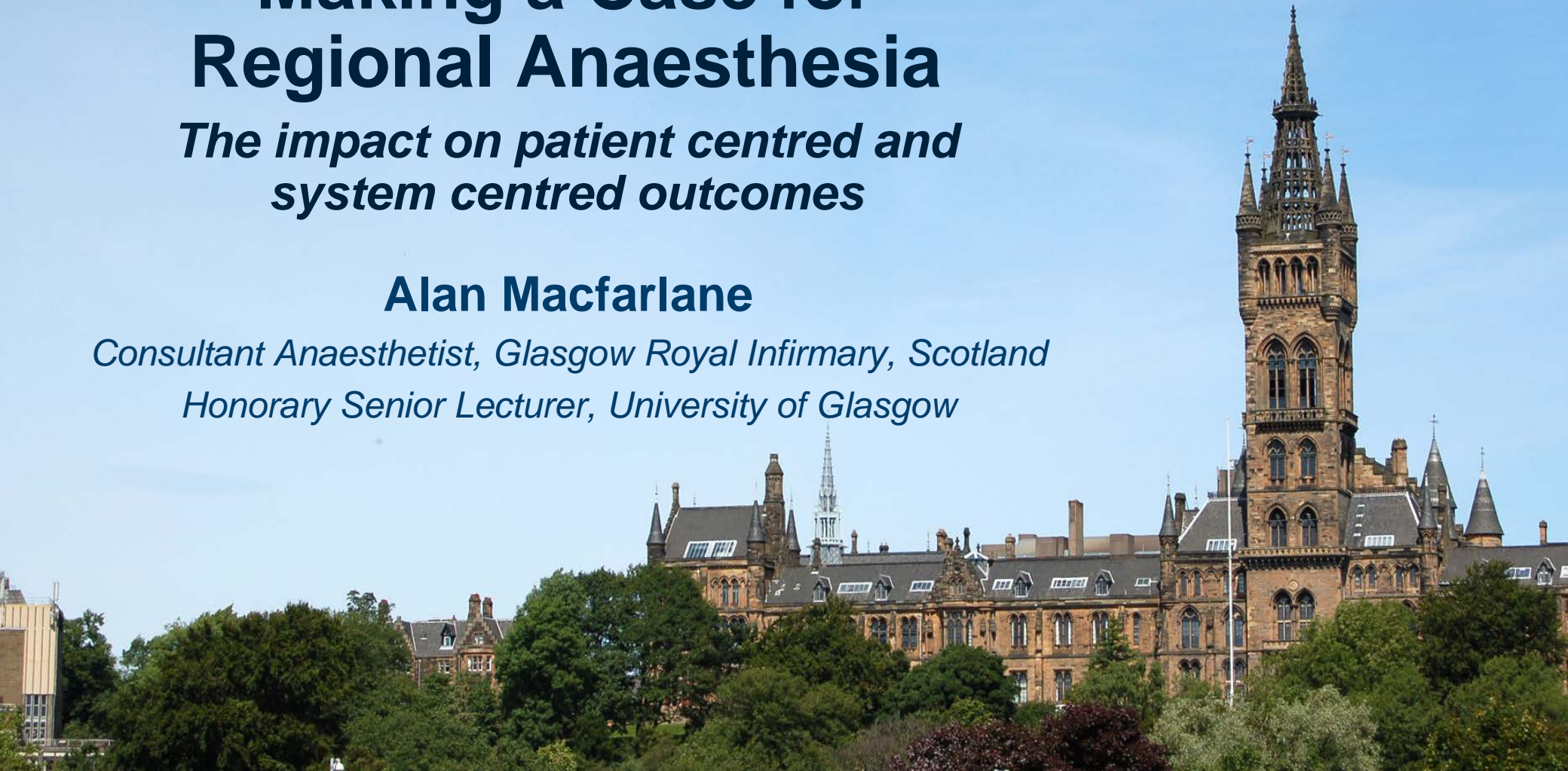
Making a Case for Regional Anaesthesia

*The impact on patient centred and
system centred outcomes*

Alan Macfarlane

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Honorary Senior Lecturer, University of Glasgow





Disclosures

Consulting fees : Heron Therapeutics



Outcomes and RA



Risk vs benefit



Variables



Variables

- **GA vs RA**



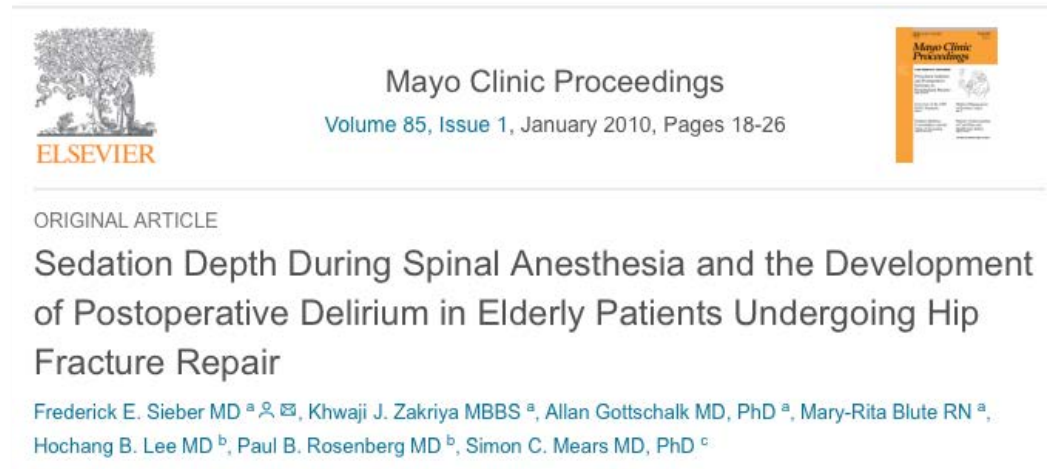
- **GA vs RA**



- **GA vs RA**

BIS

- Approx 50
- Delirium 40%



BIS

- ≥ 80
- Delirium 19%

• GA vs RA

Sedation Depth During Spinal Anesthesia and Survival in Elderly Patients Undergoing Hip Fracture Repair

Charles H. Brown IV, MD MHS,* Andrew S. Azman, MS,† Allan Gottschalk, MD, PhD,* Simon C. Mears, MD, PhD,* and Frederick E. Sieber, MD*

Anesth Analg 2014;118:977–80



Mayo Clinic Proceedings
Volume 85, Issue 1, January 2010, Pages 18-26



ORIGINAL ARTICLE

Sedation Depth During Spinal Anesthesia and the Development of Postoperative Delirium in Elderly Patients Undergoing Hip Fracture Repair

Frederick E. Sieber MD ^a, Khwaji J. Zakriya MBBS ^a, Allan Gottschalk MD, PhD ^a, Mary-Rita Blute RN ^a, Hochang B. Lee MD ^b, Paul B. Rosenberg MD ^b, Simon C. Mears MD, PhD ^c

BIS

- Approx 50
- Delirium 40%

BIS

- ≥ 80
- Delirium 19%

- **GA vs RA**
- ***GA+RA* vs GA alone**



- **GA vs RA**
- ***GA+RA* vs GA alone**
- **Regional anaesthesia**
 - » Neuraxial versus PNB
 - » Nerve localisation
 - » Operator
 - » Dose



- **Multiple variables**
 - (Anaesthetic)
 - Patient
 - Procedure

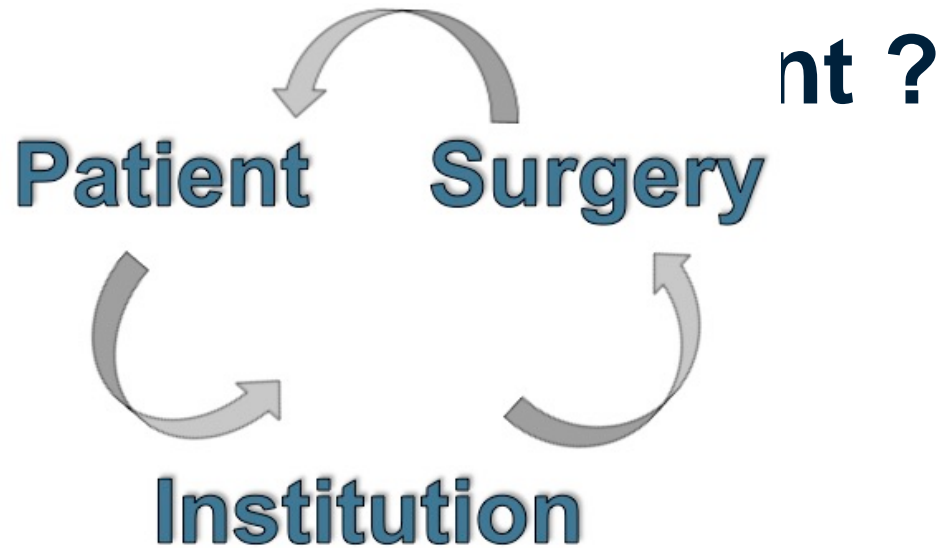
- **Multiple variables**
 - (Anaesthetic)
 - Patient
 - Procedure specific
- **Serious adverse events are rare**

Outcomes

- **What outcomes are important ?**



- **What outcomes?**
- Patient centred
- Surgical/function
- Institutional

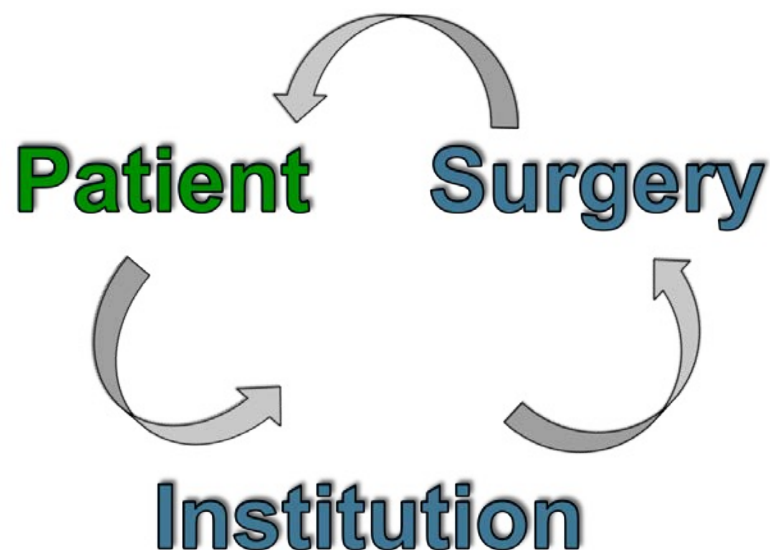


Regional anaesthesia and outcomes

M. Hutton¹ R. Brull² and A.J.R. Macfarlane^{1,*}

¹Department of Anaesthesia, Glasgow Royal Infirmary, 84 Castle Street, Glasgow, UK and ²Women's College Hospital, Toronto, Canada

Outcomes



Regional anaesthesia and outcomes

M. Hutton¹ R. Brull² and A.J.R. Macfarlane^{1,*}

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Outcomes - patient

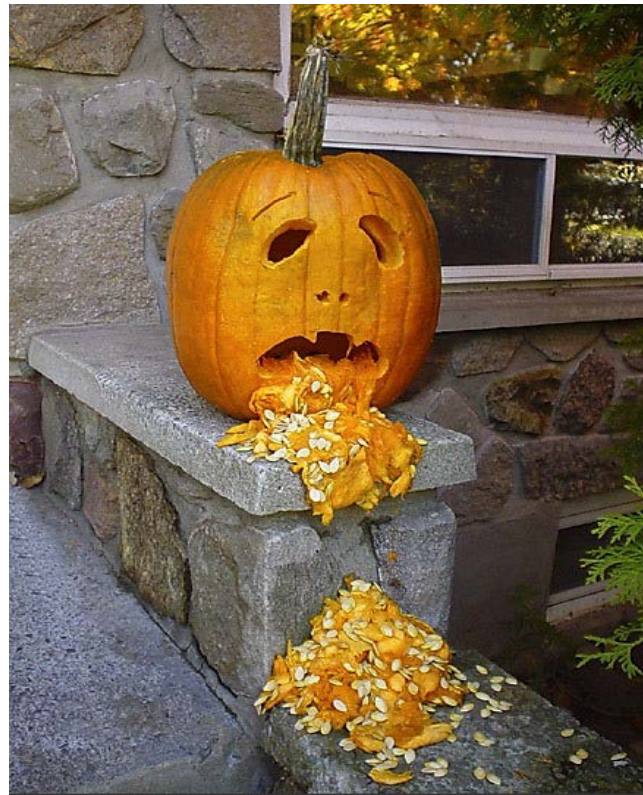
- **Pain ?**
 - Acute



opioids

Outcomes - patient

- **Pain ?**
 - Acute



opioids

Rebound pain

Outcomes - patient

- **Pain**
 - Acute
 - Chronic ?
 - Procedure specific



Outcomes - patient

- **Pain**
 - Acute
 - Chronic ?
 - Procedure specific



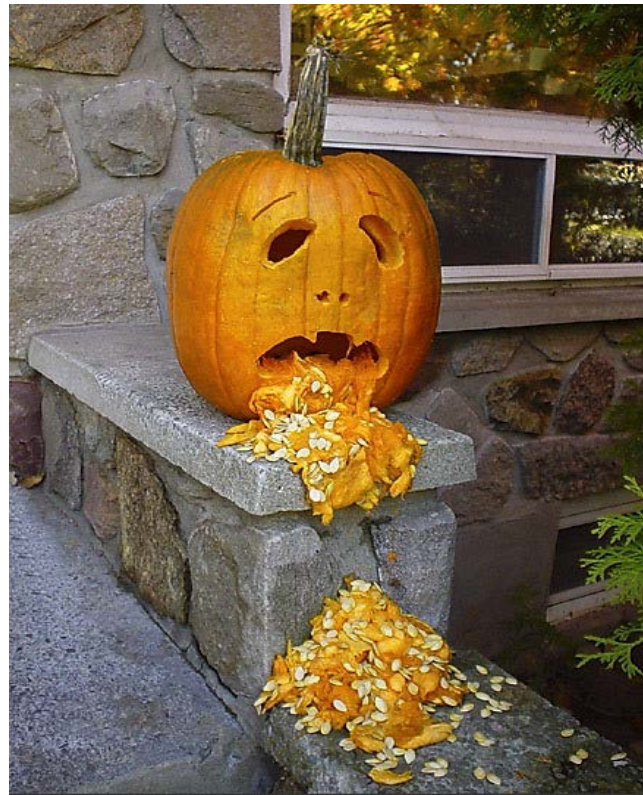
Local anaesthetics and regional anaesthesia versus conventional analgesia for preventing persistent postoperative pain in adults and children (Review)

Weinstein EJ, Levene JL, Cohen MS, Andreae DA, Chao JY, Johnson M, Hall CB, Andreae MH

Cochrane Database of Systematic Reviews 2018, Issue 4. Art. No.: CD007105.

Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV ?**



Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV**
- **Cognitive recovery ?**



Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV**
- **Cognitive recovery**
 - Delirium
 - POCD

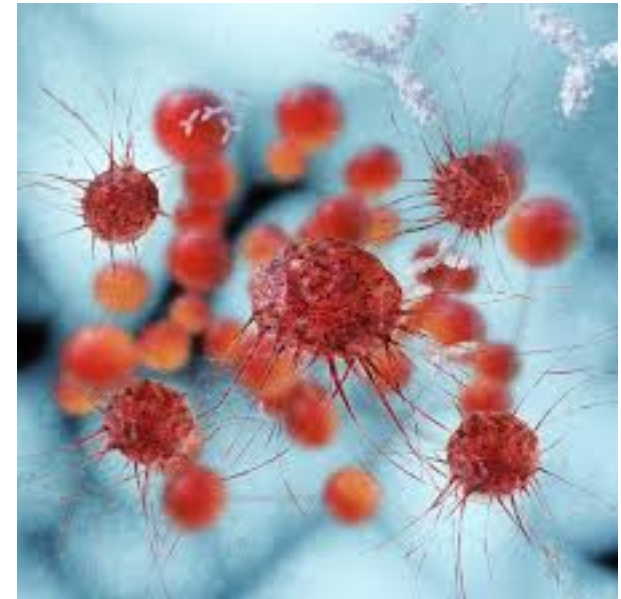


Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV**
- **Cognitive recovery**

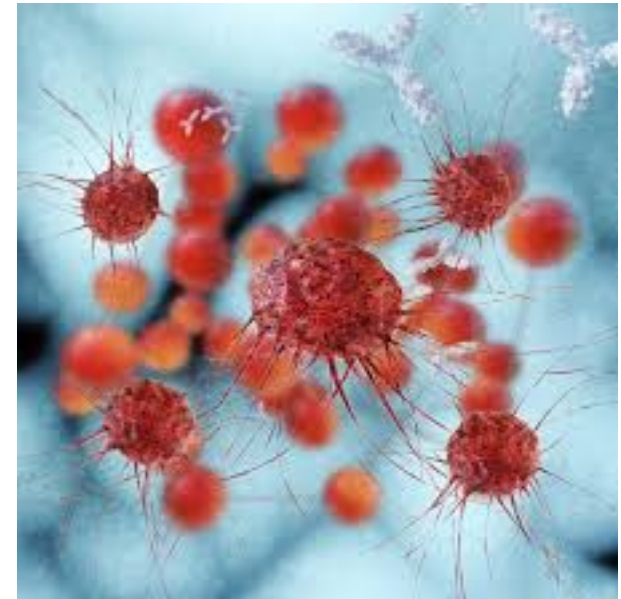
Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV**
- **Cognitive recovery**
- **Cancer recurrence ?**



Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV**
- **Cognitive recovery**
- **Cancer recurrence ?**



***Volatiles have a negative effect
on immune function***

Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV**
- **Cognitive recovery**
- **Cancer recurrence ?**

ClinicalTrials.gov

A service of the U.S. National Institutes of Health

Estimated Enrollment:	1100
Study Start Date:	January 2007
Estimated Study Completion Date:	March 2019

Outcomes - patient

- **Pain**
 - Acute
 - Chronic
- **PONV**
- **Cognitive recovery**
- **Cancer recurrence**
- **Morbidity and Mortality ?**

- **How to study ?**
 - RCTs
 - Meta-analysis
 - Retrospective databases
 - Prospective databases/registries

- **How to study ?**
 - RCTs
 - Meta-analysis
 - Retrospective databases
 - Prospective databases/registries

- **How to study ?**
 - RCTs – too small for mortality
 - Meta-analysis
 - Retrospective databases
 - Prospective databases/registries

- **How to study ?**
 - RCTs
 - **Meta-analysis**
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- **How to study ?**
 - RCTs
 - **Meta-analysis**
 - Retrospective databases
 - Prospective databases/registries



SURVEY (SYSTEMATIC REVIEW)

Does Regional Anaesthesia Improve Outcome After Total Knee

Neuraxial vs general anaesthesia for total hip and total knee arthroplasty: a systematic review of comparative-effectiveness research

R. L. Johnson*, S. L. Kopp, C. M. Burkle, C. M. Duncan, A. K. Jacob, P. J. Erwin, M. H. Murad and C. B. Mantilla

Does regional anaesthesia improve outcome after total hip arthroplasty? A systematic review

A. J. R. Macfarlane^{1 2}, G. A. Prasad¹, V. W. S. Chan¹ and R. Brull^{1*}

British Journal of Anaesthesia, 116 (2): 163–76 (2016)

- **How to study ?**
 - RCTs
 - Meta-analysis
 - Retrospective databases
 - Prospective databases/registries

- **How to study ?**
 - RCTs
 - Meta-analysis
 - Retrospective databases
 - **Prospective databases/registries**

Neuraxial and Combined Neuraxial/General Anesthesia Compared to General Anesthesia for Major Truncal and Lower Limb Surgery: A Systematic Review and Meta-analysis

Lauren M. Smith, MD,* Crispiana Cozowicz, MD,†‡ Yoshiaki Uda, MBBS, FANZCA,*
Stavros G. Memtsoudis, MD, PhD,†‡ and Michael J. Barrington, MBBS, FANZCA, PhD*§

(Anesth Analg 2017;125:1931–45)

- **Over 1 million patients**
- Contemporary data – *2010-2016*
 - » GA versus central neuraxial block
 - » GA *and* central neuraxial block vs GA alone
 - » *All operations combined*

No difference in mortality

Neuraxial and Combined Neuraxial/General Anesthesia Compared to General Anesthesia for Major Truncal and Lower Limb Surgery: A Systematic Review and Meta-analysis

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Stavros G. Memtsoudis, MD, PhD,†‡ and Michael J. Barrington, MBBS, FANZCA, PhD*§

(Anesth Analg 2017;125:1931–45)

- **CNB+GA vs GA** *reduced*
 - Pulmonary complications (OR 0.84)
 - Thromboembolic events (OR 0.84)
 - Blood loss (OR 0.90)
 - Surgical site infections (OR 0.93)
 - Length of stay (-0.16 days)
 - ICU admissions (OR 0.77)

Neuraxial and Combined Neuraxial/General Anesthesia Compared to General Anesthesia for Major Truncal and Lower Limb Surgery: A Systematic Review and Meta-analysis

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Stavros G. Memtsoudis, MD, PhD,†‡ and Michael J. Barrington, MBBS, FANZCA, PhD*§

- **CNB alone vs GA *reduced***
 - Pulmonary complications (OR 0.84) (OR 0.38)
 - Thromboembolic events (OR 0.84) (OR 0.79)
 - Blood loss (OR 0.90) (OR 0.85)
 - Surgical site infections (OR 0.93) (OR 0.76)
 - Length of stay (-0.16 days) (OR 0.29)
 - ICU admissions (OR 0.77) (OR 0.50)

Neuraxial and Combined Neuraxial/General Anesthesia Compared to General Anesthesia for Major Truncal and Lower Limb Surgery: A Systematic Review and Meta-analysis

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 - Length of stay (-0.16 days) (OR 0.29)
 - ICU admissions (OR 0.77) (OR 0.50)



Anesthesia Technique and Mortality after Total Hip or Knee Arthroplasty

A Retrospective, Propensity Score-matched Cohort Study

Anahi Perlas, M.D., F.R.C.P.C., Vincent W. S. Chan, M.D., F.R.C.P.C., F.R.C.A.,
Scott Beattie, M.D., F.R.C.P.C.

Anesthesiology 2016; 125:724-31

- 10868 patients
 - 2003 to 2014
 - *Less morbidity and mortality with CNB vs GA*

NNT of 164

Neuraxial and Combined Neuraxial/General Anesthesia Compared to General Anesthesia for Major Truncal and Lower Limb Surgery: A Systematic Review and Meta-analysis

Lauren M. Smith, MD,* Crispiana Cozowicz, MD,†‡ Yoshiaki Uda, MBBS, FANZCA,*
Stavros G. Memtsoudis, MD, PhD,†‡ and Michael J. Barrington, MBBS, FANZCA, PhD*§

(Anesth Analg 2017;125:1931–45)

- **Increased odds of MI in combined GA/CNB**
 - **OR 1.184** (99% CI 1.01 - 1.37)
 - No difference in overall mortality

British Journal of Anaesthesia 111 (3): 382–90 (2013)
Advance Access publication 23 April 2013 · doi:10.1093/bja/aet120

BJA

CLINICAL PRACTICE

Neuraxial block, death and serious cardiovascular morbidity in the POISE trial†

K. Leslie^{1,2*}, P. Myles^{4,5,7}, P. Devereaux^{8,9,10}, E. Williamson^{3,6}, P. Rao-Melancini¹¹, A. Forbes⁶, S. Xu¹², P. Foex¹³, J. Pogue¹¹, M. Arrieta^{14,15}, G. Bryson¹⁶, J. Paul¹⁷, M. Paech^{18,19}, R. Merchant²⁰, P. Choi^{21,22}, N. Badner²³, P. Peyton^{24,25}, J. Sear¹³ and H. Yang²⁶

Peripheral nerve blocks ?

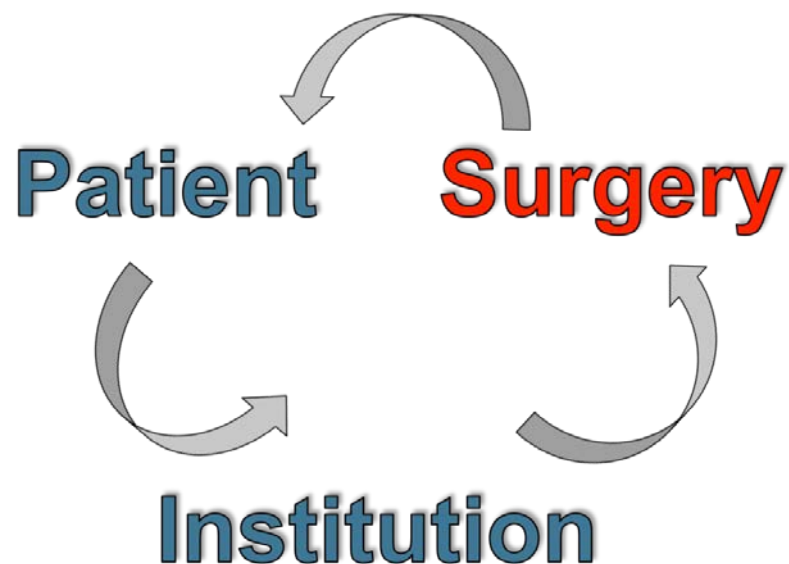
Peripheral nerve blocks ?

PAIN[®]

The impact of peripheral nerve blocks on perioperative outcome in hip and knee arthroplasty—a population-based study

Stavros G. Memtsoudis^{a,b,c,*}, Jashvant Poeran^{d,e}, Crispiana Cozowicz^{b,c}, Nicole Zubizarreta^d, Umut Ozbek^d, Madhu Mazumdar^d

Outcomes



Regional anaesthesia and outcomes

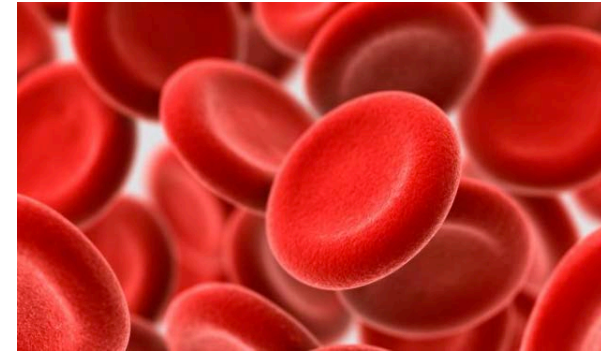
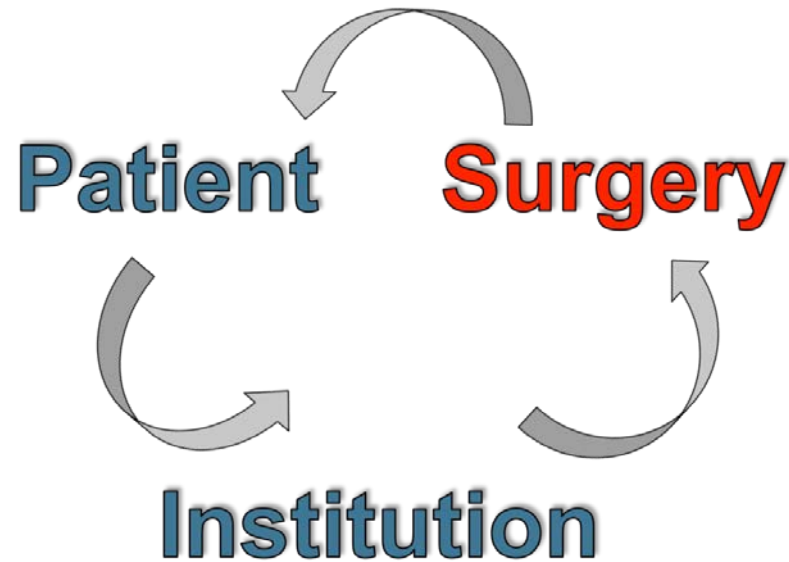
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¹Department of Anaesthesia, Glasgow Royal Infirmary, 84 Castle Street, Glasgow, UK and ²Women's College Hospital, Toronto, Canada

BJA Education, 18(2): 52–56 (2018)



Outcomes



Regional anaesthesia and outcomes

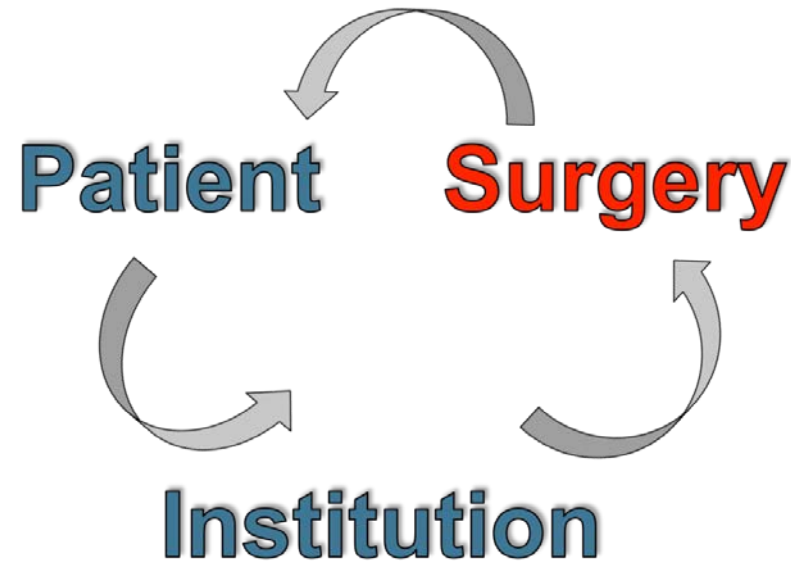
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BJA Education, 18(2): 52–56 (2018)



Outcomes



Regional anaesthesia and outcomes

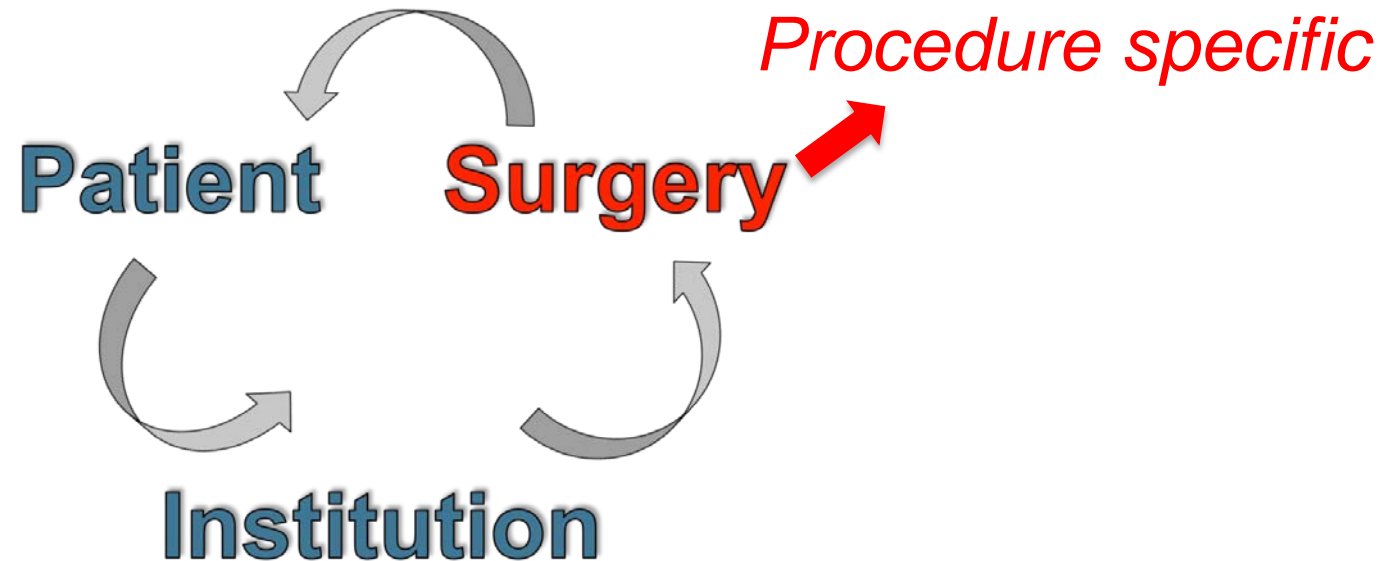
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BJA Education, 18(2): 52–56 (2018)



Outcomes



Regional anaesthesia and outcomes

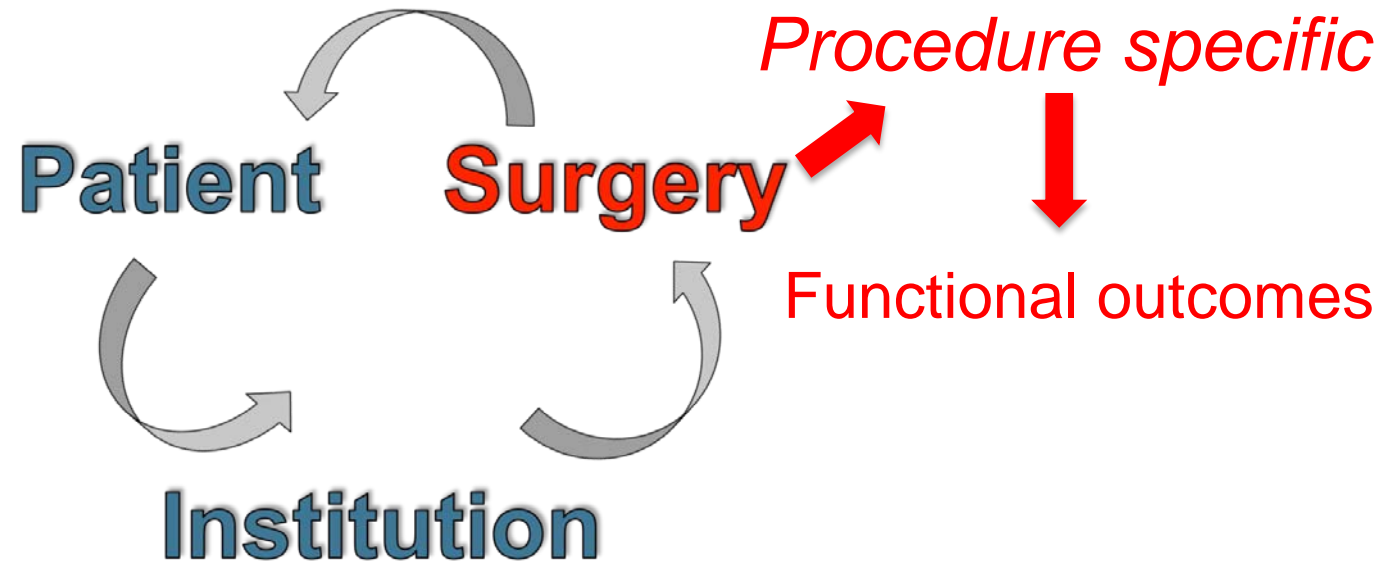
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Outcomes



Regional anaesthesia and outcomes

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¹Department of Anaesthesia, Glasgow Royal Infirmary, 84 Castle Street, Glasgow, UK and ²Women's College Hospital, Toronto, Canada

British Journal of Anaesthesia Page 1 of 11
doi:10.1093/bja/aep208

BJA

Does regional anaesthesia improve outcome after total hip arthroplasty? A systematic review

A. J. R. Macfarlane^{1 2}, G. A. Prasad¹, V. W. S. Chan¹ and R. Brull^{1*}

SURVEY (SYSTEMATIC REVIEW)

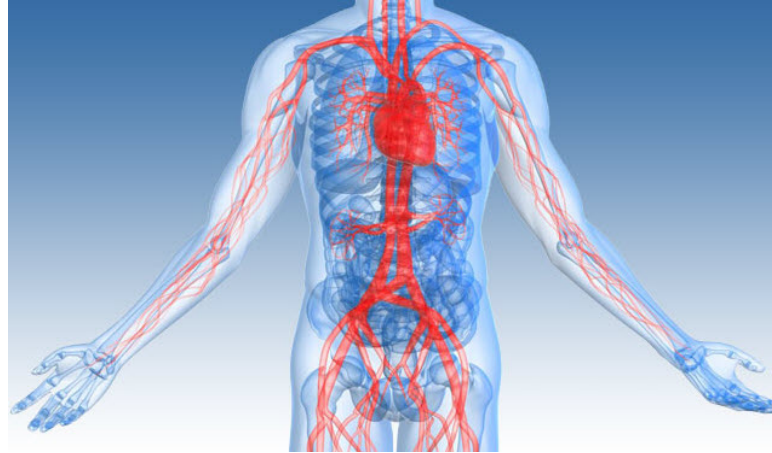
Does Regional Anesthesia Improve Outcome After Total Knee Arthroplasty?

Alan J. R. Macfarlane MBChB, Govindarajulu Arun Prasad MB BS,
Vincent W. S. Chan MD, Richard Brull MD

Early and Long-term Benefit of Regional Anesthesia Compared with General Anesthesia for Ambulatory Hand Surgery

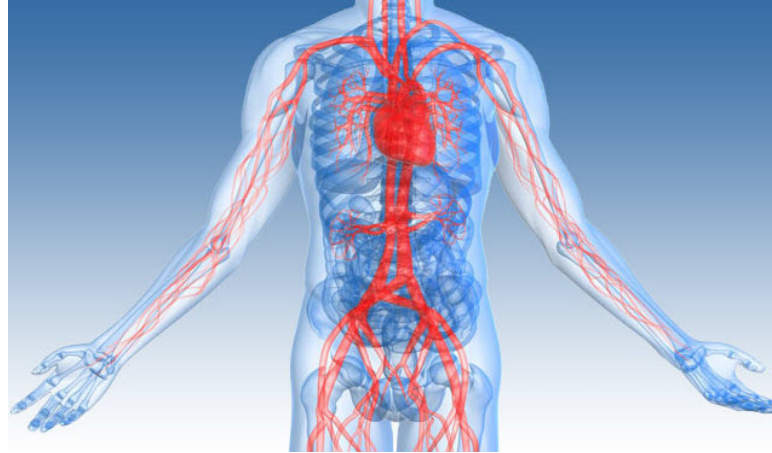
Colin J. L. McCartney, M.B.Ch.B., F.C.A.R.C.S.I., F.R.C.P.C.,* Richard Brull, M.D., F.R.C.P.C.,† Vincent W. S. Chan, M.D., F.R.C.P.C.,‡ Joel Katz, Ph.D.,§ Sherif Abbas, M.D.,|| Brent Graham, M.D., F.R.C.S.C.,# Hugo Nova, M.D.,|| Regan Rawson, R.N.,** Dimitri J. Anastakis, M.D., F.R.C.S.C., F.A.C.S.,†† Herbert von Schroeder, M.D., F.R.C.S.C.#





The effects of the type of anesthesia on outcomes of lower extremity infrainguinal bypass

Niten Singh, MD, Anton N. Sidawy, MD, Kent Dezee, MD, Richard F. Neville, MD, Jonathan Weiswasser, MD, Subodh Arora, MD, Gilbert Aidinian, MD, Chris Abularrage, MD, Eric Adams, MD, Shukri Khuri, MD, and William G. Henderson, PhD, *Washington, DC*



Effect of regional versus local anaesthesia on outcome after arteriovenous fistula creation: a randomised controlled trial

Emma Aitken, Andrew Jackson, Rachel Kearns, Mark Steven, John Kinsella, Marc Clancy, Alan Macfarlane

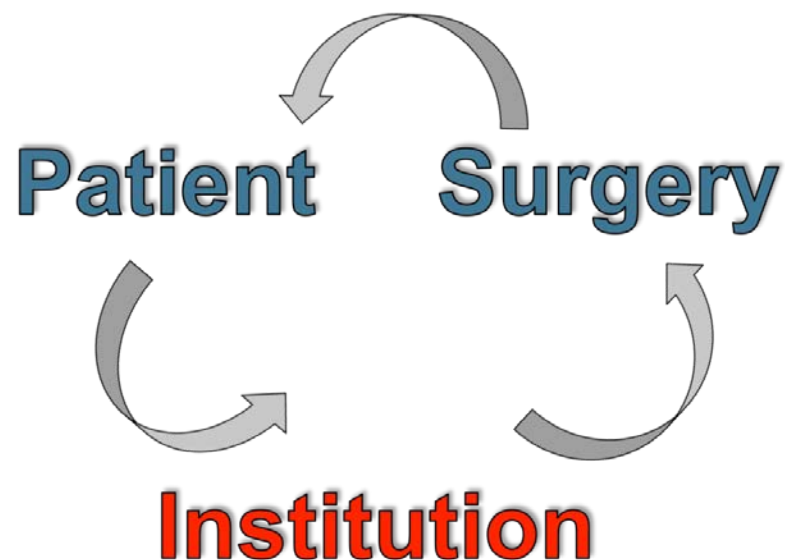
RA and AV fistula outcomes

	Overall patient population (n=126)	BPB (n=63)	LA (n=63)	P-value
ALL AVF				
Functional patency at 3 months	44 (35%)	26 (41%)	18 (27%)	0.09
Functional patency at 1 year	86 (68%)	51 (81%)	35 (56%)	<0.001

NNT = 4



Outcomes



Regional anaesthesia and outcomes

M. Hutton¹ R. Brull² and A.J.R. Macfarlane^{1,*}

¹Department of Anaesthesia, Glasgow Royal Infirmary, 84 Castle Street, Glasgow, UK and ²Women's College Hospital, Toronto, Canada

BJA Education, 18(2): 52–56 (2018)

Outcomes - institution

- **Length of stay (ERAS) ?**



Outcomes - institution

- **Length of stay (ERAS)**
- **Efficiency ?**



- **Length of stay (ERAS)**
- **Efficiency ?**
 - PACU bypass
 - Earlier discharge
 - Less unanticipated DSU admissions
 - ? More cases



Block room ?

- Length of stay (ERAS)
- Efficiency
- Environmental ?

Atmospheric science, anaesthesia, and the environment

Matt Campbell FRCA JM¹ and J. M. Tom Pierce FRCP FRCA FFICM^{2,*}

BJA Education, 15 (4): 173–179 (2015)

	Isoflurane	Sevoflurane	Desflurane
Tropospheric lifetime (yr)	3.2	1.1	14
IR absorption peak (μm)	8.5	8	8.1
IR absorption range (μm)	7.5–9.5	7–10	7.5–9.5
Radiative efficiency ($\text{W m}^{-2} \text{ppb}^{-1}$)	0.453	0.351	0.469
GWP ₁₀₀	510	130	2540
CO ₂ e of a vaporized bottle of the agent=mass×GWP	190 kg per 250 ml	49 kg per 250 ml	886 kg per 240 ml

- Length of stay (ERAS)
- Efficiency
- Environmental ?

Atmospheric science, anaesthesia, and the environment

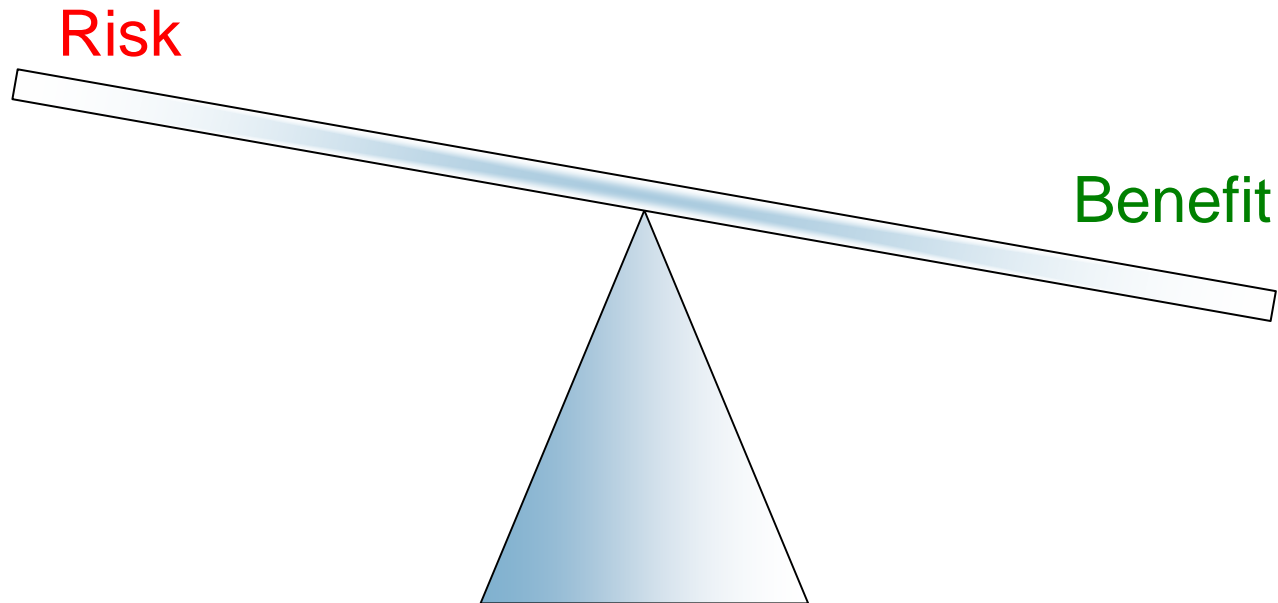
Matt Campbell FRCA JM¹ and J. M. Tom Pierce FRCP FRCA FFICM^{2,*}

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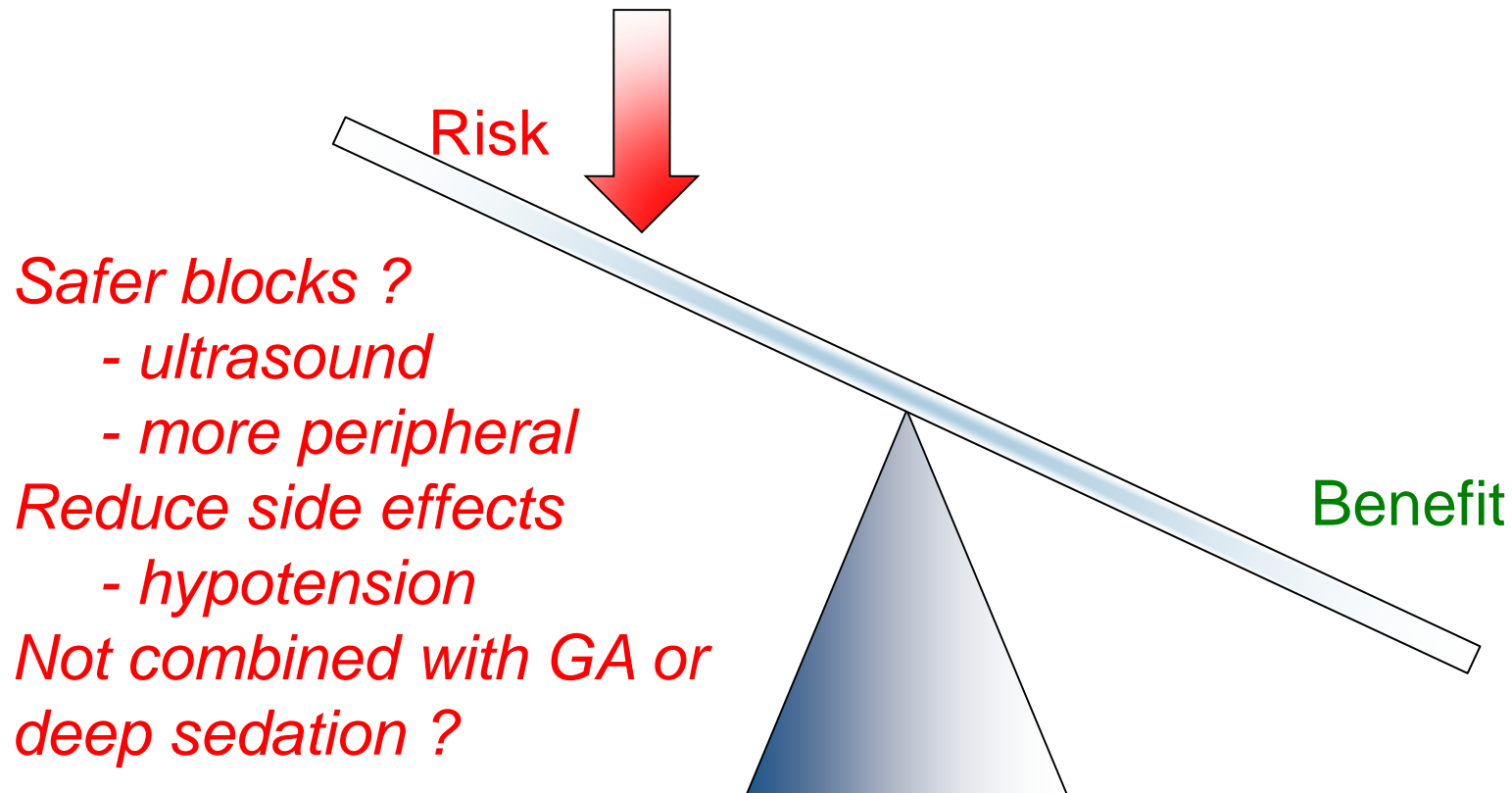
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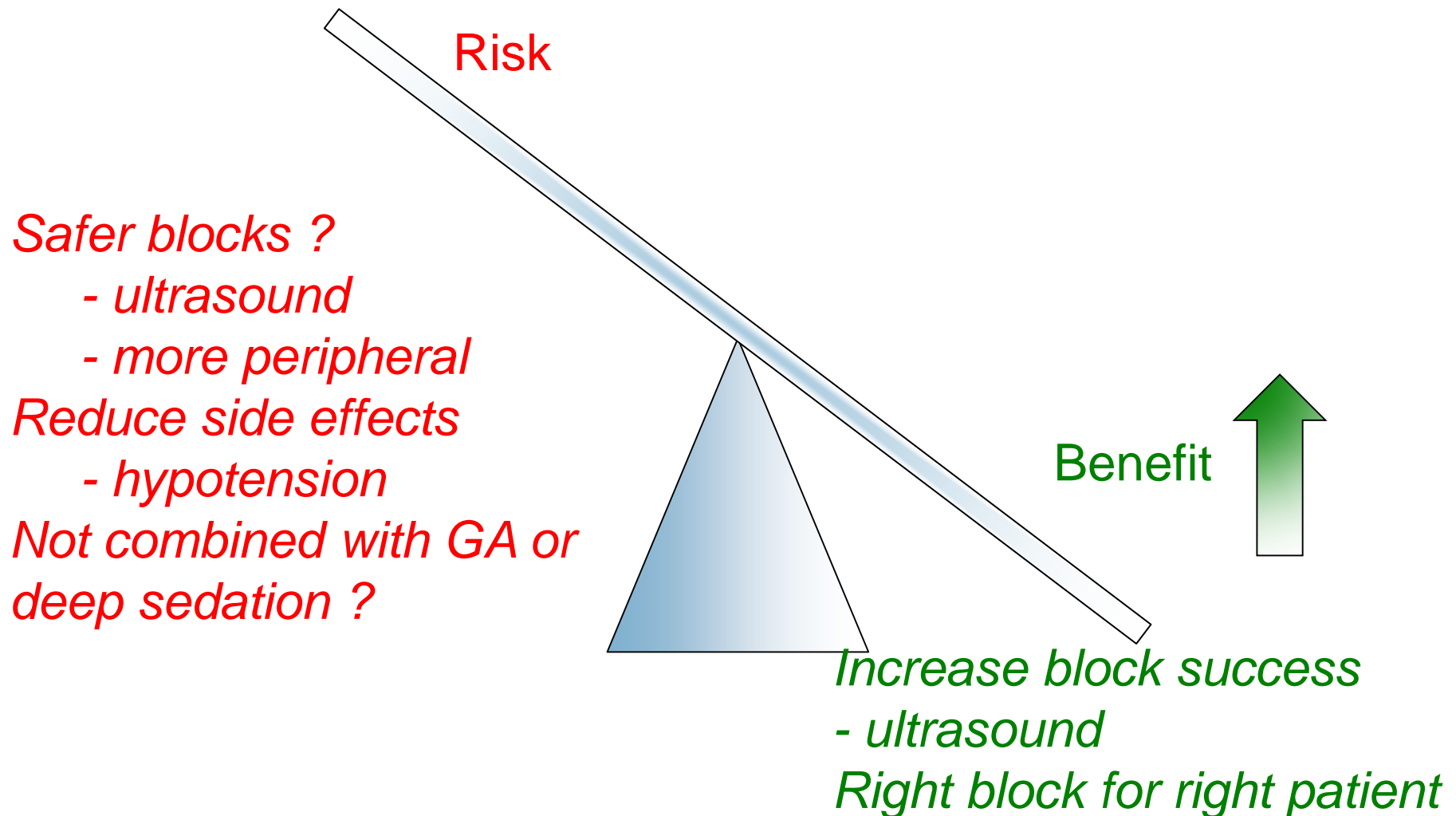
Outcomes - risk vs benefit



Outcomes - risk vs benefit



Outcomes - risk vs benefit



Standardizing end points in perioperative trials: towards a core and extended outcome set

P. S. Myles^{1,*}, M. P. W. Grocott^{2,3,4,5}, O. Boney^{2,5} and S. R. Moonesinghe^{2,5}, on behalf of the COMPAC-StEP Group

British Journal of Anaesthesia 116 (5): 586–9 (2016)

Outcomes

Table 1 Current Standardized Endpoints for Perioperative Medicine (STEP) working groups. MET, medical emergency team; MACE, major adverse cardiac events; IABP, intra-aortic balloon pump; POMS, post-operative morbidity score

Working groups	Proposed end points
Patient comfort Chair: Paul Myles	(i) Postoperative nausea and vomiting (ii) Perioperative pain measurement (iii) Quality of recovery scales (iv) Sleep quality/disturbance (v) Perioperative anxiety/stress (vi) Return of bowel function/ileus
Clinical indicators Chair: Guy Haller	(i) Perioperative hypothermia (ii) Perioperative iatrogenic injury (nerve injury, postoperative visual loss, pressure sores, dental damage, post-dural puncture headache) (iii) MET/rapid response calls; cardiorespiratory arrest; unplanned intensive care unit admission (iv) Unplanned hospital readmission; discharge destination
Cognition and stroke Chair: Lis Evered	(i) Stroke/transient ischaemic attack (including severity) (ii) Postoperative delirium/confusion (iii) Postoperative cognitive decline
Cardiovascular Chair: Scott Beattie and P. J. Devereaux	(i) Composite MACE (e.g. cardiovascular death, myocardial infarction, heart failure) (ii) Myocardial injury after non-cardiac surgery (utility of biomarkers) (iii) Arrhythmias (duration/severity/treatment needed) (iv) Venous thromboembolism (v) Hypotension/requirement for circulatory support (e.g. vasoactive drugs, IABP)
Respiratory Chair: Rupert Pearse	(i) Pulmonary complications: how defined and classified; consequences
Sepsis Chair: Mervyn Singer	(i) Wound infection (surgical site infection) (ii) Bloodstream infection
Renal Chair: David McLroy	(i) Acute kidney injury (ii) Other renal outcomes
Bleeding and transfusion Chair: Duminda Wijesundera	(i) Blood loss (ii) Transfusion requirements
Organ failure and survival Chair: Michael Grocott	(i) Mortality measures (cause/time point) (ii) Composite morbidity scales (e.g. POMS/Clavien-Dindo)
Cancer and long-term survival Chair: Dan Sessler	(i) Long-term survival (ii) Disease recurrence (local/distant)
Patient-centred outcomes Chair: Ramani Moonesinghe	(i) Patient satisfaction (ii) Health-related quality of life (iii) Disability-free survival (iv) Return to work/normal functioning (v) Functional status/mobility/6 min walk test, other (vi) Home days (days alive and out of hospital)
Healthcare resource utilization Chair: Rob Sneyd	(i) Length of stay (intensive care unit/hospital) (ii) Health-care costs (iii) Fitness for discharge; delayed discharge



Outcomes

Patient comfort

Chair: Paul Myles

- (i) Postoperative nausea and vomiting
- (ii) Perioperative pain measurement
- (iii) Quality of recovery scales
- (iv) Sleep quality/disturbance
- (v) Perioperative anxiety/stress
- (vi) Return of bowel function/ileus

Patient-centred outcomes

Chair: Ramani Moonesinghe

- (i) Patient satisfaction
- (ii) Health-related quality of life
- (iii) Disability-free survival
- (iv) Return to work/normal functioning
- (v) Functional status/mobility/6 min walk test, other
- (vi) Home days (days alive and out of hospital)

Measuring quality of recovery-15 after day case surgery

M. Chazapis^{1,2,3,4,*}, E. M. K. Walker^{1,2,3,4}, M. A. Rooms^{2,3}, D. Kamming^{2,3}
and S. R. Moonesinghe^{1,2,3,4,5}

British Journal of Anaesthesia, 116 (2): 241–8 (2016)

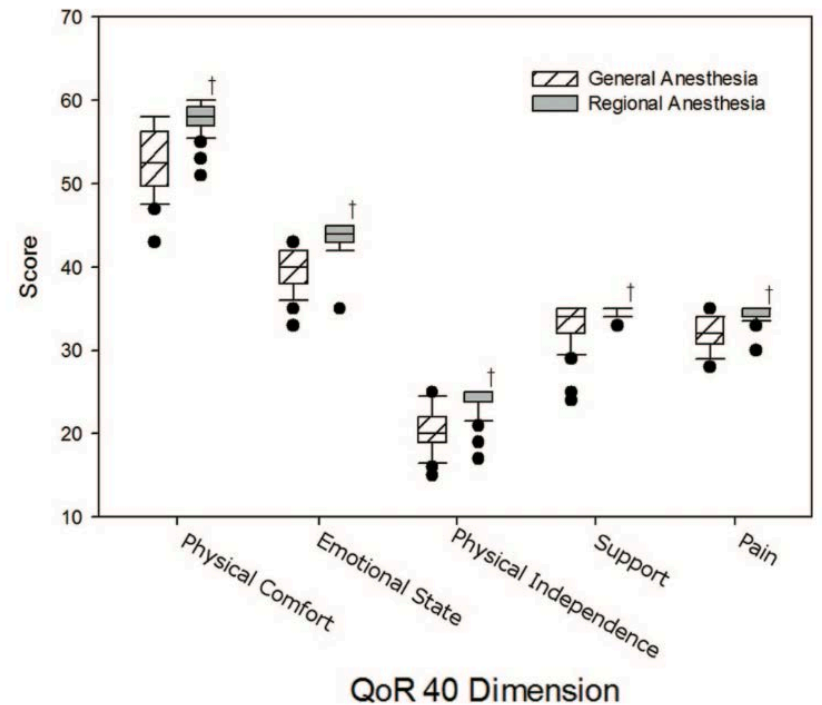
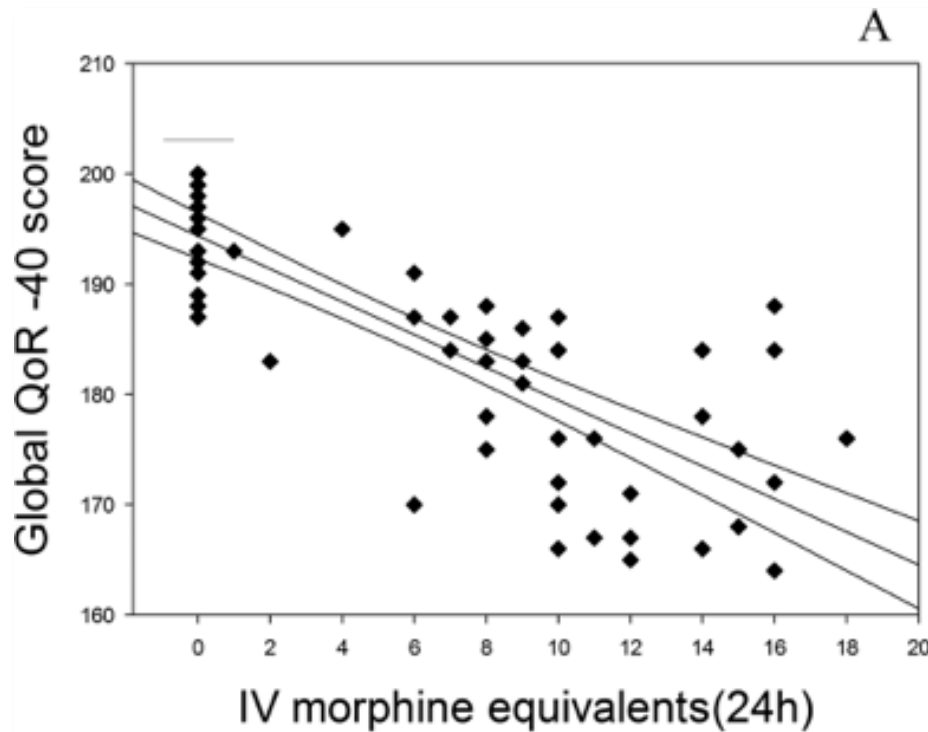
- **Negative correlation**
 - Length of surgery
 - Opioid consumption



QoR 40

The Effect of Neuraxial Versus General Anesthesia Techniques on Postoperative Quality of Recovery and Analgesia After Abdominal Hysterectomy: A Prospective, Randomized, Controlled Trial

Anesth Analg 2011;113:1480–6



- **Material risk of RA cannot be eliminated**
 - *We are learning how to reduce it however*
- **Increasing evidence RA does have some gains beyond acute pain**
 - *Some data is low/moderate quality*
 - *More work required with ‘better’ outcome measures*
- **Gains more likely when RA used alone**
 - *Care when combining RA plus GA*







In large population outcome analyses, neuraxial combined with general anaesthesia appears to increase the risk of :

- A Pulmonary complications
- B Cardiac events
- C Mortality
- D Blood loss

There is Level 1 (RCT) evidence that regional anaesthesia :

- A Reduces cancer recurrence
- B Improves cognitive recovery
- C Reduces surgical site infection
- D Improves long term AV fistula survival