Anaesthesia and the Elderly

Dr Mark Carrington
Anaesthesia/ICU Consultant
Royal Free Hospital
April 2013

Anaesthesia and the Elderly:

- Diabetes
- Pharmacology
- Post Operative Cognitive Dysfunction
- Summary of anaesthetic approach for elderly patient
- Post-operative care
- Case History: Risk versus Benefit

Diabetes and the elderly:

- **WHO data**
- Newer classifications
- Pre/Intra/Post operative care/ Medications
- Anaesthetic effects on Glycaemic control
- Intensive Insulin Therapy (IIT) and surgery
- Royal Free Practical approach

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Diabetes

World Health Organization

347 million

347 million people worldwide have diabetes.

80%

More than 80% of people with diabetes live in low- and middle-income countries.

2030

WHO projects that diabetes deaths will double between 2005 and 2030.

WHO/Chris de Bode

Diabetes is predicted to become the seventh leading cause of death in the world by the year 2030.

Total deaths from diabetes are projected to rise by more than 50% in the next 10 years.

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Diabetes and the elderly:

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Newer classifications

COMMITTEE REPORT

Table 3—*Criteria for the diagnosis of diabetes mellitus*

11.1mmol/l

1. Symptoms of diabetes plus casual plasma glucose concentration ≥200 mg/dl (11.1 mmol/l). Casual is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss.

7.0 mmol/l

or

2. FPG ≥126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.

or

3. 2-h PG ≥200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by WHO (2), using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.

In the absence of unequivocal hyperglycemia with acute metabolic decompensation, these criteria should be confirmed by repeat testing on a different day. The third measure (OGTT) is not recommended for routine clinical use.

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Diabetes and operative risk

British Journal of Anaesthesia 1992; **68**: 198–206

REVIEW ARTICLE

DIABETES AND ANAESTHESIA: THE PAST DECADE

R. M. MILASKIEWICZ AND G. M. HALL

50% increase in early mortality

Following CABG

Diabetes mellitus is the commonest endocrine dis- [illegible] 4]. [illegible] important, therefore, that all anaesthetists should understand the disease and its complications, and use a scientifically sound regimen for the perioperative management of diabetic patients. There are many articles on diabetes and the effects of anaesthesia and surgery; this review describes developments that have occurred in the past decade, concentrating mainly on the pathophysiology of diabetes and its complications, and how these may affect the anaesthetic management of a diabetic patient presenting for surgery. The various regimens used in the perioperative management of diabetes are outlined, and objective evidence of their efficacy discussed.

and the insulin resistance seen in NIDDM. However, [illegible] much research.

There is evidence for both a genetic and an environmental component in NIDDM [48, 71]. The nature of the inherited characteristic is disputed. It may be in the [illegible] insulin secretion, peripheral insulin resistance or [illegible] resistance [48]. Much of the evidence for the genetic component has arisen from studies of Pima Indians [32] and from studies of identical twin pairs. The concordance rate for identical twins approaches 100% in NIDDM, but only 45% in IDDM [3, 48]. The prevalence of NIDDM in Pima Indians is more than 50% for those older than 55 yr. Amongst the Indians who

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Evidence that Hyperglycaemia pre op is bad.

Matthew J. McGirt, M.D.
Department of Neurosurgery, The Johns Hopkins School of Medicine, Baltimore, Maryland

Graeme F. Woodworth, M.D.
Department of Neurosurgery, The Johns Hopkins School of Medicine, Baltimore, Maryland

Benjamin S. Brooke, M.D.
Department of Surgery, The Johns Hopkins Hospital, Baltimore, Maryland

Alexander L. Coon, M.D.
Department of Neurosurgery, The Johns Hopkins School of Medicine, Baltimore, Maryland

Shamik Jain, B.S.
Department of Surgery, The Johns Hopkins Hospital, Baltimore, Maryland

Donald Buck, B.S.
Department of Surgery, The Johns Hopkins Hospital, Baltimore, Maryland

Judy Huang, M.D.
Department of Neurosurgery, The Johns Hopkins School of Medicine, Baltimore, Maryland

Richard E. Clatterbuck, M.D.
Department of Neurosurgery, The Johns Hopkins School of Medicine, Baltimore, Maryland

Rafael J. Tamargo, M.D.

TABLE I.—*Stud*

Study
McGrit *et al.* 20
Dronge *et al.* 20
Rovlias *et al.* 20
Yendamuri *et al.*
Laird *et al.* 2004
Sung *et al.* 2005
Noordzij *et al.* 2
Safavi *et al.* 200
Freire *et al.* 200
Guvener *et al.* 2
CABG: coronary

HYPERGLYCEMIA INDEPENDENTLY INCREASES THE RISK OF PERIOPERATIVE STROKE, MYOCARDIAL INFARCTION, AND DEATH AFTER CAROTID ENDARTERECTOMY

OBJECTIVE: Clinical and experimental evidence suggests that hyperglycemia lowers the neuronal ischemic threshold, potentiates stroke volume in focal ischemia, and is associated with morbidity and mortality in the surgical critical care setting. It remains unknown whether hyperglycemia during carotid endarterectomy (CEA) predisposes patients to perioperative stroke and operative related morbidity and mortality.

METHODS: The clinical and radiological records of all patients undergoing CEA and operative day glucose measurement from 1994 to 2004 at an academic institution were reviewed and 30-day outcomes were assessed. The independent association of operative day glucose before CEA and perioperative morbidity and mortality were assessed via multivariate logistic regression analysis.

RESULTS: One thousand two hundred and one patients with a mean age of 72 ± 10 years (748 men, 453 women) underwent CEA (676 asymptomatic, 525 symptomatic). Overall, stroke occurred in 46 (3.8%) patients, transient ischemic attack occurred in 19 (1.6%), myocardial infarction occurred in 19 (1.6%), and death occurred in 17 (1.4%). Increasing operative day glucose was independently associated with perioperative stroke or transient ischemic attack (Odds ratio [OR], 1.005; 95% confidence interval [CI], 1.00–1.01; $P = 0.03$), myocardial infarction (OR, 1.01; 95% CI, 1.004–1.016; $P = 0.017$), and death (OR, 1.007; 95% CI, 1.00–1.015; $P = 0.04$). Patients with operative day glucose greater than 200 mg/dl were 2.8-fold, 4.3-fold, and 3.3-fold more likely to experience perioperative stroke or transient ischemic attack (OR, 2.78; 95% CI, 1.37–5.67; $P = 0.005$), myocardial infarction (OR, 4.29; 95% CI, 1.28–14.4; $P = 0.018$), or death (OR, 3.29; 95% CI, 1.07–10.1; $P = 0.037$), respectively. Median and interquartile range length of hospitalization was greater for patients with operative day glucose greater than 200 mg/dl (4 d [interquartile range, 2–15 d] versus 3 d

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Diabetes and the elderly:

- WHO data
- Newer classifications
- **Pre op/Medications**
- Anaesthetic effects on Glycaemic control
- Intensive Insulin Therapy (IIT) and surgery
- Royal Free Practical approach

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Pre operatively

1162 ANESTH ANALG
1988;67:1162–5

Di sco

Kir rah

retrospectively in 40 diabetic patients having pancreas transplantations and in 75 diabetic and 112 nondiabetic patients having difficult laryngoscopies in patients having renal transplants: 0.027 in patients without diabetes; 0.320 in patients with diabetes. The incidence of difficult laryngoscopy in diabetic recipients of cadaveric kidneys (0.419) was not significantly different from that in diabetic recipients of pancreas transplants (0.40), but significantly higher than

eys from living donors (0.187). ts were older than recipients of (40.8 v. 31.6 years), age at the s not a significant predictor of Groups were otherwise matched for clinical, morphologic, hematologic, and biochemical indices. Diabetic stiff joint syndrome (SJS), which predis- subsequent for and laryngoscopy because of involvement of the atlanto-occipital joint.

Key Words: COMPLICATIONS, DIABETES—tracheal intubation. METABOLISM, DIABETES—tracheal intubation. INTUBATION, TRACHEAL—diabetes.

Rosenbloom and Frias 1974

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Medications

- Sulphonylureas:
- Biguanides:
- Thiazolidinediones:
- Insulin: What all the fuss has been about!!

Anaesthetic agents/techniques and glycaemic control

- Modulating the stress response to surgery…
- Volatiles. Cardio protective
- Etomidate. Concerns from recent meta analyses…
- GABA agonists. All act to decreased ACTH
- Midazolam. BJA paper in 1991. Elderly patients?
- Alpha 2 agonists
- Regional/Epidural/Spinal?
- No evidence that technique has any influence!!

Post operative

- Page & Watkins Lancet 1978
- Cardio-respiratory arrest in Diabetics with neuropathy
- PONV/Gastroparesis
- Good analgaesia
- Insulin running until at least 2 hours after first meal

Intensive Insulin Therapy:IIT

The New England Journal of Medicine

VOLUME 345 NOVEMBER 8, 2001 NUMBER 19

INTENSIVE INSULIN THERAPY IN CRITICALLY ILL PATIENTS

GREET VAN DEN BERGHE, M.D., PH.D., PIETER WOUTERS, M.SC., FRANK WEEKERS, M.D., CHARLES VERWAEST, M.D., FRANS BRUYNINCKX, M.D., MIET SCHETZ, M.D., PH.D., DIRK VLASSELAERS, M.D., PATRICK FERDINANDE, M.D., PH.D., PETER LAUWERS, M.D., AND ROGER BOUILLON, M.D., PH.D.

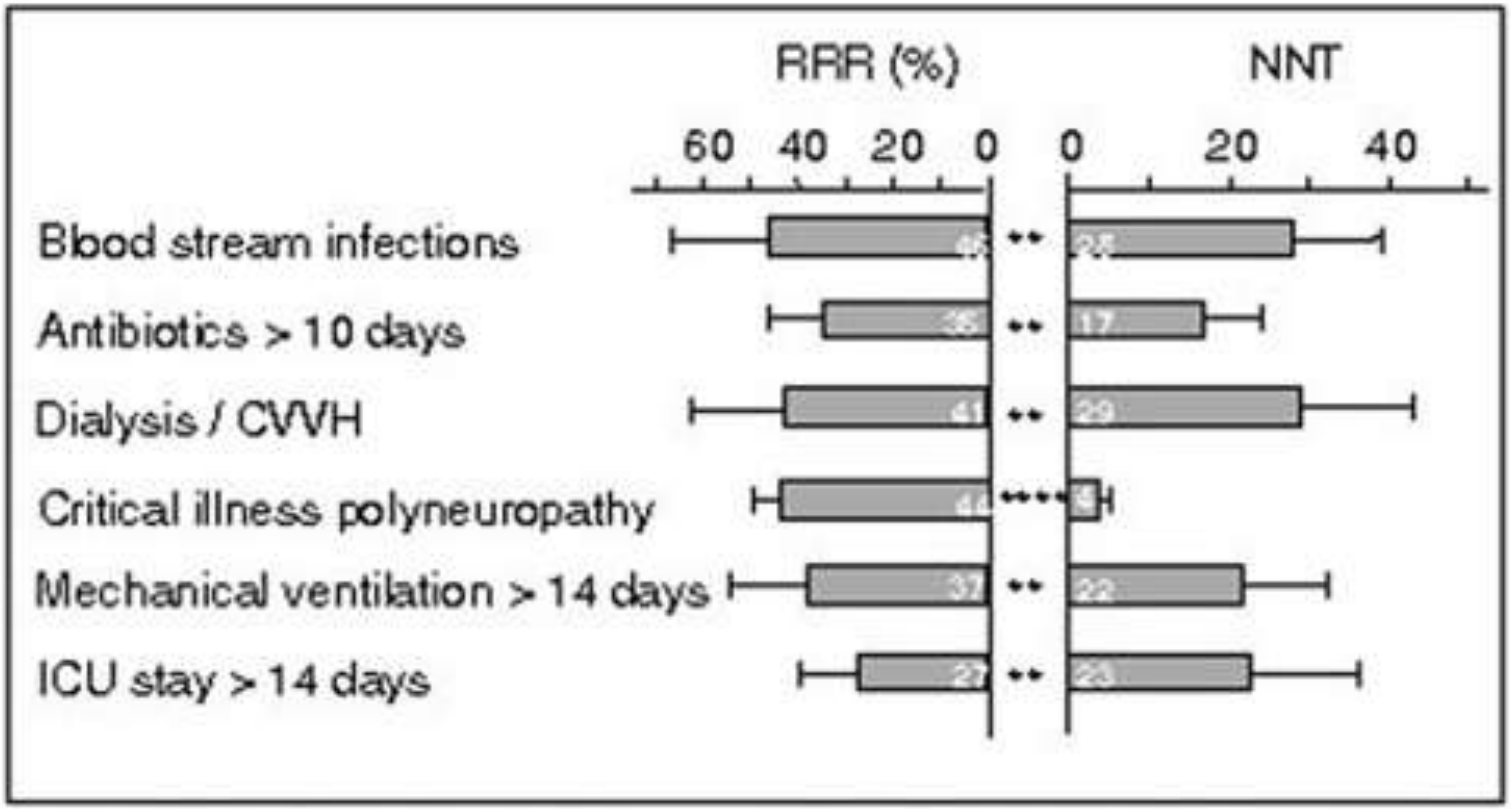
ABSTRACT

Background Hyperglycemia and insulin resistance are common in critically ill patients, even if they have not previously had diabetes. Whether the normalization of blood glucose levels with insulin therapy improves the prognosis for such patients is not known.

Methods We performed a prospective, randomized, controlled study involving adults admitted to our surgical intensive care unit who were receiving mechanical ventilation. On admission, patients were randomly assigned to receive intensive insulin therapy (maintenance of blood glucose at a level between 80 and 110 mg per deciliter) or conventional treatment (infusion of insulin only if the blood glucose level exceeded 215 mg per deciliter and maintenance of glucose at a level between 180 and 200 mg per deciliter).

CRITICALLY ill patients who require intensive care for more than five days have a 20 percent risk of death and substantial morbidity.[1] Critical-illness polyneuropathy and skeletal-muscle wasting prolong the need for mechanical ventilation.[2-5] Moreover, increased susceptibility to severe infections and failure of vital organs amplify the risk of an adverse outcome.

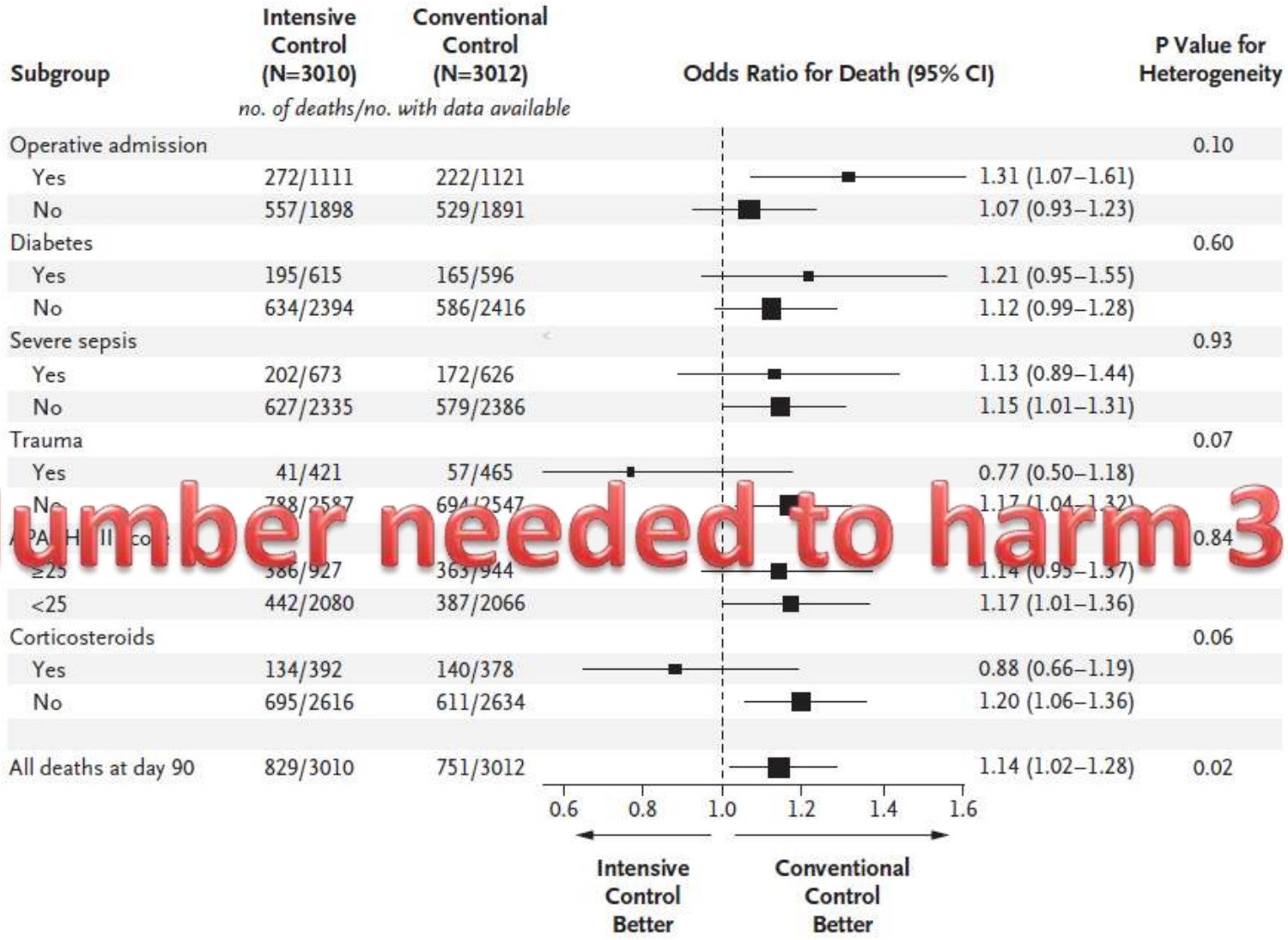
Hyperglycemia associated with insulin resistance[6-8] is common in critically ill patients, even those who have not previously had diabetes. It has been reported that pronounced hyperglycemia may lead to complications in such patients,[9-13] although data from controlled trials are lacking. In diabetic patients with acute myocardial infarction, therapy to maintain blood



** $P \leq 0.01$ **** $P < 0.0001$ *(error bars: 95% confidence intervals)*

Critical Care

B



Number needed to harm 38

IIT and surgery

- Extension of Leuven protocol from Van de Berghe's work
- Most studies retrospective
- Learning from ICU literature…
- Studies thus far haven't shown benefit
- Target of BM<10 Intra operatively holds in UK
- Unlikely to be repeated in near future!

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IIT and surgery

PLAIN LANGUAGE SUMMARY

Strict control compared with conventional glycaemic control for preventing surgical site infections in adults

Wound-related infections that complicate operations ("surgical site infections") result in worse patient outcomes. Previous studies have suggested that decreasing blood glucose levels to within a low, narrow range (strict control) around the time of surgery may decrease infections and improve outcome. However, concerns about side effects from low glucose levels, such as seizures and increased risk of death, have prevented widespread use of this strategy. There are only five trials comparing strict control strategies with the conventional strategy of treating blood glucose levels only when they become high. These trials differ significantly in patient characteristics, glucose targets, medications and methods used to lower glucose levels, as well as the outcomes measured. Furthermore, the individual studies, which are small and/or flawed, do not demonstrate a significant decrease in surgical site infections. There are insufficient data to support the routine adoption of strict blood glucose control around the time of operation to prevent surgical site infections.

THE COCHRANE COLLABORATION®

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Diabetes Summary

- Thorough pre op Ix of diabetics….
- Omit some drugs for type IIs on day of surgery
- Sliding scale for type I DM
- Blood sugar control <10 mmol/L
- No evidence for peri-op IIT on outcome
- Undiagnosed DM is higher risk (no surprise)
- No data to support superiority of one anaesthetic technique over another…Stress response

Pharmacology:

- **Pharmacokinetic and dynamic changes**
- Commonly used drugs
- Newer agents: Sugammadex
- Summary

Pharmacology

Biometric changes

Body Water decrease

Body Fat Increase

Albumin decrease

Hepatic changes

Liver weight Hepatic blood flow

Phase 1 reactions

Renal changes

Cardiovascular changes

CNS changes

Cerebral weight

Cerebral blood flow

Pharmacology:

- Pharmacokinetic and dynamic changes
- **Commonly used drugs**
- Newer agents: Sugammadex
- Summary

Pharmacology: Specific agents

- Propofol

- Increased potency: Peak EEG effect: Decrease dose by 30% (90 vs 30 year old)
- Time to maximal CV depression is later and longer (6 mins: 25yrs versus 10 min: 85years)
- Use of TCI pumps.

Context sensitive half life

Pharmacology: Specific agents

- Etomidate

Etomidate is associated with mortality and adrenal insufficiency in sepsis: A meta-analysis*

Chee Man Chan, MD, MPH; Anthony L. Mitchell, MD; Andrew F. Shorr, MD, MPH

Objective: To evaluate the effects of single-dose etomidate on the adrenal axis and mortality in patients with severe sepsis and septic shock.

Design: A systematic review of randomized controlled trials and observational studies with meta-analysis.

Setting: Literature search of EMBASE, Medline, Cochrane Database, and Evidence-Based Medical Reviews.

Subjects: Sepsis patients who received etomidate for rapid sequence intubation.

Interventions: None.

Measurements and Main Results: We conducted a systematic review of randomized controlled trials and observational studies with meta-analysis assessing the effects of etomidate on adrenal insufficiency and all-cause mortality published between January 1950 and February 2012. We only examined studies including septic patients. All-cause mortality served as our primary end point, whereas the prevalence of adrenal insufficiency was our secondary end point. Adrenal insufficiency was determined using a cosyntropin stimulation test in all studies. We used a random effects model for analysis; heterogeneity was assessed with the I^2 statistic. Publication bias was evaluated with Begg's test. Five studies were identified that assessed mortality in those who received etomidate. A total of 865 subjects were included. Subjects who received etomidate were more likely to die (pooled relative risk 1.20; 95% confidence interval 1.02–1.42; Q statistic, 4.20; I^2 statistic, 4.9%). Seven studies addressed the development of adrenal suppression associated with the administration of etomidate; 1,303 subjects were included. Etomidate administration increased the likelihood of developing adrenal insufficiency (pooled relative risk 1.33; 95% confidence interval 1.22–1.46; Q statistic, 10.7; I^2 statistic, 43.9%).

Conclusions: Administration of etomidate for rapid sequence intubation is associated with higher rates of adrenal insufficiency and mortality in patients with sepsis. (Crit Care Med 2012; 40:2945–2953)

KEY WORDS: adrenal insufficiency; etomidate; meta-analysis; mortality; sepsis; septic shock

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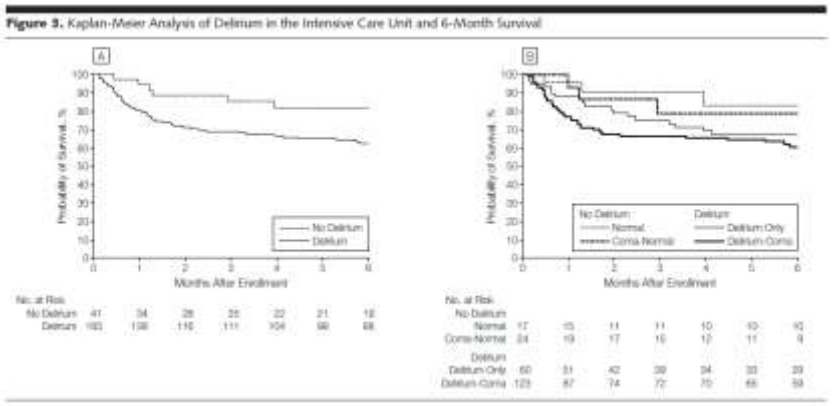
Pharmacology: Specific agents

- Benzodiazepines: Midazolam 
- Increased potency/Decreased clearance
- Active metabolite
- Longer context sensitive half life
- Benzodiazepines delirium:



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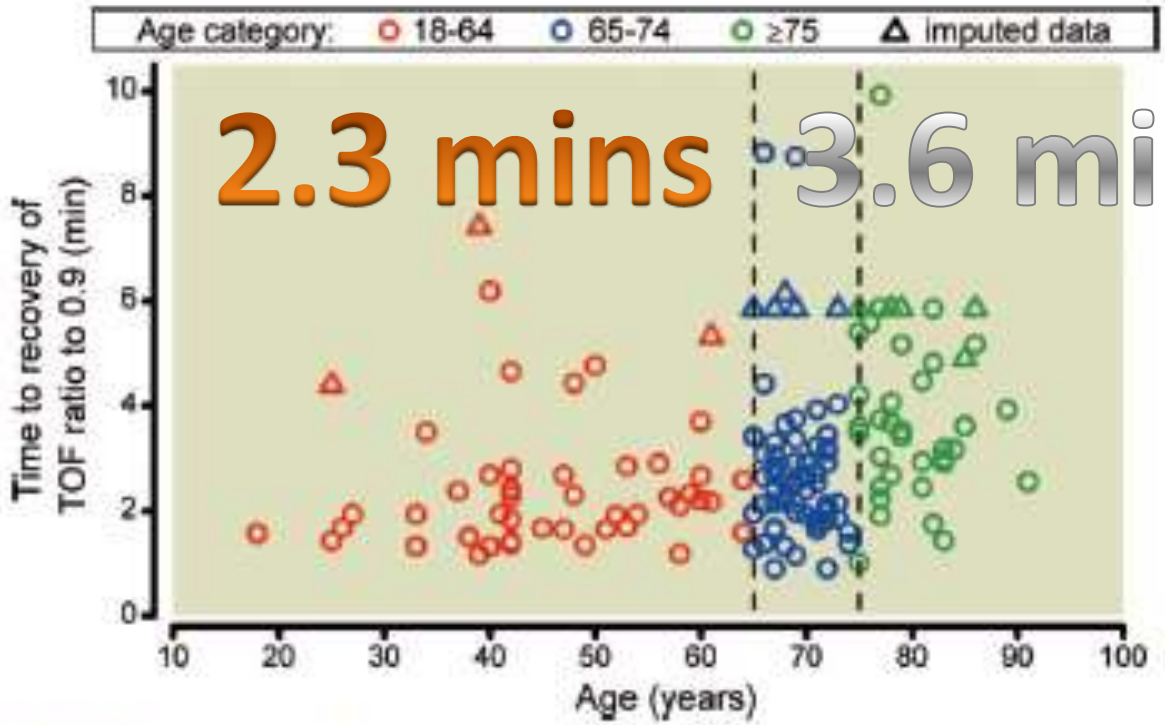
Pharmacology: Specific agents

- Ketamine: Nor-ketamine, delirium…
- LA: More spread with a given dose
- Opiods:
- Fentanyl: Halve the dose in elderly
- Remifentanyl: Bolus! TCI:
- Volatiles:
- NMBA:

Pharmacology:

- Pharmacokinetic and dynamic changes
- Commonly used drugs
- **Newer agents: Sugammadex**
- Summary

Efficacy, Safety, and Pharmacokinetics of Sugammadex for the Reversal of Rocuronium-induced Neuromuscular Blockade in Elderly Patients



2.3 mins 3.6 mins

Fig. 1. Individual patient recovery times to a train-of-four (TOF) ratio of 0.9 (intent-to-treat [ITT] population; including imputed data shown with a triangle for 13 patients). Imputed data were calculated by age group, with the two elderly groups combined into a geriatric group for imputation.

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Pharmacology:

- Pharmacokinetic and dynamic changes
- Commonly used drugs
- Newer agents: Sugammadex
- **Summary**

Pharmacology: Summary

- Predictable age related changes PK/PD
- Delayed onset of action/exaggerated effects
- Reduction of dose/Avoidance
- Newer agents

POCD

POCD describes objective measured decline in cognition after anaesthesia and surgery

"the difference in frequency and severity of CNS complications between two groups (CABG versus Vascular reflect cerebral injury resulting from cardiopulmonary bypass"

1819 — Post-operative psychosis

1955 — Lancet 1955 Bedford

1987 — Shaw 1987

1998 — Moller ISPOCD

2002 — Van Dijk 2002

2003 — ISPOCD regional

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POCD and AGE. Patient starting point?

Older people and people with dementia, severe illness or a hip fracture are more at risk of delirium. The prevalence of delirium in people on medical wards in hospital is about 20% to 30%, and 10% to 50% of people having surgery develop delirium. In long-term care the prevalence is under 20%. But reporting of delirium is poor in the UK, indicating that awareness and reporting procedures need to be improved.

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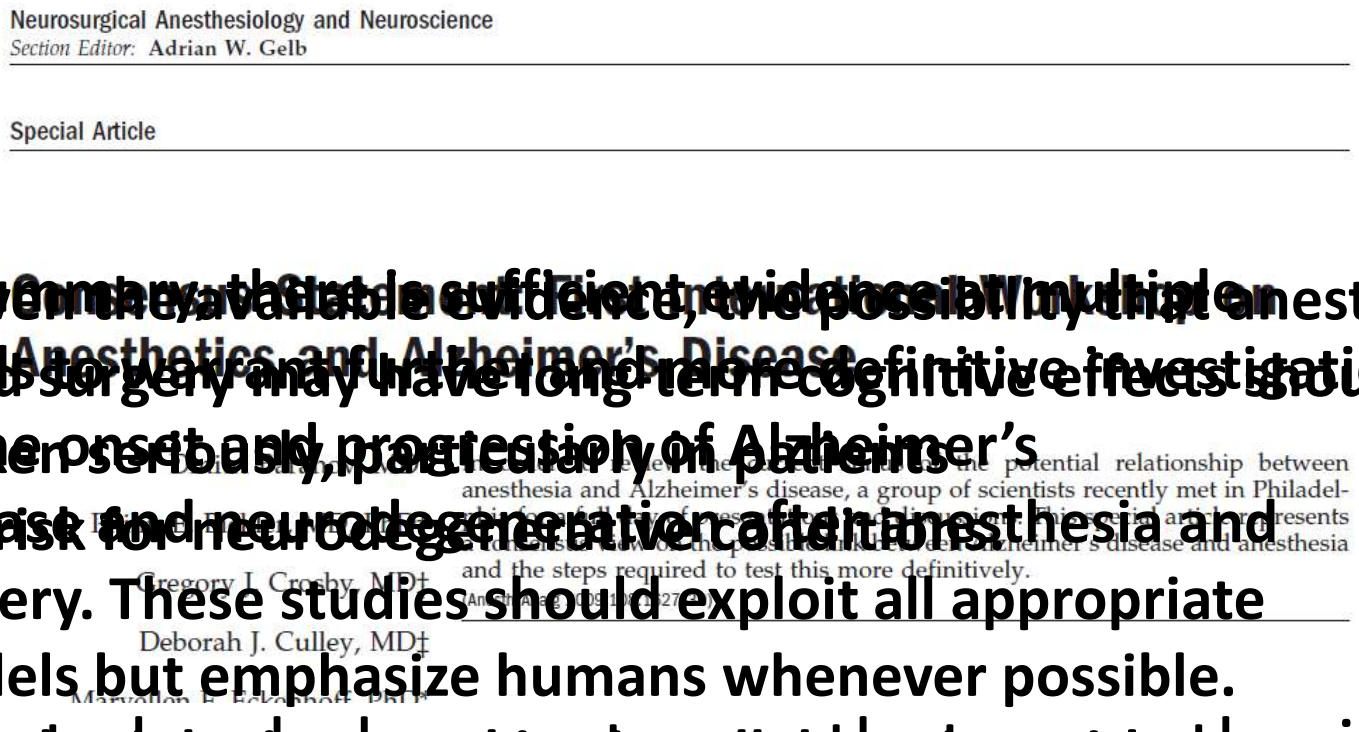


Neurosurgical Anesthesiology and Neuroscience
Section Editor: Adrian W. Gelb

Special Article

Anesthetics, and Alzheimer's Disease

Gregory J. Crosby, MD†
Deborah J. Culley, MD‡

anesthesia and Alzheimer's disease, a group of scientists recently met in Philadel-
and the steps required to test this more definitively.

- In summary, the available evidence, while insufficient, is consistent with the hypothesis that exposure to anesthetics and surgery may have long-term cognitive effects in the elderly, particularly in patients at risk for neurodegeneration. Data has led some to say that anesthesia is implicated in pathogenesis of Alzheimers disease.

- Given the available evidence, the possibility that anesthetics and surgery may have long-term cognitive effects should be taken seriously, particularly in patients at risk for neurodegeneration after anesthesia and surgery. These studies should exploit all appropriate models but emphasize humans whenever possible. Anesthesiologists, working closely with neuroscientists, epidemiologists, and others with relevant expertise, should lead this effort.

POCD Summary

- Old problem with new challenges
- Ageing population MCI/AD continuum
- Anaesthesia in animal models messes with your brain
- Regional anaesthesia has no effect on POCD rates (from literature)
- We don’t have starting points for elderly surgical patients
- We carry on with common sense approaches…

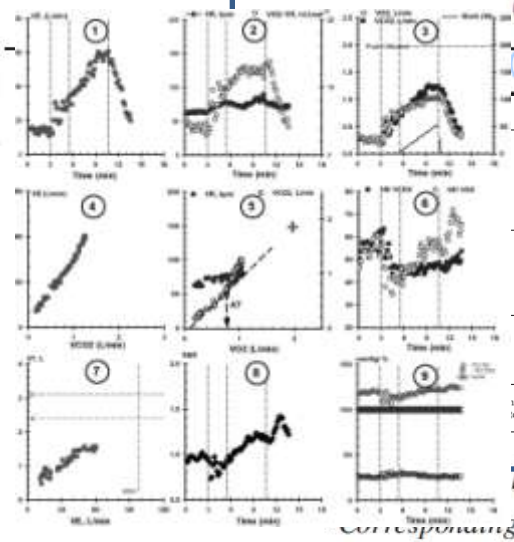
Anaesthesia and the Elderly: Final thoughts

- British Journal of Anaesthesia 101 (6): 774–80 (2008)
doi:10.1093/bja/aen310 Advance Access publication October 25, 2008

BJA

CLINICAL PRACTICE

CME



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lege of Medicine
PL6 8BU, UK

Corresponding author. E-mail: richard.struthers@phnt.swest.nhs.uk

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Anaesthesia and the elderly: Final thoughts

- Increasing need for HDU/ICU care

Level 2 and 3 care were generally utilised more than 10 years ago. However it was still planned less often (292/790) than would be expected in view of severity of illness/profile of surgery.

Post operative AKI was related to poor intra-operative management of fluids and cardiovascular status (24/151) and was compounded by deficiencies in post operative management.

Anaesthesia and the Elderly: Final thoughts

Figure 3: Adjusted odds ratio for death in hospital after surgery for each country

THE LANCET

Volume 380, Issue 9847, 22–28 September 2012, Pages 1059–1065

Articles

Mortality after surgery in Europe: a 7 day cohort study

Open Access Article

Dr Rupert M Pearse, MD[a], Prof Rui P Moreno, PhD[b], Prof Peter Bauer, PhD[c], Prof Paolo Pelosi, PhD[e], Prof Philipp Metnitz, PhD[d], Prof Claudia Spies, PhD[f], Prof Benoit Vallet, PhD[g], Prof Jean-Louis Vincent, PhD[h], Prof Andreas Hoeft, PhD[i], Andrew Rhodes, FRCP[j,k], for the European Surgical Outcomes Study (EuSOS) group for the Trials groups of the European Society of Intensive Care Medicine and the European Society of Anaesthesiology

Factors that were independently associated with mortality and that we therefore used to adjust for baseline confounders were: country where surgery was done, urgency of surgery, grade of surgery, surgical procedure category, age, American Society of Anesthesiologists (ASA) score, metastatic disease, and cirrhosis

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Surgeons have got involved…

Conclusions

Peri-operative care of higher risk general surgical patients in the UK appears to have significant deficiencies. Outcomes are variable, appear worse than other countries and generate a large health cost through prolonged hospital stay and use of intensive care.