



The Endocrine Perspective on Managing the Diabetic Foot

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or, as I would like to call it.....

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What Surgeons Should Know Before Taking Someone with Diabetes to Theatre

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Excess Mean Length of Stay in Diabetes Inpatients Aged 18 – 60 Years

269,265 Diabetes Discharges and 4,411,593 Matched Controls

	Mean LOS (days)			Excess LOS (days)			n		
	E10	E11	C	E10	E11	E10	E11	C	
Surg.	5.4 (0.1)	5.1 (0.1)	4.2 (0.2)	1.2	0.9	18,032	32,135	1,501,453	
T & O	4.8 (0.1)	5.3 (0.2)	4.6 (0.1)	0.2	0.7	8,178	12,203	885,606	
GM	4.8 (0.2)	5.4 (0.2)	4.4 (0.1)	0.4	1.0	70,988	82,446	1,709,553	
Card.	4.2 (0.1)	4.2 (0.1)	3.8 (0.1)	0.4	0.4	5,307	15,009	229,784	
MFE	4.8 (0.2)	5.6 (0.2)	4.7 (0.1)	0.1	0.1	2,444	4,549	85,197	

E10 = Type 1 diabetes E11 = Type 2 diabetes c = controls

English Hospitals, 4 consecutive years of discharges 2000-2004

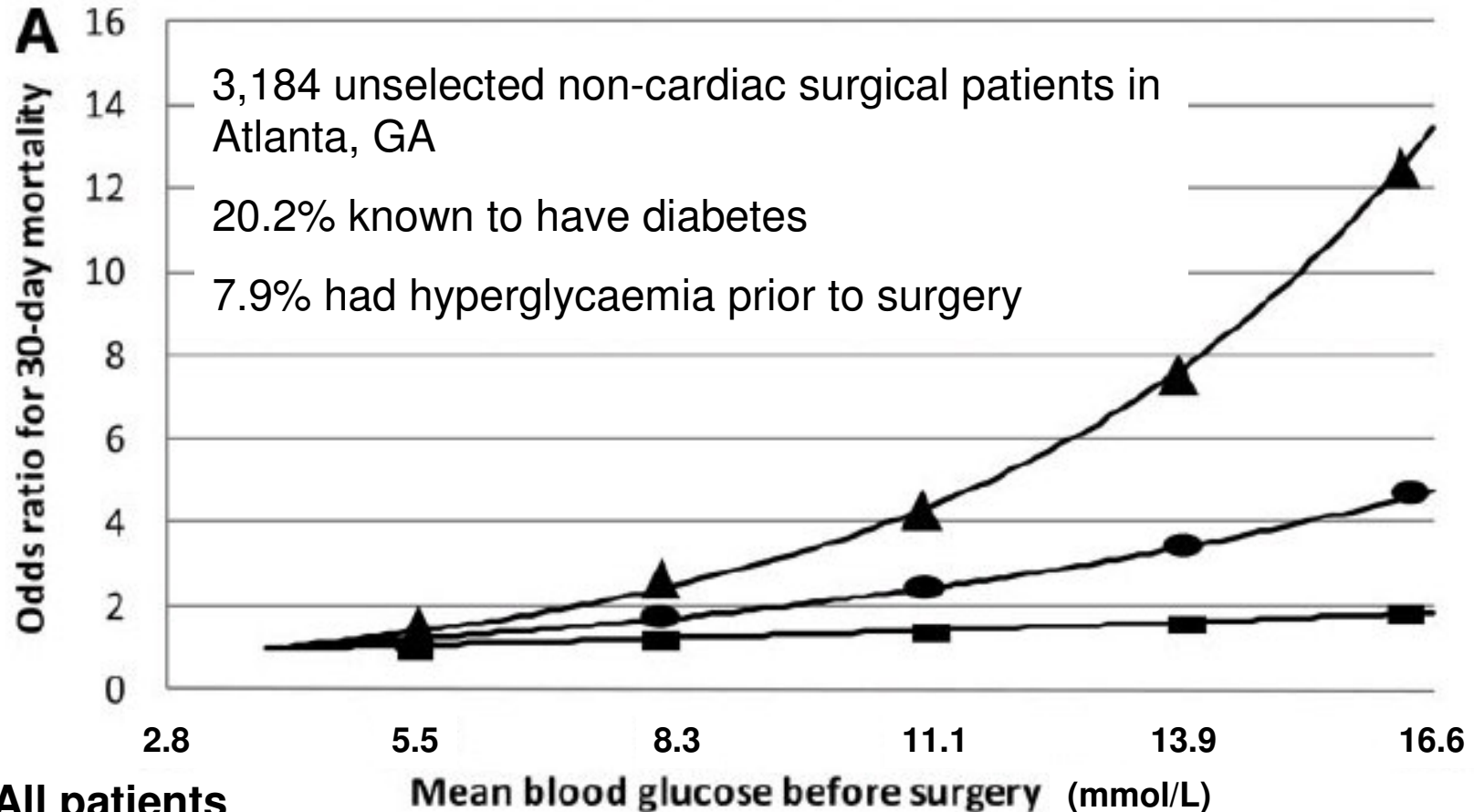
Sampson MJ et al Diabetes Research & Clinical Practice 2007;77(1):92-98

Do Peri-Operative High Glucose Levels Cause Harm?

- High pre-operative glucose or HbA1c has been related to adverse outcomes following
 - spinal surgery
 - vascular surgery
 - colorectal surgery
 - cardiac surgery
 - trauma

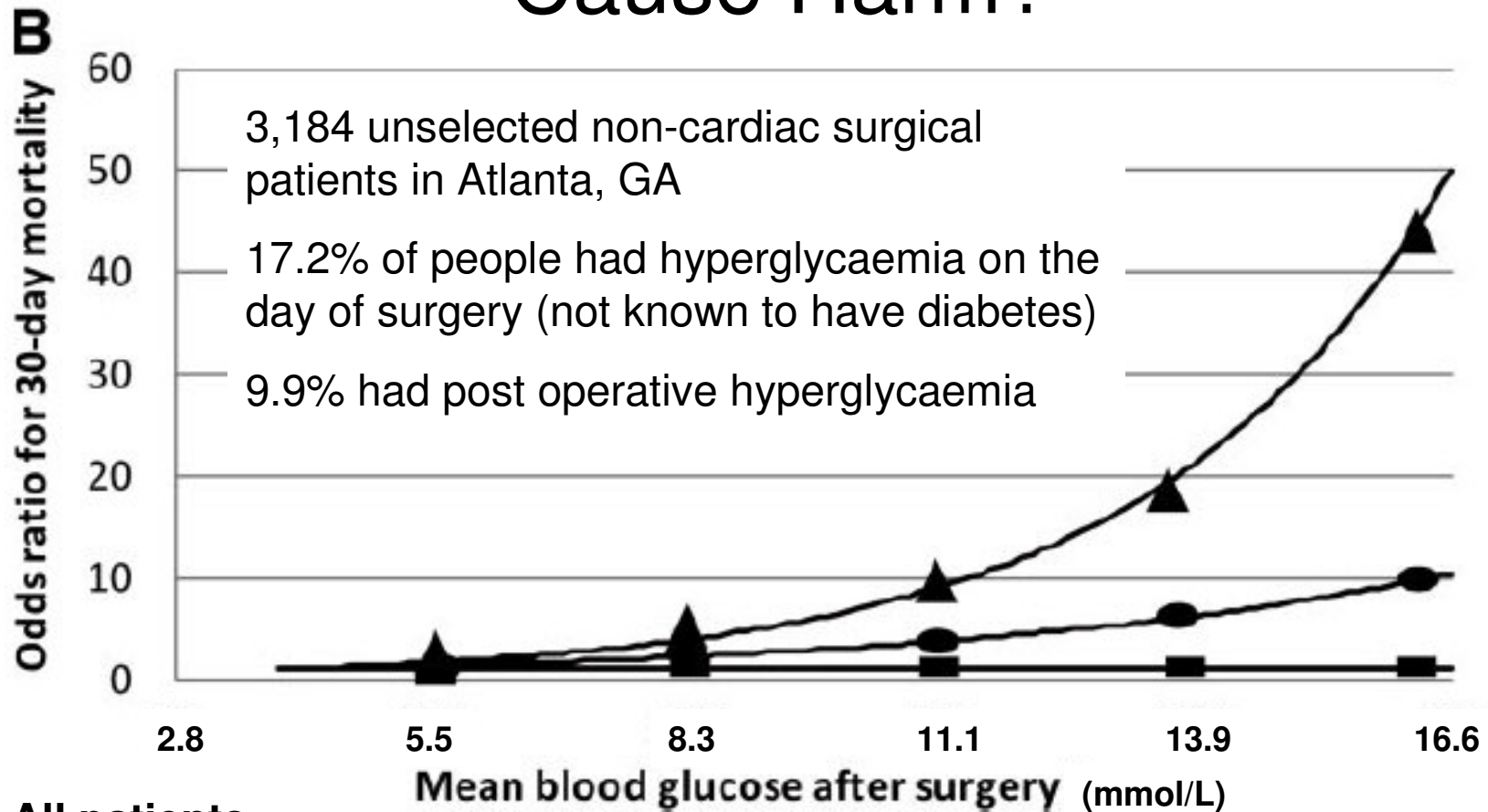
Walid MS et al 2010 Journal of Hospital Medicine 5:E10-E14
O'Sullivan CJ et al 2006 European Journal of Vascular and Endovascular Surgery 32:188-197
Gustafsson UO et al 2009 British Journal of Surgery 96:1358-1364
Halkos ME et al 2008 Annals of Thoracic Surgery 86:1431-1437
Kreutziger J et al 2009 J Trauma 67(4):704-8

Do High Admission Glucose Levels Cause Harm?



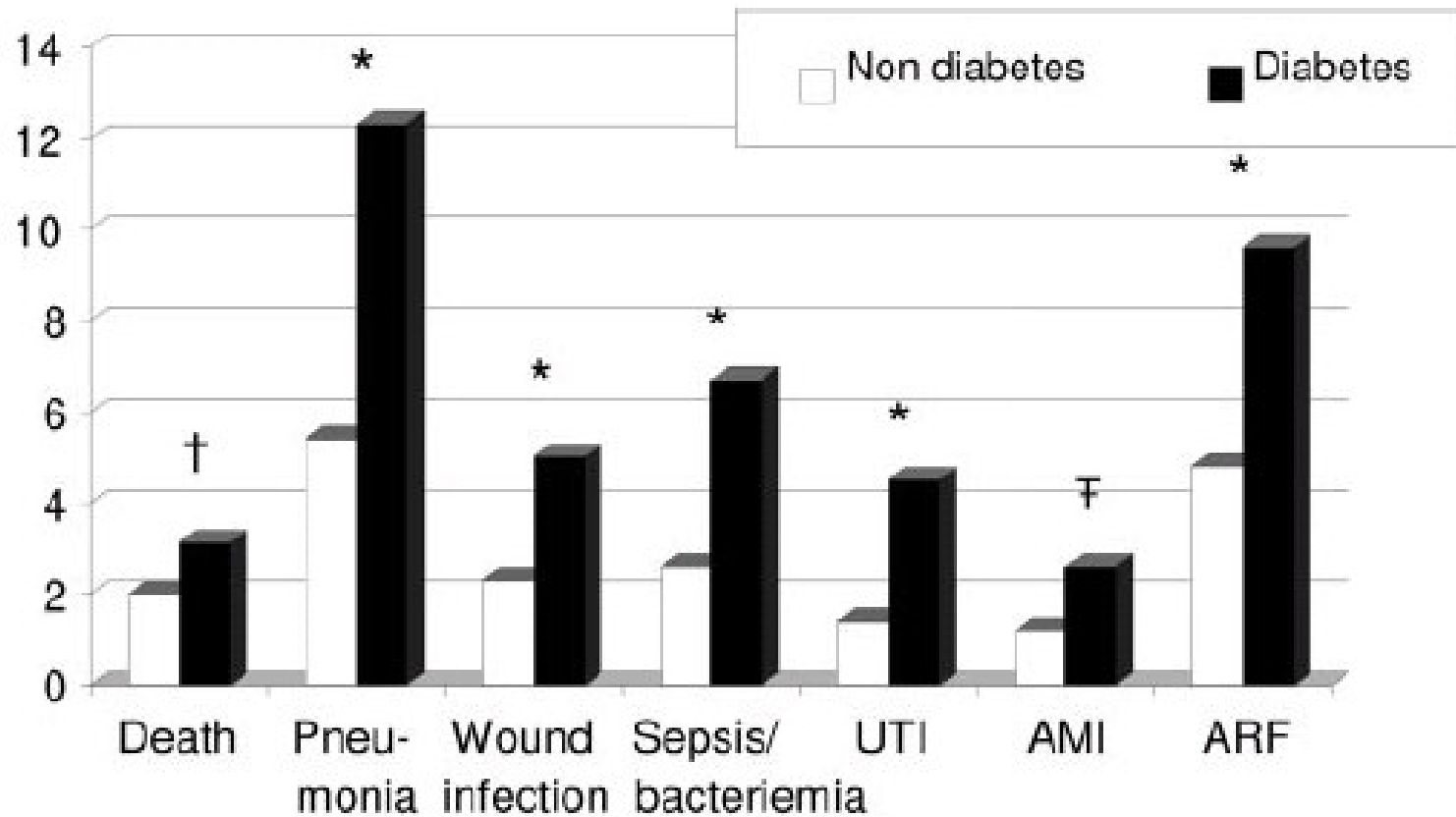
- All patients
- Patients with diabetes
- ▲ Patients without diabetes

Do High Admission Glucose Levels Cause Harm?

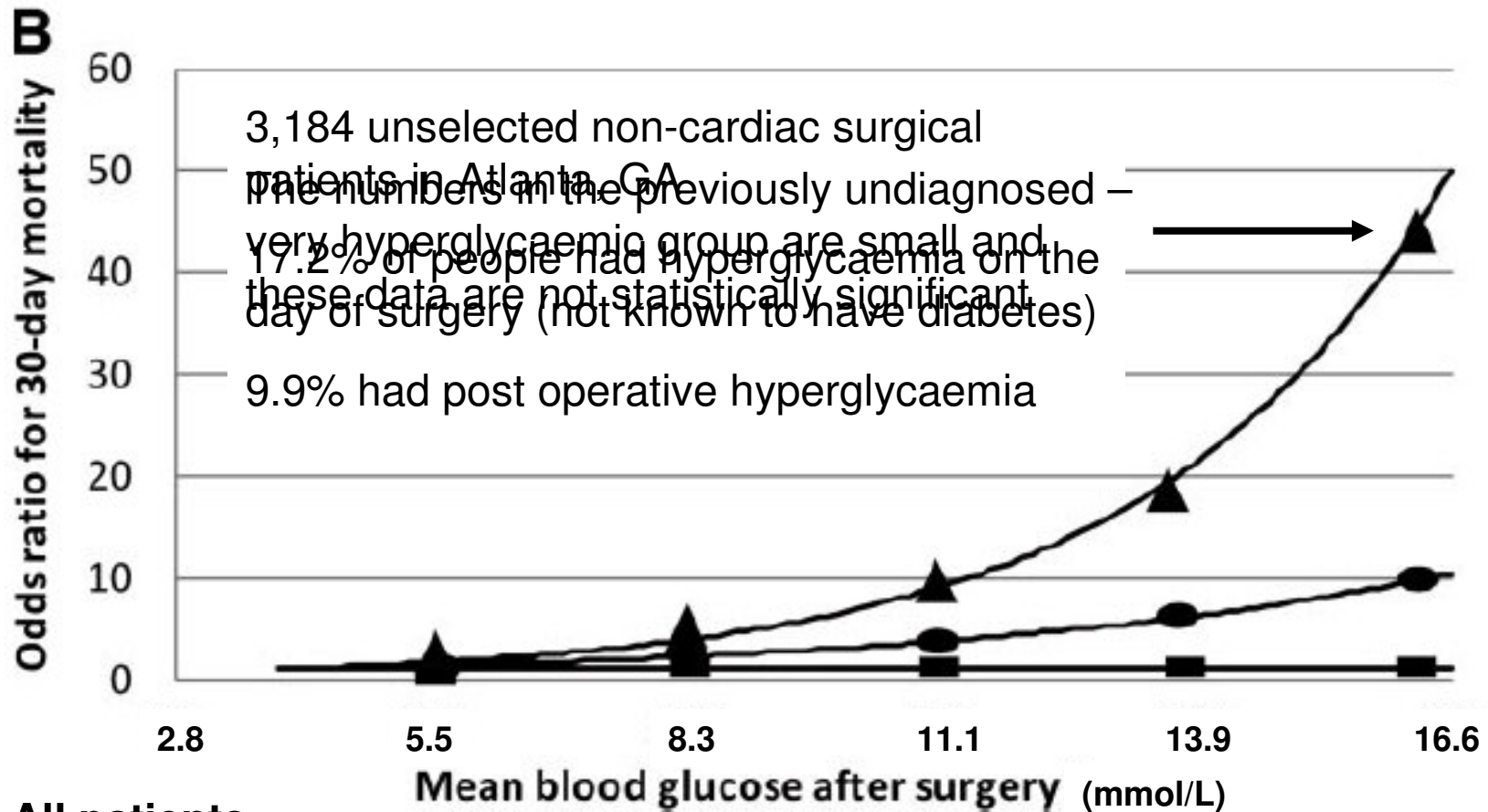


- All patients
- Patients with diabetes
- ▲ Patients without diabetes

Do High Glucose Levels Cause Harm?



An Admission



- All patients
- Patients with diabetes
- ▲ Patients without diabetes

Thus....

- Whilst there is data to show that poor glycaemic control is associated with poor outcomes
- There is no consistent data to show that improving control also improves outcomes

(A bit like diabetes care in general until the mid 1990's)

A Little Bit of Local Data From Medicine

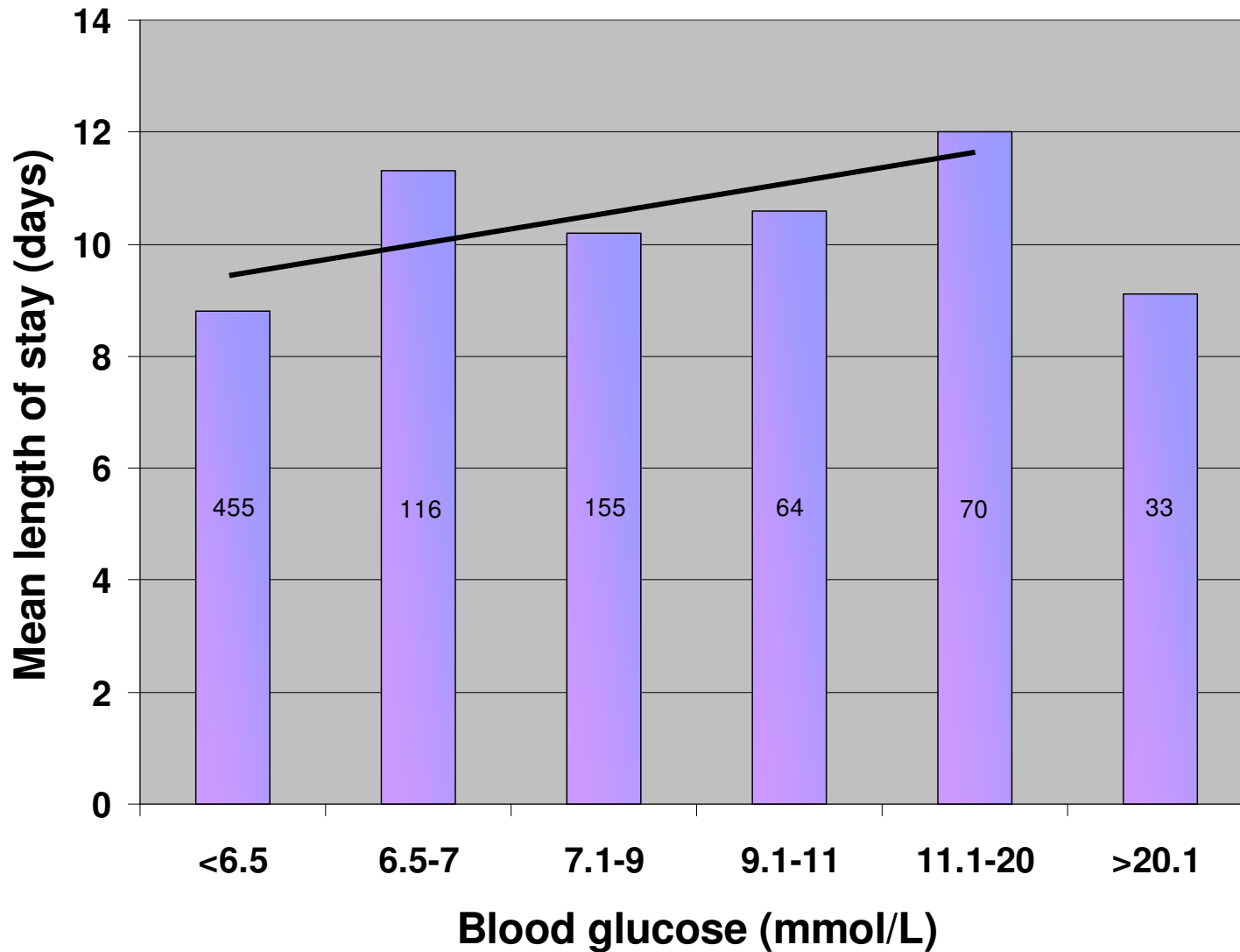
So, Is Admission Hyperglycaemia Important?

- We analysed the data for all 1,502 patients admitted through our AMU in February 2010
- We assessed
 - admission blood glucose,
 - LOS
 - 28-days readmission and mortality
 - whether admission blood glucose ≥ 11.1 mmol/l in non-diabetic individuals was followed-up

Who Admitted Them?

Specialty	Number of patients	Number with diabetes
Medicine for the elderly	577	94 (16.3%)
Cardiology	221	25 (11.3%)
Respiratory	200	28 (14%)
Nephrology	30	9 (30%)
Gastroenterology	132	18 (13.6%)
Endocrinology	30	22 (73%)
Neurology	77	12 (16.9%)
Dermatology	1	0 (0%)
Haematology	16	0 (0%)
Oncology	56	4 (7.4%)
General medicine	162	27 (16.7%)

LOS vs Admission Glucose

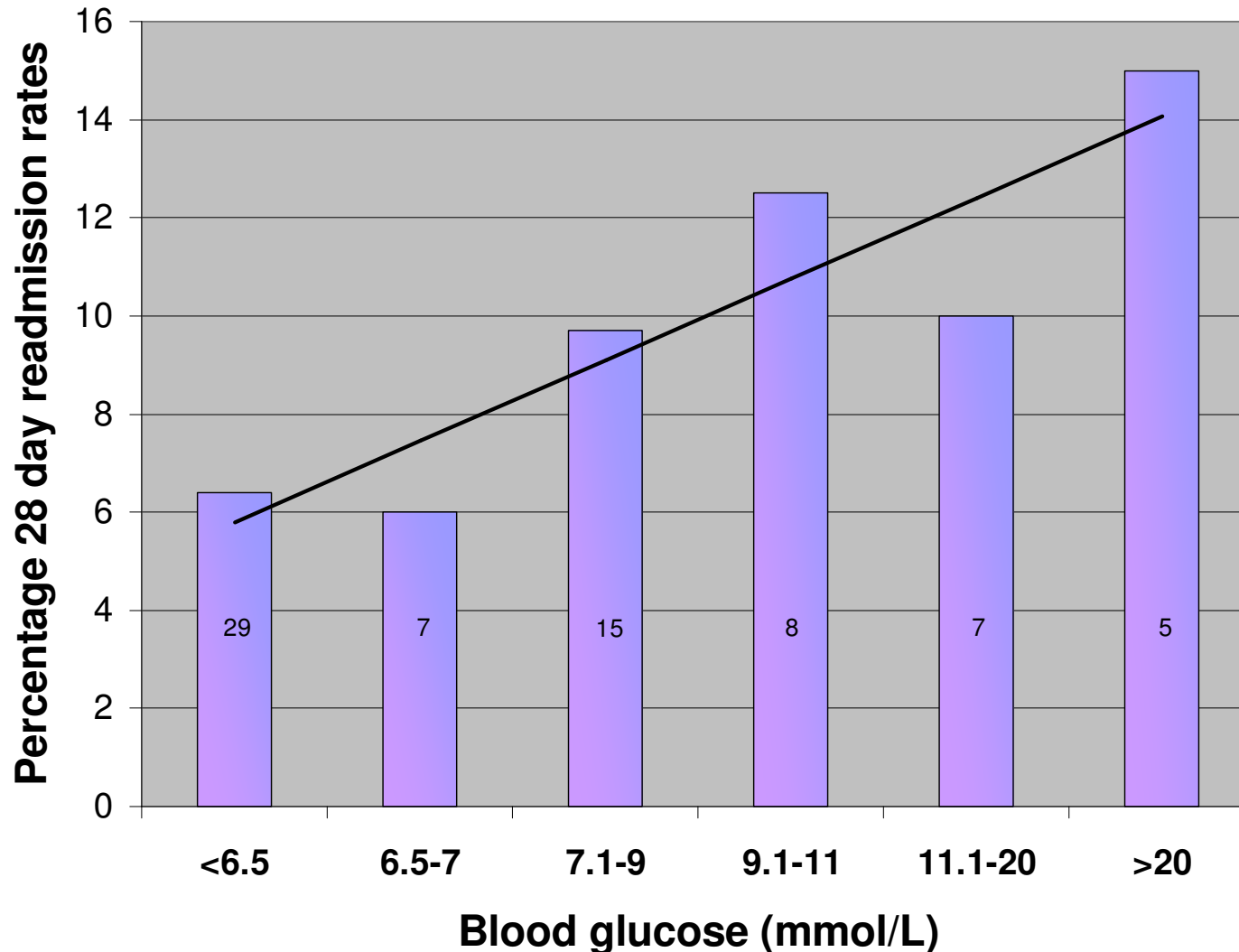


Trend $R^2 = 0.5556$

$P=0.002$

Those above 20mmol/L excluded (most under the diabetes team)

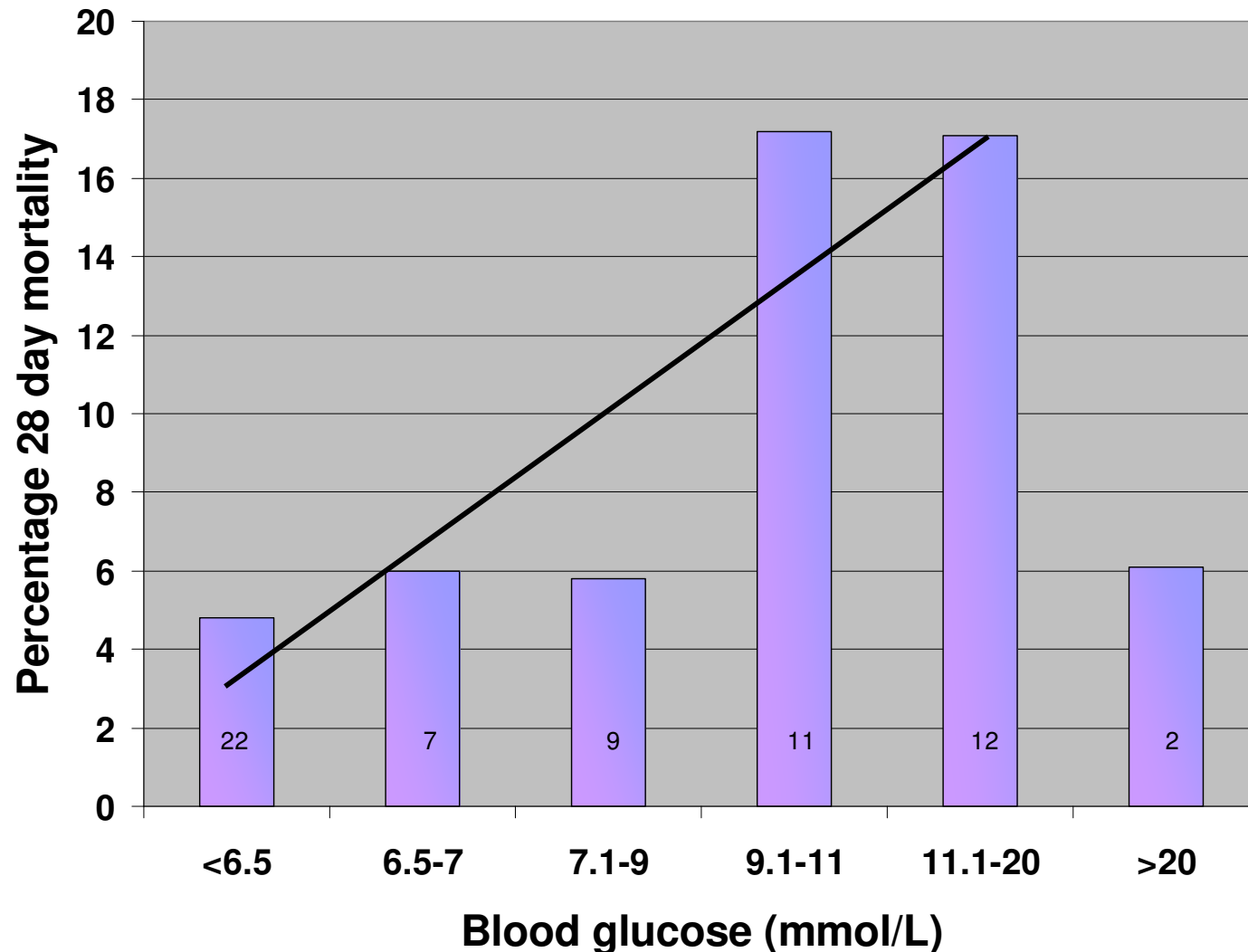
28 Day Readmission vs Admission Glucose



Trend $R^2 = 0.7918$

Of the 1,502 admissions in February 2010, 71 (4.73%) were readmitted within 28 days

28 Day Mortality vs Admission Glucose



Trend $R^2 = 0.7874$

$P < 0.0001$

Of the 1,502 admissions in February 2010, 63 (4.19%) died within 28 days

Follow up

- 37 (2.5%) of the total number of admissions were individuals without an existing diagnosis of diabetes who had an admission blood glucose of ≥ 11.1 mmol/l
- Of these, only 19 (51.4%) received further follow-up at 28 days

What About Local Surgical Data?

- I have just got a junior to start collecting this data prospectively for 3 months on the EAU(S)
- Watch this space.....
- In the meantime, we have audit

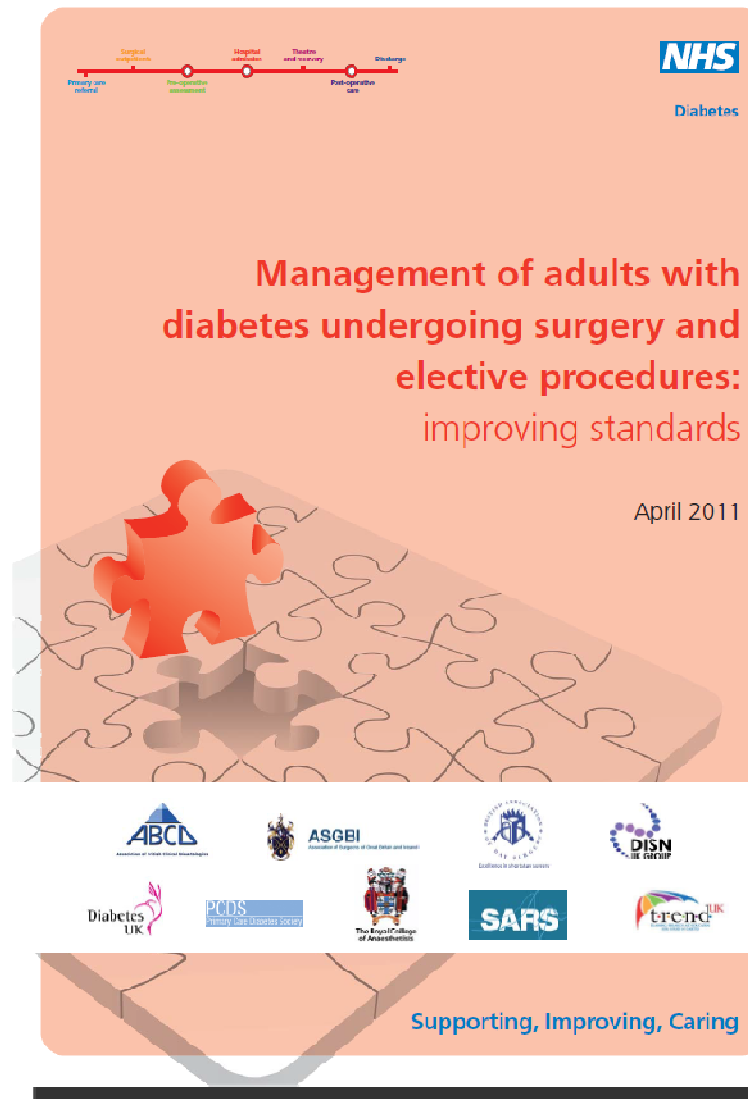
The Care of Patients with Diabetes Undergoing Arthroplasty

Annemarie Brunswicker

Mr Alan Howieson

Dr Ketan Dhatariya

They Took the Audit Tools in This



The Patients

- 50 consecutive arthroplasty patients with diabetes between July 2010 and June 2011
- Admitted through pre-assessment clinic

Institutional Standards

- Are the national guidelines adopted? Yes
- Does the trust collect diabetic outcome data for surgical patients? Yes
- Does the trust have dedicated diabetic nurses? Yes
- Does the trust have a clinical lead for peri-operative care for people with diabetes? Yes

More Standards

- Primary care referrals contain all suggested information: 100%
- Patients pre-operatively assessed: 100%
- Patients with diabetes management plan: 100%
- Admitted on day of surgery: 90%
- Listed 1st on list: 95%
- Length of stay: no longer than 10% greater than average

And More.....

- Patients receive hourly blood glucose monitoring: 100%
- Patients blood glucose maintained between 4-12mmol/l: 100%
- Patients with delayed discharge due to diabetes: 0%

GP Referral Letters Adequate?

• HbA _{1c}	0%
• BP	16%
• PMH	84%
• Medications	84%
• BMI	20%
• eGFR	4%
• Duration of diabetes	48%

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And So On.....

Overall Summary

- Primary care referrals with all suggested information: not achieved
- Patients pre-operatively assessed: achieved
- Patients with diabetes management plan: not achieved
- Admitted on day of surgery: achieved
- Listed 1st on list: not achieved
- Length of stay: no longer than 10% greater than average: achieved for TKR

OK, So What is in Your Control?

- Ask the GP's for standardised referral letters containing the following information
 - Duration and type of diabetes
 - Place of usual diabetes care (primary or secondary)
 - Other co-morbidities
 - Treatment
 - for diabetes oral agents/ insulin doses and frequency
 - For other co-morbidities
 - Complications
 - At risk foot
 - Renal impairment
 - Cardiac disease
 - Relevant measures
 - BMI
 - BP
 - HbA1c
 - eGFR

What Else Can You Influence?

- That pre-operative assessment clinic staff are educated in diabetes management
- That the way to manipulate the drugs prior to surgery is easily available and individualised for all patients
- That patients are listed as close to the beginning of the list as possible - to minimise starvation times

Tablets	Day prior to admission	Day of surgery	
		Patient for AM surgery	Patient for PM surgery
Acarbose	Take as normal	Omit morning dose if NBM	Give morning dose if eating
Meglitinide (repaglinide or nateglinide)	Take as normal	Omit morning dose if NBM	Give morning dose if eating
Metformin (procedure not requiring use of contrast media*)	Take as normal	Take as normal	Take as normal
Sulphonylurea (e.g Glibenclamide, Gliclazide, Glipizide, etc.)	Take as normal	Once daily AM omit Twice daily omit AM	Once daily AM omit Twice daily omit AM and PM
Pioglitazone	Take as normal	Take as normal	Take as normal
DPP IV inhibitor (e.g. Sitagliptin, Vildagliptin, Saxagliptin)	Take as normal	Omit on day of surgery	Omit on day of surgery
GLP-1 analogue (e.g. Exenatide, Liraglutide)	Take as normal	Omit on day of surgery	Omit on day of surgery

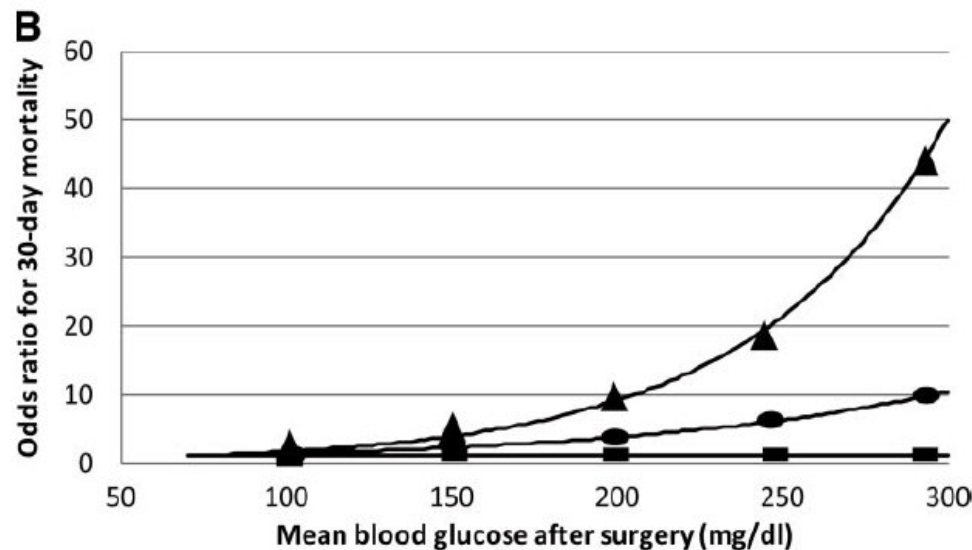
Insulins	Day prior to admission	Day of surgery	
		Patient for AM surgery	Patient for PM surgery
Once daily (evening) (e.g. Lantus® or Levemir®. Insulatard®, Humulin I®, Insuman®)	No dose change*	Check blood glucose on admission	Check blood glucose on admission
Once daily (morning) (Lantus® or Levemir® Insulatard®, Humulin I®, Insuman®)	No dose change	No dose change*. Check blood glucose on admission	No dose change*. Check blood glucose on admission
Twice daily (e.g. Novomix 30®, Humulin M3® Humalog Mix 25®, Humalog Mix 50®, Insuman® Comb 25, Insuman® Comb 50 twice daily Levemir® or Lantus®)	No dose change	Halve the usual morning dose. Check blood glucose on admission. Leave the evening meal dose unchanged	Halve the usual morning dose. Check blood glucose on admission. Leave the evening meal dose unchanged
Twice daily - separate injections of short acting and intermediate acting (e.g. animal neutral, Novorapid® Humulin S®) Apidra® and intermediate acting (e.g. animal isophane Insulatard® HumulinI® Insuman®)	No dose change	Calculate the total dose of both morning insulins and give half as intermediate acting only in the morning. Check blood glucose on admission. Leave the evening meal dose unchanged	Calculate the total dose of both morning insulins and give half as intermediate acting only in the morning. Check blood glucose on admission. Leave the evening meal dose unchanged
3, 4, or 5 injections daily	No dose change	Basal bolus regimens: omit the morning and lunchtime short acting insulins. Keep the basal unchanged.* Premixed AM insulin: halve the morning dose and omit lunchtime dose Check blood glucose on admission	Take usual morning insulin dose(s). Omit lunchtime dose. Check blood glucose on admission

The Future

- If acute admission hyperglycaemia is associated with poor outcomes in medical and surgical patients, then does lowering glucose on admission make a difference?
- Intervention Trials!

In The Meantime - It's a Minefield

- Remember, if you knew that without you even TOUCHING the patient you could *potentially* reduce their peri-operative mortality by 40 fold would you do that first?



Thank you for your attention



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