Oh Sweet Mystery of Life: Diabetes Management in Ambulatory Patients

Dr Ian McConachie FRCA FRCPC
No financial disclosures
Aims

• Evaluate risks versus benefits for management of diabetes in ambulatory surgical patients
• Assess current guidelines for management of diabetes in ambulatory patients
• Formulate management plans for managing diabetic ambulatory patients undergoing surgery
• I don’t intend to sugar coat the issues
“I guess we have to accept that we are not rocket scientists”
• Session planned before CJA publication!
• Presume you have not read it or you wouldn’t be here?
diabetes is a DISEASE?!?

omg, it sounds really serious!
<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
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<tbody>
<tr>
<td>Onset</td>
<td>Sudden</td>
<td>Gradual</td>
</tr>
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<td>Age at onset</td>
<td>Any age – mostly young</td>
<td>Mostly adults</td>
</tr>
<tr>
<td>Usual</td>
<td>Thin or normal</td>
<td>Often obese</td>
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<tr>
<td>Ketoacidosis</td>
<td>Common</td>
<td>Rare</td>
</tr>
<tr>
<td>Autoantibodies</td>
<td>Usually present</td>
<td>Absent</td>
</tr>
<tr>
<td>Endogenous insulin</td>
<td>Low or absent</td>
<td>Normal, decreased or increased</td>
</tr>
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<td>Prevalence</td>
<td>Less prevalent</td>
<td>More prevalent</td>
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• Incidence of Type I diabetes not changed significantly since introduction of insulin
• Incidence of Type 2 diabetes increasing dramatically
• Estimated 1 million new Type 2 diabetics in USA PER YEAR
• Child in USA 1:3 chance developing diabetes
• Sixth leading cause of death in USA
• Risk of death twice non diabetics
• 25% of hospitalised patients
• More likely to undergo surgery
Estimated percentage of people aged 20 years or older with diagnosed and undiagnosed diabetes, by age group, United States, 2005–2008

- 20-44: 3.7%
- 45-64: 13.7%
- ≥65: 26.9%

Percentage with physician-diagnosed diabetes
Obesity (BMI ≥30 kg/m²)

1994

2000

2009

Diabetes

1994

2000

2009

No Data  <14.0%  14.0-17.9%  18.0-21.9%  22.0-25.9%  ≥26.0%

No Data  <4.5%  4.5-5.9%  6.0-7.4%  7.5-8.9%  ≥9.0%
Percentage of adults with diagnosed diabetes receiving treatment with insulin or oral medication, United States, 2007–2009

Why do we care?
• Increased prevalence of cardiac disease
• Increased cardiac mortality
• Included in several risk scoring systems
• Unadjusted odds ratio for perioperative cardiovascular death is 3.8 (2.5-5.4) amongst diabetics (Am J Med 2005:118;1134-41)
Other problems

- 30% IDDM patients develop “stiff joint” syndrome. “Prayer sign” predicts difficult intubation.
- Up to 50% develop signs of autonomic neuropathy
  - delayed gastric emptying
  - impaired responses to hypercapnia and hypoxia
Postoperative problems

- ↑ Infections
- ↓ wound strength
- ↓ WBC function
- Worse cerebral outcome if ischemia
- Endothelial dysfunction
- DKA & hyperosmolar syndrome
- Mortality ?
Patient example 1

• 45 year old man with type 2 diabetes taking oral metformin ( not taken this AM )
• Day surgery for knee arthroscopy.
• Blood glucose on the AM of surgery is 11.5mmol/l.
• Should the patient be cancelled and brought back for surgery when blood glucose is better controlled ?
Is tight control or non tight control of blood sugar beneficial?
Is tight control of blood sugar beneficial?

1. Overall
• Long term benefits of blood glucose control in younger, type 1 patients with diabetes seem clear.
• Lesser benefits of tight control of type 2 diabetes in the elderly population.
• This may have implications for perioperative control
DCCT (Diabetes Control and Complications Trial)

Type 1 DM.
Intensive blood glucose control (Hb A1C 6%) reduces risk of:

- eye disease - 76% reduced risk
- microalbuminuria - 39% reduced risk
- neuropathy – 60% reduced risk

*NEJM* 1993; 329: 977-86
EDIC (Epidemiology of Diabetes Interventions and Complications)

Further 12 year follow up. Intensive treatment reduced the risk of:

- any predefined cardiovascular disease outcome by 42% 
- the first occurrence of nonfatal myocardial infarction, stroke, or death from cardiovascular disease by 57%

NEJM 2005; 353: 2643-2653
Action to Control Cardiovascular Risk in Diabetes (ACCORD)

• Middle aged and elderly Type 2 DM with glycolated Hb > 7.5% with IHD or IHD risk factors
• “Tight” control group aimed for glycolated Hb < 6% versus 7-7.9% in control group
• Primary outcome composite of non fatal MI, non fatal CVA or death from CV causes

• Original ACCORD trial terminated early due to increased overall mortality in tight control group (though less MI).

• Patients then managed with goal of 7-7.9%
• Long term follow up of the original ACCORD study “tight” control group (mean 3.7 years followed by 1.2 years of standard therapy).

• Decrease in non fatal MI but increased overall mortality (not thought to be due to increased hypoglycemia)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Intensive no. of events (%)</th>
<th>Standard no. of events (%)</th>
<th>Hazard Ratio (95% CI)</th>
<th>P Value for Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before transition</td>
<td>380 (2.0)</td>
<td>414 (2.2)</td>
<td>0.90 (0.78 – 1.03)</td>
<td>0.13</td>
</tr>
<tr>
<td>Until end of study</td>
<td>503 (2.1)</td>
<td>543 (2.2)</td>
<td>0.91 (0.81 – 1.03)</td>
<td>0.12</td>
</tr>
<tr>
<td>Nonfatal myocardial infarction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before transition</td>
<td>207 (1.1)</td>
<td>257 (1.4)</td>
<td>0.79 (0.66 – 0.95)</td>
<td>0.01</td>
</tr>
<tr>
<td>Until end of study</td>
<td>287 (1.2)</td>
<td>344 (1.4)</td>
<td>0.82 (0.70 – 0.96)</td>
<td>0.01</td>
</tr>
<tr>
<td>Nonfatal stroke</td>
<td></td>
<td></td>
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<tr>
<td>Before transition</td>
<td>72 (0.4)</td>
<td>72 (0.4)</td>
<td>0.99 (0.72 – 1.38)</td>
<td>0.98</td>
</tr>
<tr>
<td>Until end of study</td>
<td>82 (0.3)</td>
<td>94 (0.4)</td>
<td>0.87 (0.65 – 1.17)</td>
<td>0.35</td>
</tr>
<tr>
<td>Death from cardiovascular causes</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Before transition</td>
<td>140 (0.7)</td>
<td>109 (0.6)</td>
<td>1.27 (0.99 – 1.63)</td>
<td>0.07</td>
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<tr>
<td>Until end of study</td>
<td>187 (0.7)</td>
<td>144 (0.6)</td>
<td>1.29 (1.04 – 1.60)</td>
<td>0.02</td>
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<tr>
<td>Death from any cause</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Before transition</td>
<td>283 (1.4)</td>
<td>232 (1.2)</td>
<td>1.21 (1.02 – 1.44)</td>
<td>0.03</td>
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<tr>
<td>Until end of study</td>
<td>391 (1.5)</td>
<td>327 (1.3)</td>
<td>1.19 (1.03 – 1.38)</td>
<td>0.02</td>
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<tr>
<td>Primary outcome, revascularization, or hospitalization for CHF</td>
<td></td>
<td></td>
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<tr>
<td>Before transition</td>
<td>931 (5.3)</td>
<td>955 (5.4)</td>
<td>0.96 (0.88 – 1.06)</td>
<td>0.43</td>
</tr>
<tr>
<td>Until end of study</td>
<td>1159 (5.2)</td>
<td>1229 (5.5)</td>
<td>0.93 (0.86 – 1.01)</td>
<td>0.09</td>
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<tr>
<td>Fatal myocardial infarction, nonfatal myocardial infarction, or unstable angina</td>
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<tr>
<td>Before transition</td>
<td>439 (2.3)</td>
<td>490 (2.6)</td>
<td>0.88 (0.77 – 1.00)</td>
<td>0.05</td>
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<tr>
<td>Until end of study</td>
<td>580 (2.4)</td>
<td>627 (2.6)</td>
<td>0.90 (0.81 – 1.01)</td>
<td>0.08</td>
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<tr>
<td>Fatal or nonfatal stroke</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Before transition</td>
<td>78 (0.4)</td>
<td>80 (0.4)</td>
<td>0.97 (0.71 – 1.33)</td>
<td>0.85</td>
</tr>
<tr>
<td>Until end of study</td>
<td>91 (0.4)</td>
<td>106 (0.4)</td>
<td>0.86 (0.65 – 1.13)</td>
<td>0.27</td>
</tr>
<tr>
<td>Fatal or nonfatal CHF</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Before transition</td>
<td>189 (1.0)</td>
<td>158 (0.8)</td>
<td>1.19 (0.96 – 1.47)</td>
<td>0.11</td>
</tr>
<tr>
<td>Until end of study</td>
<td>232 (0.9)</td>
<td>212 (0.9)</td>
<td>1.09 (0.91 – 1.32)</td>
<td>0.35</td>
</tr>
<tr>
<td>Event</td>
<td>Before transition</td>
<td>Until end of study</td>
<td></td>
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<td>-----------------------------------</td>
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</table>

![Table showing comparison between Intensive Therapy and Standard Therapy in terms of death from cardiovascular causes and any cause.](image)
globin levels. The higher risk of death from any cause and from cardiovascular causes in the intensive-therapy group means that a therapeutic approach that targets glycated hemoglobin levels below 6% cannot be generally recommended in this population. Thus, the results of the ACCORD trial suggest a lower limit for glycemic targets, achieved with the use of multiple combinations of currently available approaches.
• So….tight control beneficial in Type 1 diabetes patients but less beneficial in Type 2 diabetic patients.

• This may have implications perioperatively for differences in control of Type 1 or Type 2 patients.
Is tight control of blood sugar beneficial?

1. Overall
2. Perioperative period
“When a thing ceases to be a subject of controversy, it ceases to be a subject of interest”

W Hazlitt 1778-1830
“In ICU, before 2001, most studies did not include normoglycaemia among their aims.”

“Until 2001, the main thrust of intraoperative and postoperative glycemic control was avoiding hypoglycemia”
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.
Benefits of tight control?

- Early studies in ICU patients seemed to show benefits of tight control of blood glucose.
- Later studies, less certain benefit, and concerns about mortality associated with hypoglycemia.
NICE – SUGAR trial

- 6104 patients expected to be in ICU for 3 days
- Randomised to blood glucose control 4.5-6.0mmol/l or < 10mmol/l

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Intensive Control (N=3010)</th>
<th>Conventional Control (N=3012)</th>
<th>Odd Ratio for Death (95% CI)</th>
<th>P Value for Heterogeneity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operative admission</strong></td>
<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td>272/1111</td>
<td>222/1121</td>
<td>1.31 (1.07–1.61)</td>
<td>0.10</td>
</tr>
<tr>
<td>No</td>
<td>557/1898</td>
<td>529/1891</td>
<td>1.07 (0.93–1.23)</td>
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<tr>
<td><strong>Diabetes</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>195/615</td>
<td>165/596</td>
<td>1.21 (0.95–1.55)</td>
<td>0.60</td>
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<tr>
<td>No</td>
<td>634/2394</td>
<td>586/2416</td>
<td>1.12 (0.99–1.28)</td>
<td></td>
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<tr>
<td><strong>Severe sepsis</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>202/673</td>
<td>172/626</td>
<td>1.13 (0.89–1.44)</td>
<td>0.93</td>
</tr>
<tr>
<td>No</td>
<td>627/2335</td>
<td>579/2386</td>
<td>1.15 (1.01–1.31)</td>
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<tr>
<td><strong>Trauma</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>41/421</td>
<td>57/465</td>
<td>0.77 (0.50–1.18)</td>
<td>0.07</td>
</tr>
<tr>
<td>No</td>
<td>788/2587</td>
<td>694/2547</td>
<td>1.17 (1.04–1.32)</td>
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<tr>
<td><strong>APACHE II score</strong></td>
<td></td>
<td></td>
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<tr>
<td>≥25</td>
<td>386/927</td>
<td>363/944</td>
<td>1.14 (0.95–1.37)</td>
<td>0.84</td>
</tr>
<tr>
<td>&lt;25</td>
<td>442/2080</td>
<td>387/2066</td>
<td>1.17 (1.01–1.36)</td>
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</tr>
<tr>
<td><strong>Corticosteroids</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>134/392</td>
<td>140/378</td>
<td>0.88 (0.66–1.19)</td>
<td>0.06</td>
</tr>
<tr>
<td>No</td>
<td>695/2616</td>
<td>611/2634</td>
<td>1.20 (1.06–1.36)</td>
<td></td>
</tr>
<tr>
<td><strong>All deaths at day 90</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Intensive Control Better</td>
<td>829/3010</td>
<td>751/3012</td>
<td>1.14 (1.02–1.28)</td>
<td>0.02</td>
</tr>
<tr>
<td>Conventional Control Better</td>
<td></td>
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</tr>
</tbody>
</table>
What about high risk surgical patients?
Non cardiac patients

- 989 patients, retrospective case control series
- Preoperative hyperglycemia is associated with increased CV mortality in patients undergoing noncardiac, nonvascular surgery

CABG patients

- Retrospective study 4658 patients.
- Moderate glycemic control in perioperative period was superior to tight glycemic control, with decreased mortality and major complications.

J Thorac Cardiovasc Surg 2011; 141: 543-51
CABG patients

- Postoperative hyperglycemia is associated with increased in-hospital mortality in nondiabetic patients after coronary artery bypass graft surgery.
- In diabetic patients, hyperglycemia was not associated with mortality.

J Thorac Cardiovasc Surg 2011 epub Apr 15
Cochrane review of perioperative glucose control and surgical infection

“There is insufficient evidence to support strict glycaemic control in the intra- and post-operative period among surgical patients for the prevention of SSIs.”

• Lack of apparent benefits in high risk patients and ICU patients.
• Risk of hypoglycemia (with documented associated mortality in ICU patients under tight control) should temper enthusiasm for tight control in low risk patients.
• First do no harm!
No evidence of increased mortality from poor perioperative control in low risk patients

Optimum blood sugar in surgical patients is not known.
• So…overall in ICU patients and high risk surgical patients:
• High is bad (especially preop and in non diabetic patients?)
• Low (tight control) possibly bad
• Moderate control probably best
• What about low risk, ambulatory patients?
• There are no RCTs assessing tight control perioperatively in low risk, ambulatory surgery patients (and nor are there likely to be)
• Would require very large numbers to be adequately powered to detect differences in outcome
• Tight control cannot at present be recommended in ambulatory patients?
Perioperative management regimens
Patient example 2

- 45 year old man with type 2 diabetes taking oral metformin (not taken this AM)
- Ambulatory surgery for hernia repair.
- Blood glucose on the AM of surgery is 8.5mmol/l.
- How should his diabetes be managed intraoperatively?
SANOL'S

ANTI DIABETES

This valuable remedy has been thoroughly tested and is being prescribed by the most eminent physicians both in Canada and in the United States for the treatment of diabetes mellitus.

Directions:
Each space on label represents one dose to be taken in the morning one to two hours before breakfast and half to one hour before retiring. Children half quantity. Full directions on enclosed circular.

Shake well before taking.

Address Orders to
INTERNATIONAL PRODUCTS CO.
ANTI DIABETES

THIS VALUABLE REMEDY HAS BEEN THOROUGHLY TESTED AND IS BEING PRESCRIBED BY THE MOST EMINENT PHYSICIANS BOTH IN CANADA AND IN THE UNITED STATES FOR THE TREATMENT OF DIABETES MELLITUS.
Goals Type 1

- Glucose must be administered to prevent ketosis, ketoacidosis, dehydration etc.
- Recommended range from 5 – 10 g/hr in 70kg patient. (100ml/hr 5% glucose = 5g/hr)
- Insulin to avoid hyperglycaemia
- K usually needed with prolonged infusions
Choice of method of glucose control probably less important than the skill, organization and coordination of the nurses and doctors involved
Historical regimens Type 1

• No insulin, no glucose
• Glucose with reduced dose insulin
• Glucose infusion with sc insulin by sliding scale
• Infusion of GIK at standard rate
• Fixed rate glucose infusion plus variable rate insulin infusion
No insulin, no glucose

- Simple
- Unlikely to cause hypoglycaemia
- Potentially progressing towards ketoacidosis
- Intraoperative hyperglycaemia inevitable
- Potentially OK for very brief AM procedures which delay normal AM insulin and food by less than an hour
IV glucose & reduced dose AM insulin

- Probably OK for brief procedures in AM if can eat late breakfast after surgery.
- Reduced dose insulin sc eg 1/2 or 1/3 usual dose
- IV glucose to avoid hypoglycemia
Glucose infusion with sc insulin by sliding scale

• Traditional approach based on custom rather than logic
• If hypoglycaemia is to be avoided each injection certain to be preceded by period of hyperglycaemia
• May not provide good control

Infusion of GIK at standard rate

- Alberti regime
- 1979
- 100ml/hr of 500ml of 10% Glucose solution containing 10u soluble insulin (2u/hr) and 1G KCL
- If glucose < 5 or >15 insulin concentration altered
- Revert to sc dosing when oral intake
• Claimed to be simple
• In theory, safe - as wide variations in infusion rate should cause minimal changes in blood glucose

However....
• Little evidence of improved control over other methods
• Risk of hyponatremia
• 10% irritant to peripheral veins (widely used modification uses 5% glucose)
• Frustrating and wasteful in unstable patients due frequent bag changes
Fixed rate glucose infusion plus variable rate insulin infusion

- Insulin requirements vary widely perioperatively.
- A variable rate infusion shown to achieve normoglycemia in all patients

Measure glucose hourly

Blood glucose

Action

< 4.5
give 25G glucose
stop insulin 30min

4.5-6.6
↓ insulin 0.3u/hr

6.7-10
no change

10.1-13.3
↑ insulin 0.3u/hr

> 13.3
↑ insulin 0.3u/hr
• Close control
• Labor intensive
• Risk of insulin being given without glucose
• Wrongly programmed pumps
Which regimen? Type 1

- Possible better control with IV insulin compared to sc sliding scale
- Little outcome data
- Few direct comparative studies
- “Tight control” needs IV insulin
- Brief procedures in AM where can have late breakfast can still probably be managed with IV glucose and reduced dose of AM insulin
Goals Type 2

- Keep it simple
- Minimise hyperglycemia
- Avoid hypoglycemia
- If chronic poor control and proceed with surgery do not acutely normalise BS
- Aim for BS < 10 mmol/l
• Aim to resume normal diet and oral agents as soon as possible
• PONV prophylaxis may be useful
• Perioperative insulin not necessary for most surgeries unless NPO for prolonged periods
Recent different approaches

Light at the end of the tunnel?
How well do hospitals manage diabetes?

- 37 US Academic centres, 1718 patients
- 79% prior diagnosis of diabetes
- Wide variation in management practices
- Hyperglycemia common – 50% a least 1 blood glucose > 180mg/dl on days 2 or 3
- Severe hypoglycemia (< 50mg/dl) in 2.8% of patient days

“Let’s stop this sliding-scale insulin insanity now.”

J Hosp Med 2006; 1: 141-4
Insulin Glargine

- Microcrystals slowly release insulin
- Duration of action 18 to 26 hours
- “Peakless" profile
- Pharmacokinetically resembles basal insulin secretion of non-diabetic pancreatic beta cells
- Need fast acting insulin with food
- Seems associated with less hypoglycemia
Hirsch, I.B.; Insulin Analogues. NEJM Volume 352 (2); 174-183 January 13th 2005. [http://content.nejm.org/cgi/content/full/352/2/174](http://content.nejm.org/cgi/content/full/352/2/174)
Rabbit 2 trial (Randomized Study of Basal-Bolus Insulin Therapy)

- RCT. 211 patients
- Type 2 DM. Gen surgery
- Comparing basal-bolus insulin regimen with glargine once daily and glulisine before meals to sliding scale regular insulin four times daily

Diabetes Care 2011 ; 34 : 256-261
• Wound infections and pneumonia less in Basal Bolus therapy group.
• Hypoglycemia ( < 70 mg/dL)
  23.1 % BBI v 4.7% in SSI
• No difference severe hypoglycemia ( < 40 mg/dL)
Insulin glargine v GIK

- RCT
- 30 type 2 DM patients on insulin undergoing vascular surgery
- Insulin glargine SC + Dex 5% IVI versus GIK infusion

Perioperative pitfalls
Perioperative pitfall 1

Hypoglycemia
• “Code blue” 08.00 23 Dec 2006
• Ophthalmology patient.
• NPO most of 22 Dec
• Requested and given 52 units NPH nocte
• Found unresponsive. BS 1.2
• Given IV glucose
• Full recovery
• Hypoglycemia big problem in some ICU studies
• Frequent monitoring important
• Beware long acting insulins
Perioperative pitfall 2

Insulin and glucose facilitate intracellular transfer of K
- Hypokalemia during infusion
- Report of Hyperkalemia after infusion stopped:

“This case demonstrates that changes in insulin therapy warrant not only close monitoring of blood glucose, but also of serum potassium”

Perioperative pitfall 3

“After 10 mg dexamethasone, blood glucose levels increase in non-diabetic and type 2 diabetic patients undergoing abdominal surgery. Poorly controlled diabetes and severe obesity can influence the development of hyperglycaemia”

Br J Anaesth. 2006 ; 97 : 164-70
“The dexamethasone treated patients were more likely to have a higher blood glucose on admission to the intensive care unit”

Effects of single dose, postinduction dexamethasone on recovery after cardiac surgery. Ann Thorac Surg 2000:69;1420-4
Perioperative pitfall 4

Doing something is better than doing nothing!

Do the patients always get what we think they get (or order)?
• 63 male patient
• IDDM, Hypertension and retinopathy
• Sliding scale ordered
• 11.30 AM blood glucose 15.3
• Should have had 8 units insulin
• Actually had.....nothing!
• So…what is the best way to manage ambulatory diabetic patients in the perioperative period?
Optimal evidence-based perioperative blood glucose control in patients undergoing ambulatory surgical procedures remains controversial. Therefore, the Society for Ambulatory Anesthesia has developed a consensus statement on perioperative glycemic management in patients undergoing ambulatory surgery. A systematic review of the literature was conducted according the protocol recommended by the Cochrane Collaboration. The consensus panel used the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) system for providing suggestions. It was revealed that there is insufficient evidence to provide strong recommendations for the posed clinical questions. In the absence of high-quality evidence, recommendations were based on general principles of blood glucose control in diabetics, drug pharmacology, and data from inpatient surgical population, as well as clinical experience and judgment. In addition, areas of further research were also identified. (Anesth Analg 2010;111:1378–87)
Samba guidelines summary

- Normal oral hypoglycemic agents the day before surgery
- No oral hypoglycemic agents to be taken on day of surgery
- No change in insulin dose the day before surgery apart from intermediate duration insulin – give 75% in evening

Anesth Analg 2010; 111: 1378-87
• No short, rapid insulin preop on day of surgery
• 50-75% of AM dose if intermediate insulins
• 75-100% of AM dose of basal, peakless insulin eg Glargine
• No change to insulin pump
Additional points and comments

• Type 1 patients should not have insulin withheld apart for briefest AM procedures
• Type 1 DM patients need IV glucose for all but briefest procedures
• Nausea/vomiting prophylaxis
• Care with dexamethasone
• Check before, during (approx every 2 hours) and after surgery
• Patients to eat and resume treatment ASAP
• On discharge, patients must watch for hypoglycemia and have ability to manage it
• SC insulin best for perioperative control
• Optimal dosing schedule not known
• Patients to eat and resume treatment ASAP

• On discharge, patients must watch for hypoglycemia and have ability to manage it

• SC insulin best for perioperative control

• Optimal dosing schedule not known
SAMBA cancellation guidelines

• Postpone elective surgery if severe dehydration, ketoacidosis, and hyperosmolar non-ketotic states.
• May be OK to proceed if preoperative hyperglycemia but good long term control.
• If poor long term control, decision to proceed or postpone on individual basis after discussion with surgeon taking into consideration other comorbidities and potential surgical complications.
Audit

Do we have a consistent approach?

Suitable subjects for audit
• Adequacy of blood glucose control
• Implementation of orders

D. Lomax, Intraoperative care, Management of diabetes mellitus in The Royal College of Anaesthetists, Raising the Standard: A compendium of audit recipes
The future?

- Inhaled insulin
- Currently off market
- Controversial
- Expensive
- Still need long acting insulins
Various types of insulin patches are under development by different pharmaceutical manufactures. Dermisonics Inc. is developing a new, ultrasonic transdermal drug-delivery patch and the company has recently announced that it has received approval from the regulatory authorities to enter into the next stage of human pilot trials of its proprietary U-Strip (TM) Insulin Patch drug-delivery system.
Electron micrograph of a single islet of Langerhans with a thin shell alginate/polylysine coating.
Reversal of type 2 diabetes: normalisation of beta cell function in association with decreased pancreas and liver triacylglycerol

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