MANAGEMENT OF CHILDREN WITH DIABETES REQUIRING SURGERY OR FASTING

Children with diabetes requiring surgical procedures:

◊ need careful liaison between the Surgical, Anaesthetic and Children's Diabetes teams (see contact lists below) before admission for elective surgery and as soon as possible after admission for other surgical admissions
◊ must be admitted for general anaesthesia (GA) to a hospital ward with staff experienced in managing childhood diabetes
◊ need insulin, even if fasting, to avoid ketoacidosis
◊ should receive a glucose infusion at the time of GA to prevent or correct hypoglycaemia

Minor procedures requiring fasting and GA

For short procedures when rapid recovery is anticipated (eg. Day Case OGD, Jejunal Biopsy, Tonsillectomy, Dental extractions) a simplified protocol may be organised by experienced diabetes/anaesthetic personnel. Recommendations:

<u>For morning list</u>

1. On day before surgery child eats normally and has normal insulin regimen and unless specifically recommended by surgeon or anaesthetist does not need admission to hospital
2. **Put child first on list**
3. Admit child at 8am and do not give insulin
4. No solids for 6 hours before surgery but may have clear fluids including sugary drinks up to 2 hours before GA
5. On admission to ward, check capillary blood glucose level (BG) and if less than
4 mmol give half tube of Hypostop and check BG in 15 minutes
6. On induction of anaesthesia IV to be set up to keep vein open
7. Post-op child to have BG test and **return to ward without delay**, give usual morning dose of insulin and light breakfast (eg. toast/cereal/sugar free drink). If food or drink not tolerated run IV Glucose 10% at maintenance infusion *(see appendix)* and monitor BG initially half hourly and then hourly to maintain BG 4-10 *(see extra insulin recommendations below).*
8. May go home later in day if well and following a check by anaesthetist, surgeon and/or diabetic team

<u>For afternoon List</u>

1. **Put child first on list** (ie 2pm)
2. Admit at 9-10 am after normal insulin and breakfast
3. No food after 8 am for 2pm list but allow clear (sugar) drinks until 12 midday

4. Monitor BG hourly to maintain BG 4-10 mmol. If less than 4 give half tube Hypostop.
5. On induction, insert IV to keep vein open.
6. Post-op child to have BG and **return to ward without delay**. Allow light lunch (eg. toast, bread). If not tolerated run IV Glucose 10% at maintenance infusion *(see appendix)* to maintain BG 4-10.
7. May go home later in day if well and following a check by anaesthetist, surgeon and /or diabetes team

Extra Insulin Recommendations

If BG rises to high levels post-op the parents usually have in their possession advice for additional Novo Rapid Insulin to reduce BG rapidly and safely.

The dose of NovoRapid will be approximately 0.1 units/kg for BG above 15 or
0.15 units/kg for BG above 20 mmol/l. The effect of this should be monitored every hour and additional doses can be given every 2-3 hours as necessary before usual insulin is restarted.

Elective major/complex surgery (or poorly controlled diabetes)

- Operations are best scheduled early on the list, preferably in the morning
- Admit to hospital the afternoon prior to surgery for **morning** and **major** operations
- Earlier admission is important if glycaemic control is poor so that control can be improved
- Admission should be to either the paediatric surgical Wards or Ward 11 for diabetes management

The evening prior to surgery

- Capillary Blood Glucose (BG) monitoring is important especially before meals and snacks and before bedtime (check urinary ketones if the BG is > 20mmol/l). Remember that the parents of children with diabetes know how to check BG with their own BG meters and may advise staff about preferred carbohydrate intake
- Give the usual evening or bedtime insulin(s) and ensure that the bedtime snack is eaten
- Ketosis or severe hyperglycaemia will necessitate correction preferably by overnight IV infusion & might cause a delay in surgery.
  (The IV cannula may be inserted day before surgery to keep vein open and infusion details written up for the next morning)

(a) For morning operations

1. No solid food from midnight
2. Fluids such as milk may be allowed up to 6 hours pre-operatively. Clear fluids may be allowed up to 2 hours pre-op (check with anaesthetist)
3. Omit usual morning insulin dose

4. Start **IV glucose 10% and insulin infusion** at 0800 h latest *(see Appendix for infusion guide)*
5. Hourly BG monitoring pre-operatively; half-hourly during operation and until woken from anaesthetic
6. Hourly BG monitoring for 4 hours post-operatively
7. Aim to maintain blood glucose between 4 and 10 (see **Appendix**)
8. Continue IV infusions until the child tolerates oral fluids and snacks (this may be for 24-48 hours following a major operation and required morphine administration etc)
9. Change to usual SC insulin regimen or short/rapid acting insulin before the first meal is taken eg. If first meal is lunch give NovoRapid 0.1unit/kg immediately before or after the meal
10. If food tolerated stop insulin infusion 30 minutes after the subcutaneous NovoRapid insulin is given

(b) <u>For afternoon operations</u>

1. Give one third of the usual total morning insulin dose as short acting (Actrapid) insulin
2. Allow light breakfast. Clear fluids may be allowed up to 2 hours pre-operatively (check with anaesthetist)
3. Start **IV glucose 10% and insulin infusion** at breakfast time or at 12.00 midday at the **latest** *(see Appendix)*
4. Then as for (a) 5.

Emergency surgery

REMEMBER

◊ Diabetic ketoacidosis may present as an 'acute abdomen'
◊ Acute illness may precipitate diabetic ketoacidosis (with severe abdominal pain)

- Nil by mouth
- Secure IV access
- Check weight, electrolytes, glucose, blood gases and blood/urinary ketones pre-operatively
- If ketoacidosis is present, follow protocol 14 for DKA and delay surgery until circulating volume and electrolyte deficits are corrected
- If there is no ketoacidosis, start IV glucose and insulin infusions as for elective surgery

APPENDIX

Infusion guide for surgical procedures

1. Maintenance fluid guide

- Glucose 10%
- If infusion is required for more than 12 hours infuse Glucose 4%/Saline 0.18%/Potassium Chloride 10 mmol in each 500ml bag and monitor electrolytes and BG.

	Body Weight	Fluid Requirement / 24h
	3 - 9 kg	100 ml/kg
For each kg between	10 - 20 kg	add 50 ml/kg
For each kg over	20 kg	add 20 ml/kg (max 2000ml female 2500ml male)

2. Insulin infusion

- Add Actrapid Insulin 50 units (drawn up in insulin syringe) to 50 ml Saline 0.9% in 50ml syringe making a solution of exactly 1 unit / ml. Attach to syringe pump and label clearly
- Start infusion at **0.05 ml / kg / hour** (ie 0.05 units / kg / hour)
- Aim to maintain BG levels between 4 and 10 mmol /l by adjusting insulin infusion hourly
  If BG is >10 mmol /l increase insulin infusion by 25% (ie 0.0625 ml / kg / hr)
  If BG is < 5 mmol /l decrease insulin infusion by 50% (ie 0.025 ml / kg / hr)

Write up the sliding scale of insulin infusion in mls per hour clearly on the green insulin infusion chart

- Do not stop the insulin infusion if BG <5mmol/l as this will cause a rapid rebound hyperglycaemia. Reduce the rate of insulin infusion as above or increase the concentration of glucose solution (eg Glucose 10%)
  (The insulin infusion may be stopped if BG <3mmol /l but only for 15 minutes)

References

This protocol has been based on the International (ISPAD) Consensus Guidelines 2000 and previously discussed by the Trent Paediatric Diabetes Interest Group and with the paediatric anaesthetists in the LRI (2004).

URGENT CONTACTS

1. **Registrar on call**
2. **Consultants – Dr James Greening/ Dr Savitha Shenoy –Airpage via switchboard**
3. Paediatric Diabetic Specialist Nurses (PDSN's)
   Specialist Nurses Office 0116 258 6796 (08.30 am to 4.30 pm – answer message available)
   Jo Erez 07921545406
   Julie Phillips
   Elaine Hartshorn 07921545638
   Tina Woodford 07921545407
   Debbie Carlyle 07921545529
4 Children's Specialist Diabetes Dietitian: Emma Marcus - 07789926868

Previous version: Dr Peter Swift 2003, Dr Declan Cody Mar 2005

Current Version: Dr S Shenoy, Dr J Greening 2007

Acknowledgements; Paediatric diabetic nurses and Dietiticians

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