

Diabetes Management for Children and Young People undergoing Surgery (0-16 yrs)	Clinical Guideline Register No: 10096 Status: Public
--	---

Developed in response to:	Updated national guidelines
Contributes to CQC Outcome	4

Consulted With	Post/Committee/Group	Date
Consultant paediatricians	Children's Services	9th July 2010
Sharon Lim	Consultant Paediatrician	9th July 2010
Clare Fitzgerald	Pharmacist for Children	9th July 2010
Ronan Fenton	Anaesthetist	9th July 2010
Carol Newman	Lead Nurse for Children and Young People	9th July 2010
Professionally Approved By	Dr Babu Clinical Director for Children	9th July 2010

Version Number	1.0
Issuing Directorate	Children and Young People
Ratified by:	Document Ratification Group
Ratified on:	26th August 2010
Trust Executive Sign Off Date	CMB September 2010
Implementation Date	30th August 2010
Next Review Date	July 2013
Author/Contact for Information	Sharon Lim/Caroline Fox
Policy to be followed by (target staff)	Nursing and Medical Staff
Distribution Method	Hard Copies to all wards Electronic copy to all appropriate staff Intranet Notification in Staff Focus
Related Trust Policies (to be read in conjunction with)	Hand Hygiene v4.1 04072 Aseptic ANTT 08038 DKA 08114

Document Review History

Review No	Reviewed by	Review Date

It is the personal responsibility of the individual referring to this document to ensure that they are viewing the latest version which will always be the document on the intranet

Index

- 1.0 Purpose**
- 2.0 Equality and Diversity**
- 3.0 Scope**
- 4.0 Best Practice Recommendations**
- 5.0 Surgery**
- 6.0 Admission procedure for elective surgery**
- 7.0 Infusion guide for surgical procedures**
- 8.0 Insulin therapy for twice daily (BD) doses**
- 9.0 Multi-dose insulin (basal bolus and Lantus/Levemir)**
- 10.0 Emergency Surgery**
- 11.0 Management of Hypo- and Hyper-glycaemia**
- 12.0 Staff Training**
- 13.0 Infection Prevention**
- 14.0 Audit and Monitoring**
- 15.0 Communication**
- 16.0 References**

Appendix 1 Ketones Monitoring Flowchart



E:\New MEHT\Work
ongoing\Diabetes\Ket

1.0 Purpose

1.1 To guide best practice in the management of diabetes for children under going surgery.

2.0 Equality and Diversity

2.1 Mid Essex Hospitals is committed to the provision of a service that is fair, accessible and meets the needs of all individuals.

3.0 Scope

3.1 For all Children with diabetes who are admitted to hospital for general anaesthesia and surgery.

4.0 Best Practice Recommendations

4.1 Surgery on children and young people with diabetes should only be performed in centres with dedicated paediatric facilities for the care of young people with diabetes.

4.2 To ensure the highest levels of safety, careful liaison is required between surgical, anaesthetic and children's diabetes care teams before admission to hospital for elective surgery and as soon as possible after admission for emergency surgery.

4.3 Children should receive a glucose infusion (section 6) when fasting for more than 2 hours before anaesthetic to prevent hypoglycaemia.

4.4 All children receiving elective surgery must be invited to attend the pre-assessment clinic.

4.5 All children should have a capillary blood ketone taken and if levels > 3.0 mmol/L, iv fluids and insulin should be commenced (section 6), the Children's Diabetes team should be made aware.

5.0 Surgery

5.1 Minor Surgery or Procedures that require a brief general anesthetic (GA) [or heavy sedation], usually of less than one hour duration, and which should not have a major impact on glycaemic control. Examples include: Endoscopies, jejunal biopsy, adenotonsillectomy, grommet insertion, or repeated short procedures such as in oncology or burns wards. The child will usually be discharged from hospital on the day of procedure.

5.2 When rapid recovery is anticipated, a simplified protocol may be organised by experienced diabetes/anaesthetic personnel and may include either:

- early morning procedures (for example, 8.00–9.00 am) with delayed insulin and food until immediately after completion,

- or reduced usual insulin dose (or give repeated small doses of short/rapid-acting insulin).

5.3 Glucose 5–10% infusion and frequent blood glucose monitoring are recommended in all these situations.

5.4 **Major Surgery** that requires more prolonged general anaesthesia (GA), is associated with greater risks of metabolic decompensation, and the child is unlikely to be discharged from hospital on the day of procedure. Operations are best scheduled first on the list, preferably in the morning.

6.0 Admission procedure for Elective Surgery

6.1 Admission should be on to the children ward with access to specialist children's diabetes team.

6.2 Admit to hospital the afternoon prior to surgery for **morning** and **major** operations, or early morning for minor operations after 12 mid-day.

6.3 Earlier admission is important if glycaemic control is poor or if blood capillary ketone known to be raised.

7.0 Infusion guide for surgical procedures

7.1 Maintenance fluid guide

Maintenance rate:

Body weight:	1 st 10kg	4mls/kg/hr
	10-20kg	add 2ml/kg/hr (making 6mls per kg/hr)
	>20kg	add 1ml/kg/hr (making 7mls per kg/hr)

What fluid?

Capillary glucose:	<6.0 mmol/L	10% Dextrose
	6-12 mmol/L	0.45% saline + 5% dextrose
	>12 mmol/L	0.9% saline

- Monitor electrolytes. After surgery or if still on IV fluids 12 hours post op, add 10mmol Potassium chloride (KCL) to 500ml of IV fluids.

7.2 Insulin infusion

- Add soluble insulin 50 units to 50 ml normal saline 0.9%, making a solution of 1 unit insulin/ml; attach to syringe pump and label clearly
- Start infusion at 0.025 ml/kg/h (i.e., 0.025 U/kg/hour) if BG (blood glucose) is <6–7 mmol/l, 0.05 ml/kg/h if 8–12 mmol/l, 0.075 ml/kg/h between 12–15 mmol/l and 0.1 U/kg/h if > 15 mmol/l.

- Aim to maintain BG between 5–10 mmol/l, depending of the type of surgery, by adjusting insulin infusion hourly.
- BG must be measured at least hourly when the patient is on IV insulin
- **Do not stop the insulin infusion** if BG <5–6 mmol/l (90 mg/dl) as this will cause rebound hyperglycemia. Reduce the rate of infusion.
- The insulin infusion may be stopped temporarily if BG <4 mmol/l (55 mg/dl) but only for 10–15 min

8.0 Insulin therapy for twice daily (BD) doses

8.1 Morning surgery

- No solid food or milk from 6 hours pre-operatively
- Clear fluids are allowed up to 2 hours pre-operatively
- Omit usual morning insulin dose

8.1.2 Start intravenous fluid and insulin infusion at 6.00-7.00 am (fluids table 7.1)

8.1.3 Hourly blood glucose monitoring pre-operatively, then half-hourly during operation and until woken from anaesthetic.

8.2 Afternoon surgery

8.2.1 Give one-third of the usual morning insulin dose as short-acting insulin if the surgery is after midday.

8.2.2 Allow a light breakfast to be eaten before 7.00am.

8.2.3 Clear fluids may be allowed up to 2 hours pre-operatively

7.2.4. Start intravenous fluids and insulin infusion at midday at the latest then follow for morning operations (see above).

8.3 Post operative care

8.3.1 Post operatively continue to measure hourly capillary glucose levels for four hours, then gradually increase intervals until 4 hourly.

8.1.2 Aim to maintain blood glucose between 5 and 12 mmol/l

8.1.3 Continue intravenous infusion until the child tolerates oral fluids and snacks (this may not be until 24–48 hours after major surgery)

8.1.4 Change to usual subcutaneous insulin regimen or short-/rapid-acting insulin before or immediately after the first meal is taken

- 8.1.5 Stop insulin infusion 60 minutes after subcutaneous insulin is given
- 8.1.6 IF BMs are >15 mmol/L at any time after infusions are stopped, give short acting insulin (usually 10% of total daily dose).
- 8.1.7 For minor operations it may be possible to discharge from hospital after the evening meal if the child is fully recovered

9.0 Multi dose insulin therapy (Basal bolus and Lantus/Levemir)

9.1 Morning operations

- 9.1.1 On day before surgery, give usual basal insulin and Lantus/Levemir dose in the evening
- 9.1.2 Follow the instructions in 8.1 and omit morning bolus dose
- 9.1.3 Insulin infusion dose is started at **0.025u/kg/hr**, change infusion fluid according to BM
- 9.1.4 On morning of surgery, if split dose Levemir/Lantus, omit Levemir/Lantus dose and manage as 8.1

9.2 Afternoon operations

- 9.2.1 Give usual morning basal insulin dose if the operation is after midday, if split dose **Lantus/Levemir**, give usual basal insulin in the morning and start insulin at **0.025u/kg/hr**
- 9.2.2 Allow a light breakfast to be eaten before 7.00am
- 9.2.3 Start intravenous fluids and insulin infusion as in 7.1 at midday at the latest.
- 9.2.4 Clear fluids may be allowed up to 2 hours pre-operatively

9.3 Post-operative care

- 9.3.1 Continue to monitor BMs hourly (see section 7.0, and 11.0 for management of hypo-/hyperglycaemia)
- 9.3.2 If child is still on full IV fluids the next day, check Us & Es
- 9.3.3 When child is on basal bolus regimen (4-5 injections a day) and is eating and drinking, give usual dose of short acting insulin pre meal and then stop all infusions **one hour** after meal
- 9.3.4 IF BMs are >15 mmol/L at any time after infusions are stopped, give short acting insulin (usually 10% of total daily dose).

- Glucose 5–10% infusion and frequent blood glucose monitoring are recommended in all these situations.

10.0 Emergency surgery

10.1 Diabetic ketoacidosis may present as ‘acute abdomen’ and acute illness may precipitate diabetic ketoacidosis (with severe abdominal pain)

- Nil by mouth
- Secure intravenous access
- Check weight, electrolytes, glucose, blood gases and blood ketones pre-operatively
- If ketoacidosis is present, follow protocol for diabetic ketoacidosis and delay surgery until circulating volume and electrolyte deficits are corrected, contact Children’s Diabetes team
- If there is no ketoacidosis, start intravenous fluid and insulin infusion as for elective surgery

11.0 Management of Hypo- and Hyper-glycaemia

11.1 Blood Glucose level:

11.1.1 4.1 to 6.0 mmol/l

- Start 10% Dextrose infusion at normal maintenance fluid rate

11.1.2 2.1 to 4.0 mmol/l

- Inform doctor
- Start 10% Dextrose infusion at normal maintenance fluid rate
- Reduce insulin infusion by 50% (check rate/infusion equipment)
- Recheck capillary glucose every 15 minutes until >4 mmol/l or increasing

11.1.3 Less than 2.0 mmol/l

- Call doctor
- Give 10% Dextrose (2 to 3 mls/kg) by slow intravenous injection
- Continue 10% Dextrose infusion at normal maintenance fluid rate
- (If no IV access, administer oral glucose [e.g. Lucozade 50-100 mls], Hypostop, or Glucagon 1mg, IM. Then establish IV access.)
- Reduce insulin infusion by 50% (check rate/infusion equipment)
- Recheck capillary glucose every 15 minutes. If still <2 mmol/l, repeat 10% Dextrose bolus, and send a Lab. Glucose urgently
-

11.1.4 Above 12 mmol/l for two consecutive hours (or if above 24 mmol/l)

- Use 0.9% saline as maintenance fluid
- Check IV cannula, pumps and connections
 - a) If not on IV insulin: start insulin infusion **0.05 units/kg/hr**

- b) If already on IV insulin: increase insulin infusion rate by **50%**
- Check blood for ketones, if ketones 1.1-3mmol/L (appendix 1), check a venous gas and if acidotic – see DKA guideline (08114)

12.0 Staff Training

- 12.1 All medical and nursing staff are to ensure that their knowledge, competencies and skills are up-to-date in order to complete their portfolio for appraisal.
- 12.2 During induction process junior medical staff will receive instruction on current policies and guidelines.
- 12.3 At case presentation and junior doctor teaching will discuss the management of diabetic surgical cases and learn from the outcomes.

13.0 Infection Prevention

- 13.1 All staff should follow Trust guidelines on infection prevention ensuring that they effectively 'decontaminate their hands' before and after each procedure.
- 13.2 All staff should ensure that they follow Trust guidelines on infection prevention using Aseptic Non-Touch Technique (ANTT) when carrying out procedures.

14.0 Audit and Monitoring

- 14.1 Where a child's notes have demonstrated that the appropriate action has not been taken a 'risk event form' is to be completed. This will address any further training needs for staff that require updating.
- 14.2 A biannual audit will take place against these guideline, action plan devised and feedback provided to all involved in the patient's surgical care.
- 14.3 Where a patient's notes have demonstrated that the appropriate action has not been taken a 'risk event form' is to be completed. This will address any further training needs for staff that require updating.

15.0 Communication

- 15.1 Approved guidelines are published monthly in the Trust's Focus Magazine that is sent via email to all staff.
- 15.2 Approved guidelines will be disseminated to appropriate staff via email after ratification of guideline.
- 15.3 All action plans will be shared and a lead nominated to implement improvements.

15.4 The Paediatric Diabetes team can be contactable on 01245 513461

- Lead for Children's Diabetes 07880500802
- Diabetes Nurse 07879113697
- Consultants 01245 513266/513260
- Paediatric Registrar bleep # 6555 3520.

16.0 References

ISPAD Clinical Practice Consensus Guidelines 2009 Compendium

ISPAD Consensus Guidelines 2000

Addenbrookes 'Diabetic children requiring surgery' 2002