Guideline for management of Diabetic Ketoacidosis

Version:	*4.1.0*
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Purpose of the guideline:	This ED guideline summarises the latest evidence-based recommendations from *"**BSPED recommended guideline for the management of children and young people under the age of 18 years with diabetic ketoacidosis (Aug 2015)**" – **available here***
Who should use the guideline?	*ED, PICU, HDU, Hospital at night. All Departments managing Children with Diabetes*
How was the guideline developed?	*This guideline was reviewed in conjunction with the Diabetes Operational group, Endocrine team, Emergency Department, PICU.*
How will the guideline be monitored?	*The guideline will be audited prospectively and outcomes reviewed 6 monthly to look at rates of resolution of acidosis, and instances of complications; cerebral oedema, hypoglycaemia and hypokalaemia*
Approved by:	*Dr W Hogler*
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DIABETIC KETO-ACIDOSIS - ONE PAGE SUMMARY

General Resuscitation	Follow APLS principles in assessment and stabilisation of patients with DKA. Particular attention should be paid to the following aspects:	
Airway	At risk of losing airway protection and vomiting	If P/U on AVPU insert oral or pharyngeal airway Contact Anaesthetist or PICU team for support Insert NG tube – aspirate and leave on open drainage
Breathing	At risk of hypoxia	Give 100% oxygen by non-rebreath face mask
Circulation	At risk of hypovolaemia & shock but may develop cerebral oedema with fluid boluses	Insert IV cannula and obtain blood samples* including glucose Only give a MAXIMUM of 10mls/kg 0.9% sodium chloride bolus **in severe DKA (pH<7.1) if shocked**
	After 10 ml/kg, further boluses must be discussed with senior responsible paediatrician	
Disability	At risk of seizures and coma (thrombosis, infarction, oedema) At risk of hyper- and hypo-glycaemia	Check and track conscious level (AVPU) Check Pupil responses May need CT brain if abnormal
Additional measures	**Do NOT** routinely give IV fluid bolus with either **mild, moderate or severe DKA** **Do not start insulin until boluses have finished and/or after 1-2 hour of fluids being started** Please inform on call consultant endocrinologist and diabetic home care nurse	
Examination & Assessment	Infection, ileus, cerebral oedema – headache, slowing pulse, rising blood pressure, change in conscious level. Weigh child and document clinical features of dehydration. Record PEWS and keep NBM. Careful documentation of fluid balance, measure volume of every urine sample	
***Investigations & Observations**	Blood glucose – every 1 hour (unless indicated sooner) *If new diagnosis send HbA1c, ICA and GAD antibodies* Capillary blood ketone levels every **1-2 hours**. Check FBC. ***DO NOT** routinely send TFTs or cortisol* Urea, electrolytes and creatinine – **on admission, 2 hours after admission then 4 hourly** Blood gas on admission, **2 hours after admission then 4 hourly**. Neurological observations every 30 mins if <2 years or severe DKA, otherwise hourly. **DOCTOR TO REVIEW FACE TO FACE AT LEAST 4 HOURLY IF SEVERE DKA OR <2YEARS.**	
Fluids & Insulin Replacement	Use 0.9% sodium chloride for the first 48 hours with 40 **mmol/L** Potassium (20mmol in 500ml bag) unless in renal failure/anuria. **NB:** If more than 20ml/kg 0.9% sodium chloride given in fluid boluses subtract any bolus volume **above this** from the deficit calculation. (e.g. If 30ml/kg given, subtract 10ml/kg from the deficit)	
	HOURLY RATE = (DEFICIT / 48 HOUR) + MAINTENANCE PER HOUR (use and print intranet calculator)	
DEFICIT	**pH ≥ 7.1 (Mild/Moderate)**	**Assume 5% fluid deficit**
	pH< 7.1 (Severe)	**Assume 10% fluid deficit**
MAINTENANCE Weight-based	< 10 kg	2ml/kg/hr
	10-40 kg	1ml/kg/hr
	> 40 kg	Fixed volume 40mls/hr
INSULIN **Do not start insulin infusion until iv fluids on for 1-2 hours.**	Use pre-filled syringes of Actrapid insulin 50 units to 50ml 0.9% sodium chloride in a syringe pump 1-2 hours after IV fluids started. Run at 0.05 units/kg/hour. This can be increased after discussion with consultant to 0.1units/kg/hr if acidosis is **not** correcting or blood ketones are not falling within 6-8 hours. For children on **long-acting insulin, continue as usual in addition to the IV insulin infusion.** If on **continuous subcutaneous insulin infusion (CSII) pump therapy, stop pump when starting DKA treatment.** **DO NOT REDUCE OR STOP THE INSULIN WITHOUT DISCUSSION WITH CONSULTANT**	
GLUCOSE **If glucose falls by more than 5 mmol/hour discuss with Endocrine team**	If glucose falls to less than 14 mmol/L And ketones < 3 mmol/L	Change fluid to 5% dextrose + 0.9% sodium chloride and 40mmol/L KCl and reduce insulin if current dose >0.05 Unit/kg/hr.
	If glucose falls to less than 14 mmol/L And Ketones > 3 mmol/L	Change fluid to 10% dextrose + 0.9% sodium chloride and 40mmol/L KCl and maintain insulin rate
	If glucose less than 6 mmol/l	Increase dextrose content of infusion.
	If glucose less than 4mmol/l	Give iv bolus of 2ml/kg10% dextrose & increase dextrose content of infusion. Consider reducing insulin for 1 hour maximum. **Retest glucose at 30mins**

IF SIGNS OF CEREBRAL OEDEMA DEVELOP, OR DEVIATING FROM THIS PROTOCOL, OR YOU HAVE CLINICAL CONCERNS, OR CHILD IS NOT RESPONDING 4-6 HOURS INTO TREATMENT SEEK SENIOR HELP AND REFER TO FULL BSPED GUIDELINE.

This is a rapid summary guideline only. **Use** fluid calculator and corrected sodium calculator, both available at BSPED website. Print copy for medical notes. This guideline is subject to prospective audit. The Audit tool sheet- here- should be printed and used to document fluids administered and results of bloods/gases. Completed audit forms to be sent to Dr M Kershaw, Department of Endocrinology.