

# DIABETIC KETOACIDOSIS – INITIAL MANAGEMENT GUIDELINE

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<p><i>This clinical guideline was produced by NECTAR hosted by Newcastle Upon Tyne Hospital Trust. To be used by clinicians in the emergency care of acutely/critically ill children. This guideline represents the views of NECTAR and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guideline does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.</i></p>	

# DIABETIC KETOACIDOSIS – INITIAL MANAGEMENT GUIDELINE

**DIAGNOSIS OF DKA** BLOOD GLUCOSE(BG) > 11\*- (glucose *may* be normal in a known diabetic) + **ACIDOSIS** - pH <7.3 or HCO<sub>3</sub><sup>-</sup> <15mmol/l + **KETONAEMIA** – Bld Ketones > 3mmol/l  
ketosis or acidosis – Consider [Hyperosmolar Hyperglycaemic State](#)  
Follow BSPED Integrated Care Pathway (ICP) in conjunction with the online calculator at [www.dka-calculator.co.uk](http://www.dka-calculator.co.uk).

\*If Hyperglycaemic (>35mmol/L) in the absence of significant

Neonatal DKA [CONTACT NECTAR](#) (special circumstance) .

[In all cases of DKA- Consider cause/contributing factors e.g sepsis](#)

**DIAGNOSIS OF SHOCK – APLS definition**  
– Tachycardia, prolonged CRT, poor peripheral pulses, hypotension (late sign)  
**Beware** – acidosis due to DKA can alter CRT and cause poor peripheral perfusion

## INITIAL ASSESSMENT

## FLUID DEFICIT AND MAINTENANCE

## INSULIN

### AIRWAY

Assess patency – if not self-maintaining, or AVPU score = 'V' or less

- ☐ Insert OPA / NPA if required
- ☐ Seek urgent anaesthetic assistance
- ☐ Insert an NG tube on free drainage
- ☐ **CONTACT NECTAR**

### ASPIRATION CAN BE FATAL IN DKA

### BREATHING

- ☐ Give high flow O<sub>2</sub> to maintain normal SpO<sub>2</sub>
- ☐ Continuously monitor RR and SpO<sub>2</sub>
- ☐ If requiring assistance with ventilation seek urgent anaesthetic help & **CONTACT NECTAR**

### CIRCULATION

- ☐ Record BP hourly, start continuous ECG monitoring (peaked T waves = hyperkalemia)
- ☐ Obtain IV/IO access and send bloods for FBC, U&E, CRP Glucose, Blood Gas and Ketones

### INADEQUATE RESUSCITATION CAN BE FATAL

### DISABILITY

- ☐ Measure GCS / AVPU **1 hourly OR every 30 minutes** in severe DKA or patients under 2yrs of age.
- ☐ Use PEWS or equivalent local chart alongside the Serial Data Sheet in the Integrated Care Pathway
- ☐ Assess for evidence of cerebral oedema – see box

If no shock give 10ml/kg over 30min (*subtract from deficit*)

If signs of **shock/thready pulse/hypotension**

- ☐ Give 10mls/kg 0.9% saline/Hartmann's/Plasmalyte ASAP – reassess & repeat involving the Consultant Paediatrician.
- ☐ If persistent shock after 20ml/kg consider severe sepsis and carefully consider further fluid boluses and/or inotropes - involve Diabetes Consultant/[NECTAR](#) for further advice.

### CALCULATE FLUID DEFICIT

pH <7.3/ HCO<sub>3</sub> <15mmol/L = Mild DKA (5% dehydration)  
pH <7.2/ HCO<sub>3</sub> <10mmol/L = Mod DKA (5% dehydration)  
pH <7.1/ HCO<sub>3</sub> <5mmol/L = Severe DKA (10% dehydration)

### CALCULATE MAINTENANCE REQUIREMENTS

- ☐ Weigh patient or use recent accurate weight
- 100 ml/kg/day for the first 10 kg BW
- 50 ml/kg/day for the second 10 kg BW
- 20ml/kg for each additional kilogram above 20 kg
- **Max 75 kg body weight/97<sup>th</sup> centile for age (choose lower)**
- Hourly =  $\frac{\text{Deficit \%} \times \text{Weight (kg)} \times 10}{48 \text{ hours}}$  + Maintenance requirement (ml/hr)

**N.B. Fluid boluses *should not* be subtracted from total fluid allowance for *shocked* patients**

- ☐ 0.9% saline/Hartmann's/Plasmalyte for fluid bolus
- ☐ All fluids except bolus to contain 40mmol/L KCl unless initial K >5.5 OR <3
- ☐ Change to 0.9% saline + 5% Glucose once BG <14mmol/L
- ☐ If ongoing acidosis, calculate Anion gap (Na-(Cl+HCO<sub>3</sub>)). If normal -indicative of hyperchloremic acidosis from NaCl replacement. (If so ,consider switch to balanced crystalloid e.g Plasmalyte)

- ☐ Commence an IV Insulin infusion **1-2hrs after** starting IV fluid therapy due to expected fall in blood glucose
- ☐ Start soluble insulin infusion at 0.05-0.1units/kg/hr

**Expect K<sup>+</sup> levels to fall with insulin infusion. If starting k<3mmol/l- delay starting insulin until <3mmol/l and d.w NECTAR**

- ☐ Monitor 1-2hrly Glu/Ketones/k and Lab U&E minimum 4hrly
- ☐ If K<sup>+</sup> < 3.0mmol – **CONTACT NECTAR**

### HYPOKALAEMIA CAN BE FATAL IN DKA

### CEREBRAL OEDEMA

Assess for headache, irritability, ↓GCS, ↓HR, ↑BP, unequal/dilated pupils, posturing or oculomotor palsies

- ☐ Calculate corrected Na<sup>+</sup>=Na<sup>+</sup>+{(Glucose mmol - 5.5)/3.5} .Lab Na<sup>+</sup> should rise with therapy by 0.5-1mmol/hr. **If Sodium not increasing and GCS falling treat as cerebral oedema.**

**Do not give intravenous sodium bicarbonate**

### In suspected cerebral oedema

- ☐ Place in 30° head up position
- ☐ Give 2.5-5 mls/kg of 3% Saline **or** 2.5-5 ml/kg of 20% Mannitol over 15mins
- ☐ ½ maintenance& slow deficit over 72hrs
- ☐ Urgent anaesthetic help and **CONTACT NECTAR**
- ☐ Consider excluding other diagnoses with CT

### CEREBRAL OEDEMA CAN BE FATAL IN DKA

# APPENDIX 1

## SPECIAL CONSIDERATIONS/ ROLES & RESPONSIBILITIES

### Significant deviation from usual DKA presentation

Most frequent referrals to NECTAR which can be potentially **life threatening**

Refractory circulatory shock

Hypo\*/Hyperkalemia

Cerebral oedema

#### Conference call checklist

- ☐ Ensure Paediatric Consultant input is available at patient bedside at referring hospital
- ☐ Ensure fluid calculations are accurate
- ☐ Ensure insulin dosing and timing of commencement are discussed
- ☐ Ensure adequate monitoring including fluid input/output
- ☐ Ensure IV access issues are discussed if appropriate
- ☐ Ensure Integrated Care pathway (BSPED) being followed alongside NECTAR guidance
- ☐ Ensure additional local Paediatric Diabetes expertise is used if available
- ☐ Ensure discussion about most appropriate care area for ongoing management based on clinical condition
- ☐ Involve PICU\_GNCH Consultant to discuss if admission to PICU is appropriate
- ☐ Ensure Consultant level discussion and local escalation plans are activated to ensure no admission delays due to capacity
- ☐ Ensure any safeguarding issues are documented/addressed
- ☐ Agree follow-up calls if appropriate

- **Second conference call at 6hrs if no improvement/earlier if patient deteriorating**

### \*Hypokalaemia

Guidance on when to consider enteral and higher concentration peripheral replacement in DKA:

- If K <3mmol/l despite 40mmol/L kcl iv fluids, reduction in insulin therapy and giving oral potassium chloride solution 2mmol/kg if tolerated/not vomiting (max 20mmol/dose) – switch to 60mmol/k KCl
- If symptoms/signs or ECG changes-switch from 40mmol/l to 60mmol/l + contact NECTAR as to consideration CVC. (Reduce down back to 40mmol/l KCl once K reaches 3mmol/L)
- If k <= 2.5mmol/L, switch to 60mmol/l kcl
- If administering 60mmol/l Kcl- do so via reliable venous access- at least 22g or midline (+not in ACF)