Diabetic Ketoacidosis (DKA)

Aims

- To outline the indications for transfer of patients with DKA
- To outline treatment regime for patients with DKA

Background

Definition

- Hyperglycaemia (BM>14 usually)
- Metabolic acidosis (venous bicarbonate <15)
- Ketonuria/ ketonaemia

Diabetic Ketoacidosis (DKA) is a common potentially life-threatening emergency with mortality of up to 4-5%. Varying mortality can be related to a variety of outcomes such as cerebral oedema, ARDS or overwhelming sepsis.

Most patients will respond to IV fluids and insulin infusion as per the Scottish Protocol for the Management of DKA in adults. A proportion of patients will require intensive treatment and monitoring in a HDU / ITU setting

Application

EMRS team members
SAS Airwing Paramedics
Patients appropriate for EMRS activation / Policy

Patients with DKA who fail to respond to initial fluid and insulin therapy. Patients who show signs associated with worse prognosis i.e. decreased level of consciousness, respiratory or circulatory compromise, or signs of sepsis.

Advice to GP prior to team arrival

Optimise medical therapy as per Scottish Protocol for the Management of DKA in adults


- Establish IV access
- Start IV fluids early – 1000mls normal saline over 1 hour within 30 mins of admission
- Start IV insulin infusion 6 units/ hour (use any soluble insulin 50 units of insulin in 50mls normal saline through a syringe driver)
- Fluid balance chart
- Monitor conscious level
- Treat any underlying infective cause

Medical management on scene

- ABC as standard
- Consider central line
- Urinary catheter
- Continue fluid resuscitation
- Appropriate potassium replacement within fluid administration
- No evidence to support the use of Bicarbonate unless signs cardiogenic shock or other lactic acid generating conditions
- Use Protocol as guideline

Scottish Protocol for the Management of DKA in adults has developed two pathways. The first ‘Pathway’ covers the initial 4 hours from admission and the second ‘Pathway’ all subsequent management thereafter throughout the acute episode. EMRS will usually be involved in patient care during the first 4 hours and Appendix 1 shows the pathway.

Triage

Ensure medical HDU bed available at destination hospital if patient to be transferred self ventilating.
Hyperglycaemic Hyperosmolar State  
(*Hyperosmolar Non-Ketotic Coma (HONK*))

**Background**

**Definition**
- Severe hyperglycaemia (>30 mmol/l)
- Total osmolality >340 mosmol/kg
- Serum bicarbonate >15 mmol/L (not acidotic)
- Urinary ketones ≤ +

Occurs in elderly patients with NIDDM/Type 2 DM (may be previously undiagnosed) with an insidious onset. There is marked hyperglycaemia and dehydration without significant ketosis and acidosis. Aim should be for gradual restoration of blood biochemistry. Patients often have co-existing medical conditions making mortality much higher than DKA.

**Patients appropriate for EMRS activation / Policy**

Patients with HONK who fail to respond to initial fluid and insulin therapy. Patients who show signs of outcomes associated with worse prognosis i.e. decreased level of consciousness, respiratory or circulatory compromise, or signs of sepsis. Patients with significant co-existing medical problems.

**Medical management on scene**

- ABC as standard
- CVP monitoring is often required to guide fluid replacement.
- Give thromboprophylaxis Subcutaneously, if no contraindications
- Aim for fall in blood glucose of 2-3 mmol/hour
- IV fluids (as a guide)
  - 1\textsuperscript{st} litre over 1 hour
  - 2\textsuperscript{nd} litre over 2 hours
  - 3\textsuperscript{rd} litre over 4 hours

Remember to continually assess hydration status in the patients with co-morbidities

**The medical/monitor pack does NOT include a glucometer.**

**SAS will have a glucometer.**
## Appendix 1: Care Pathway 0-4 hours

### Diabetic ketoacidosis care pathway 1

**Time of Arrival:______________  NAME:_________________**

**Location:___________________  Date:______________**

### 0-4 hours Emergency Management

Ideally patients with DKA should be managed in a MHDU setting.

**Aim:** To improve the acute management of diabetic ketoacidosis in adults aged 16 years and over within the first 4 hours of presentation (for paediatric management go to [www.bsped.org.uk](http://www.bsped.org.uk)).

**Definition:** Severe uncontrolled diabetes with: a) ketoadamia/ketonuria b) metabolic acidosis c) usually with hyperglycaemia

**Severe DKA = pH < 7.1 or HCO3 < 5mmol/L or H+ > 80mEq/L**

Consultant/Senior physician should be called immediately if:

- Cerebral Oedema
- Hypokalaemia on admission
- Severe DKA
- Reduced conscious level

### 1. Immediate actions

- Confirm diagnosis H+ > 45 or HCO3 < 18 or pH < 7.3 on venous gases
- Check U&Es and laboratory Blood Glucose
- Check urine or blood ketones
- Confirm patient ≥ 16 years
- Record time of arrival

### 2. Management 0-60 mins

- Commence IV 1L Sodium Chloride 0.9% over 1 hour within 30 mins of admission
- Time and sign fluid commencement (on reverse)
- Commence soluble insulin IV 0 units/hour within 30 mins of admission
- Time and sign start of insulin (on reverse)
- Record SEW/S/MEWS/SIRS score

**Other interventions to be considered (tick box if performed)**

- Review ECG or cardiac monitor
- Blood cultures
- Record GCS score
- Central line
- Insert catheter if oliguric
- Chest Xray
- MSSU
- DVT prophylaxis
- If protracted vomiting insert NG tube
- If deteriorating, consultant or senior physician called

### 3. Ongoing Management 1-4 hours

- Time and sign ongoing Sodium Chloride 0.9% replacement (on reverse)
- 1L Sodium Chloride 0.9% hour 2 + KCL
- 50mmol/hour for hours 3-4 + KCL
- Review K+ result – admission or most recent result
- Prescribe KCl in 500 ml Sodium Chloride 0.9% bag as:
  - None if anuric or K+ > 5 mmol/L
  - 10 mmol if level 3.5-5 mmol/L
  - 20 mmol if level < 3.5 mmol/L
- Check finger prick Blood Glucose hourly: 1hr 2hrs 3hrs 4hrs
- Lab Glucose, U&Es and HCO3 at: 2hrs 4hrs

**If Blood Glucose falls to ≤ 14 mol/L in first 4 hours**

- Commence Glucose 10% 500mls with 20 mmol KCl at 100ml/hour
- Continue Sodium Chloride 0.9% at 400mls/hour + KCL (as per K+ table above) until end of hour 4
- Reduce insulin to 3 units/hour
- Maintain Blood Glucose >9 mmol/L and ≤14 mmol/L adjusting insulin rate as necessary
- If Blood Glucose <5mmol/L adjust insulin to maintain level >9mmol/L and <14mmol/L
- If Blood Glucose >14mmol/L see supplementary note
- Progress on to second DKA Care Bundle "4 hours to discharge"