Acute management of Hyperosmolar Hyperglycaemic State (HHS)

Calderdale and Huddersfield NHS
NHS Foundation Trust

Establish Diagnosis:

- **Hypovolaemia**
- **Marked hyperglycaemia** (≥ 30 mmol/L) without Ketones (blood <3 mmol/L), (urine < 2+) or acidosis (pH > 7.3, bicarbonate > 15 mmol/L)
- **Osmolality usually ≥ 320 mosmol/kg** (calculated osmolality = 2(Na+) + glucose + urea)

Fluids:

- Target - to achieve **positive fluid balance:**
- **2-3 litres by 6 hours**
- **3-6 litres by 12 hours**

- IV 0.9% NaCl – 1L over 1 hour
- IV 0.9% NaCl – further 0.5 to1L/hr
- Consider faster if SBP < 90 mmHg, caution in elderly and depending on clinical assessment of dehydration / risk of heart failure and fluid balance

- Check U+Es and glucose every 1-4hours initially

- **Target for osmolality: fall of 3-8 mosmol/kg/hr**

- An initial rise in sodium is expected and is not in itself an indication for hypotonic fluids. Thereafter, the rate of fall of plasma sodium should not exceed 10 mmol/L in 24 hours)
  - If Na ↑ but osmolality ↓ at appropriate rate, continue 0.9% NaCl
  - If Na ↑ AND osmolality ↑ (or ↓ at less than 3 mosmol/kg/hr) check fluid balance – If positive balance inadequate, increase rate of infusion of 0.9% NaCl
  - If osmolality ↑ and fluid balance adequate, switch to 0.45% NaCl at same rate
  - If osmolality ↓ at rate exceeding 8 mosmol/kg/hr, reduce infusion rate of IV fluids and/or insulin (if already commenced)

Potassium:

- K+ > 5.5 – no added potassium
- K= 3.5-5.5 – add 40mmol/L in infusion
- K+ < 3.5 – senior review as additional potassium required

Glucose:

Glucose will often improve with IV fluids alone

If blood glucose falling less than **5 mmol/L per hour** check fluid balance:

- If positive balance inadequate, increase rate of infusion of 0.9% NaCl
- If positive fluid balance adequate, commence IV insulin – see below.

Insulin:

DO NOT start insulin unless significant ketones (blood > 1 mmol/L, urine ≥ 2+) i.e. mixed DKA and HHS

Start insulin if:

- blood glucose falling less than 5 mmol/L and
- positive fluid balance adequate

Regimen:

- low dose fixed rate IV insulin (0.05 units/kg/hr)
- Increase to 0.1 units/kg/hr if glucose falling less than 5 mmol/L
- Avoid hypoglycaemia (target glucose 10-15 mmol/L in first 24 hours)
- If blood glucose < 14 mmol/L commence 5% or 10% glucose at 125 ml/hr AND CONTINUE 0.9% NaCl

Additional measures:

- Assess for degree of dehydration, sepsis, vascular event, foot risk and consciousness
- Insert urinary catheter to monitor hourly urine output and calculate fluid balance
- Commence prophylactic LMWH (unless contraindicated)

This & other diabetes guidance eg. DKA/Enteral feeding available at: http://nww.cht.nhs.uk/divisions/medical/diabetes/

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Version 2 Nov 2015. Review Nov 2018