Management of Diabetic Emergencies

Diabetic Ketoacidosis (DKA)

Relative lack of insulin results in an inability of cells to take up glucose and hyperglycaemia (glucose > 11mmol/L) - “starvation in the midst of plenty”. Hence, cells switch to fatty acid metabolism resulting in the production of acidic ketones (ketonuria & metabolic acidosis).

1. ABCDE
   - Follow standard ABCDE protocol

2. Confirm diagnosis
   - Ensure you include VBG, urine dip and glucose measurement
   - Confirm diagnosis (all of):
     - Glucose > 11mmol/L (or known diabetes)
     - pH < 7.3 or HCO₃⁻ < 15
     - Capillary ketones >3mmol/L or ++ urinary ketones

3. Intravenous Fluids
   NB. Dehydration is more lethal than hyperglycaemia
   - 1L saline over 1 hour (or faster if hypotensive) – without potassium
   - 1L saline over next 2 hours
   - 1L saline over next 2 hours
   - 1L saline over next 4 hours
   - 1L saline over next 4 hours
   - 1L saline over next 6 hours
   - 1L saline over next 6 hours

After the 1st litre, add potassium chloride to each litre depending on VBG results:
- K⁺ <4.5mmol/L = 40mmol KCl
- K⁺ 4.5-5.5mmol/L = 20mmol KCl
- K⁺ > 5.5 = nil

4. Fixed-Rate Insulin Infusion
   - IV insulin infusion 0.1unit/kg/hour (max 15 units/h) from 50units human soluble rapid-acting insulin (e.g. Actrapid) in 50ml saline. \textit{Note maximum rate is 15 units per hour.}
   - When capillary glucose is <14mmol/L, give 10% IV glucose at 125ml/hour (adjusted depending on capillary glucose level) in addition to normal saline – but reduce saline rate to account for extra fluid (glucose is used so that insulin can continue to drive more glucose into cells to reduce ketosis and acid production)

5. Investigation to Find Cause
   - History
   - Top to tail examination (include diabetic feet!)
   - Bloods (FBC, glucose, U&Es, LFTs, osmolality)
   - MSU
   - Chest X-ray

6. Other Priorities
   - Treat the cause
   - Consider intensive care if: ketones >6, HCO₃⁻ < 5/pH<7.1, GCS <12, SBP<90, sats <92% or HR >100/<60
   - Continue patient’s long-acting insulin throughout and start long-acting insulin (Lantus or Levemir 0.25 units/kg once daily s/c) if it is a new presentation
   - Check VBGs 2-hourly to assess acid-base balance, potassium and glucose
     - Aim to increase HCO₃⁻ by 3mmol/L/h, reduce glucose by 3mmol/L/h and reduce ketones by 0.5mmol/L/h
     - Insulin can be increased by 1 unit/h if target is not reached
   - When the acid-base abnormality is fully corrected (i.e. \textit{pH >7.3} and \textit{capillary ketones are <0.6mmol/L}) (normally takes 24-48 hours) and the patient is eating and drinking, return to a normal insulin regime at mealtime (you should have continued their long acting insulin throughout – but ensure you restart if before stopping the infusion if it was stopped)
   - If the patient if not eating and drinking, start a variable rate insulin infusion
   - Ensure prophylactic LMWH is prescribed
   - NG tube (aspiration is a common cause of death)
   - Education and medication review
Hyperglycaemic Hyperosmolar State (HHS)

Hyperglycaemia develops slowly as a result of illness/dehydration and causes hyperosmolarity in the intravascular compartment. This causes severe cellular dehydration. Glucose is usually >35mmol/L. Notably, there is no acidosis/ketones (basal insulin levels allow sufficient cellular glucose uptake). The main danger is dehydration and a thrombotic state.

Confirm diagnosis

- Confirm diagnosis
  - Glucose > 11mmol/L (but usually >30mmol/L)
  - Osmolarity > 320mmol/L
  - Absence of significant ketosis

Management

- Rehydrate (need ~9L saline over 24 hours)
- Prophylactic LMWH (high risk of VTE)
- Insulin - wait 1 hour (they may not need it), start IV insulin infusion at 0.05units/kg/hour if glucose is not reducing with fluids alone
- Look for cause (as above)
- Stop metformin for 2 days (it causes a metabolic acidosis)

Hyperglycaemia without DKA/HHS

- Rehydrate if necessary
- STAT dose of rapid-acting (e.g. Novorapid) or short-acting (e.g. Actrapid) insulin dose can be used
  - Type 1: 1 unit decreases blood glucose by 3mmol/L (aim glucose <12mmol/L)
  - Type 2 (more insulin resistant): 0.1unit/kg (aim glucose <14mmol/L)
- Assess cause as above – check patient has taken insulin normally
- Adjust normal insulin regime as necessary
- Correct causes
- Recheck glucose in 1 hour and reassess

Hypoglycaemia

- Unconscious
  - 150ml 10% glucose or 75ml 20% glucose IV STAT
  - Glucagon 1mg IM if no IV access (can only be repeated 1-2x due to glucagon stores)
  - Check capillary glucose 10mins later, repeat as needed and give long acting carbohydrate when able to swallow
- Conscious but can’t swallow
  - 1.5-2 tubes glucose gel around teeth if mild and patient conscious
  - Check capillary glucose 10mins later and give long acting carbohydrate when able to swallow
- Can swallow:
  - 15-30g fast acting carbohydrate (e.g. 5-7 glucose tablets, 150ml fruit juice/Lucozade)
  - AND long acting carbohydrates (e.g. biscuits, toast)
- All:
  - Correct cause
  - Don’t omit insulin/tablets after (risk of rebound hyperglycaemia) – reduce dose instead

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<td>Not enough going in</td>
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<td>Poor oral intake</td>
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<td>Vomiting</td>
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<td>More going out</td>
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<td>Insulin excess/sulfonylureas</td>
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<td>↓renal function (and hence ↓drug excretion)</td>
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<td>Alcohol</td>
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<td>Abrupt steroid discontinuation</td>
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