

# ThinkGlucose! ThinkKetones!

## Treatment of Hyperglycaemia - When to Check Blood Ketones

Patients with persistent hyperglycaemia and values **consistently above 14.0mmol/L** should be discussed with the specialist diabetes team as a review of treatment is likely to be required. Failure to address hyperglycaemia increases adverse outcomes and the risk of Diabetic Ketoacidosis (DKA) or Hyperosmolar Hyperglycaemic State (HHS) both are life threatening conditions.

**If the patient is vomiting, clinically deteriorating or blood glucose is persistently elevated >14.0 mmol/L ensure blood ketones\* are checked to exclude DKA.**

- Two values above **14.0mmol/L** requires prompt review i.e. supervising medical team to review; reviews should not be delayed during weekends.
- **Two values above 18.0mmol/L** requires urgent review & treatment i.e. same day review by team or on-call team to review out of hours.

**Ensure the patient has not decompensated into DKA or HHS.** For full guidance on refer to **Guidance for the management of inpatients with hyperglycaemia'** available on [COIN CID2512](#).

### GUIDANCE AND SYMPTOMS FOR DKA AND HHS

#### Unwell Patient with Diabetes?

DKA	HHS
More common in Type 1 but can occur in Type 2 (especially if treated with SGLT 2 inhibitors)	Type 2
Raised Glucose level <b>&gt;11.0 mmol/L</b>	Very high Glucose level <b>&gt;30.0 mmol/L</b>
Can occur at any age	More likely to occur in the elderly
Can develop within hours	Often preceded by illness and days of dehydration
Blood ketones raised	Blood ketones may not be raised
<b>Symptoms of DKA include:</b>	<b>Symptoms of HSS include:</b>
Excessive thirst/dehydration	Excessive thirst, dry mouth / dehydration
Urinating more frequently	Urinating more frequently
Dry or flushed skin	Dry or flushed skin
Nausea/vomiting	Nausea/vomiting
Drowsiness/Confusion	Drowsiness/Confusion
Finding it hard to breathe	Vision blurred/loss
Stomach pain	Fever
Blurred vision	Hallucinations
Breath that smells like pear drops	Convulsions/coma

#### Ketone below 0.6 mmol/L – Low risk DKA

Readings below 0.6mmol/L are in the normal range. No additional treatment at this point.

#### Ketone 1.5 mmol/L – 2.9 mmol/L Moderate risk DKA

Consider additional insulin and ensure adequate hydration, repeat glucose and ketones 1 hourly to ensure ketones are falling.

#### Ketone result greater than 3.0mmol/L – High risk DKA

High risk of DKA, investigate for DKA (ABG), give additional insulin and ensure adequate hydration (likely to need IV). Repeat after 1 hour.

Blood glucose (BG) meters measure hyperglycaemia up to a concentration of 27.8 mmol/L, above this level the glucose result is reported as >27.8mmol/L. In these circumstances a venous sample must be sent to the laboratory to check the blood glucose level and the degree of hyperglycaemia in order to assess the response to treatment until the BG has returned to the measurable range <27.8 mmol/L.

**Blood ketone interpretation** - Ketones are produced from metabolism of fat in the absence of insulin. Patients with type 1 diabetes are prone to ketone formation as are other patients such as those with longstanding insulin treated type 2 diabetes, those treated with SGLT2 inhibitors or post pancreatectomy. The presence of moderate or large amounts of ketones in the blood (or urine > 2+) suggests insulin deficiency. Ketones are cleared by the administration of additional insulin and adequate hydration. **Euglycaemic DKA is a serious condition seen in patients treated with SGLT2i's that may present with glucose levels under 11 mmol/L but the patient is unwell and has raised ketones indicative of DKA.**