For use in Covid-19 suspected/positive people and those without Covid-19 disease when diagnosis of DKA has been confirmed (see COVID: Diabetes Front Door Guidance).

This approach is NOT recommended where:
- Mixed DKA/Hyperosmolar state (osmolality greater than 320 - osmolality = [2 x Na] + Urea + Glucose)
- The person is pregnant
- Severe metabolic derangement (e.g. pH less than 7.0, OR bicarbonate less than 10 mmol/l, OR potassium less than 3.5 mmol/l)
- Significant other co-morbidity (e.g. acute coronary syndrome, CKD stage 4 or 5, end-stage liver disease)
- Conscious level impaired

In these situations, help should be sought early from the specialist diabetes team and teams should refer to their local DKA protocol.

Aims of treatment:
- Fall in ketones of 0.5 mmol/l/hour while
- Maintaining glucose at a safe level without hypoglycaemia
  - Target glucose range is 6 - 14 mmol/l
  - Additional glucose is required (by IV infusion – see Fluid Replacement over) when glucose is lower than 14 mmol/l
- Remember, euglycaemic DKA – where glucose levels are normal – can occur in pregnancy or in those using SGLT2 inhibitors

Targets of treatment:
- Ketones less than 0.6 mmol/l
- pH greater than 7.3
**FLUID REPLACEMENT**

**FLUID SHOULD BE REPLACED INTRAVENOUSLY**

For general guidance regarding intravenous fluid replacement see local guidance or JBDS guidance available here.

**Important resuscitation** – if systolic BP less than 90 mmHg infuse 500mls 0.9% saline bolus over 15 minutes. Repeat if systolic BP remains below 90 mmHg. Seek senior support if requiring more than 1 bolus of this sort.

Standard rate of fluid replacement with 0.9% saline (note slower rate should be considered in those aged 18-25 and over 70, and who are pregnant or who have cardiac or renal failure)

<table>
<thead>
<tr>
<th>WEIGHT (KG)</th>
<th>RATE (ML/HR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 50</td>
<td>100</td>
</tr>
<tr>
<td>50-60</td>
<td>115</td>
</tr>
<tr>
<td>61-70</td>
<td>130</td>
</tr>
<tr>
<td>71-80</td>
<td>140</td>
</tr>
<tr>
<td>81-90</td>
<td>150</td>
</tr>
<tr>
<td>91-100</td>
<td>165</td>
</tr>
<tr>
<td>Over 100</td>
<td>170</td>
</tr>
</tbody>
</table>

If a more cautious approach is required in COVID-19 positive/suspected, after an initial fluid bolus of 250ml in 15 minutes, the table below is a starting point only, and aims to avoid excessive fluid replacement. Use clinical judgment, frequent senior review and consider a higher rate of fluid replacement if significantly hypovolaemic/AKI:

<table>
<thead>
<tr>
<th>WEIGHT (KG)</th>
<th>RATE (ML/HR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st litre (given over 1 hr)</td>
<td>1000</td>
</tr>
<tr>
<td>2nd litre (given over 2 hr)</td>
<td>500</td>
</tr>
<tr>
<td>3rd litre (given over 2 hr)</td>
<td>500</td>
</tr>
<tr>
<td>4th litre (given over 4 hr)</td>
<td>250</td>
</tr>
<tr>
<td>5th litre (given over 4 hr)</td>
<td>250</td>
</tr>
</tbody>
</table>

**RAPID-ACTING INSULIN**

4 Hourly Subcutaneous Doses of Rapid-Acting Insulin Analogue (Novorapid® / Humalog® / Apidra®)

Aiming for a reduction in ketones of at least 0.5 mmol/l/hour (2 mmol/l over 4 hours)

- **Initial dose of 0.4 units/kg every 4 hours.** This dose may appear large however is equivalent to the IV dose used in standard DKA management.
- **Reduce to 0.2 units/kg every 4 hours** once glucose less than 14 mmol/l.
- **Continue until ketones less than 0.6 mmol/l.**

If ketones not falling as expected:

- **Increase rapid acting insulin dose to 0.5 units/kg every 4 hours.**
- **Contact the diabetes specialist team.**
- **Consider switching to iv insulin if infusion pump available.**

**POTASSIUM**

The effect of Covid-19 disease on potassium regulation remains unknown, and so potassium replacement should follow standard protocols and be guided by 2 hourly monitoring.

**MONITORING IMPACT OF TREATMENT**

- **Glucose and ketones** - check at least 2 hourly
- **Fluid balance** - record hourly, regular review and adjustment according to clinical condition
- **Oxygen saturations** - regular assessment as a potential marker of fluid overload

**ONE TREATMENT TARGETS ARE ACHIEVED:**

If the person is already treated with insulin

- Transfer back onto usual regimen
  - If on subcutaneous insulin injections
    - Long-acting insulin should have been continued – ensure this is the case
    - Add rapid-acting insulin according to the usual regimen before meals
    - Correction doses can be used according to the “Guidance for managing inpatient hyperglycaemia” document
  - If using a personal insulin pump
    - The person will need to be well enough to reinstate their pump and manage their insulin regimen themselves
    - Ensure pump started within 3 hrs of subcutaneous rapid acting insulin dose

If the person was not previously on insulin

- Administer long-acting insulin as above (Basal Insulin section) and use the “Guidance for managing inpatient hyperglycaemia” document for correction doses
- **Involve your local diabetes team.**

**ALWAYS monitor glucose and ketones initially 4 hourly following transfer to ‘usual’ insulin regimen to ensure ketones remain lower than 1.5 mmol/l and blood glucose is within target range (6 – 14 mmol/l).**

**BASEL INSULIN**

**ALWAYS START/CONTINUE LONG-ACTING INSULIN WHEN TREATING DKA**

- If using regular injectable long-acting insulin this should be continued
- If not previously using basal insulin initiate a dose of 0.15* units/kg/day (involve the local diabetes team at the earliest opportunity)

If using a personal insulin pump either:

1. **Continue basal insulin rate via pump** if person can safely manage this themselves. The pump infusion set should be changed by the patient (it may be an infusion set problem that caused DKA)
   - **Find the usual total daily basal insulin dose and use the same dose of injectable basal insulin (the patient will be able to find this dose from the pump).**
   - **If unable to find total basal insulin dose from pump then give a total daily basal insulin dose of 0.25* units/kg**
   - **Options are twice daily Levemir® or once daily Lantus® / Abasaglar® / Semglee®.**

2. **Switch to sc basal insulin regime if the person is not able to safely manage their own pump:**
   - **Find the usual total daily basal insulin dose and use the same dose of injectable basal insulin (the patient will be able to find this dose from the pump).**
   - **If unable to find total basal insulin dose from pump then give a total daily basal insulin dose of 0.25* units/kg**
   - **Options are twice daily Levemir® or once daily Lantus® / Abasaglar® / Semglee®.**

*Different basal dose depending on insulin naive or previous insulin use.