

COncise adVice on Inpatient Diabetes (COVID:Diabetes):

DiABETES UK
KNOW DIABETES. FIGHT DIABETES.

GUIDELINE FOR MANAGING DKA USING SUBCUTANEOUS INSULIN

(where intravenous insulin infusion is not possible)



NATIONAL INPATIENT DIABETES COVID-19 RESPONSE GROUP*

- ✔ 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 = $[2 \times \text{Na}] + \text{Urea} + \text{Glucose}$)**
- ⚠ **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**

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Acknowledgements: London Diabetes Inpatient Network – COVID-19 • Designed by: [Leicester Diabetes Centre](#)

FLUID REPLACEMENT

✔ FLUID SHOULD BE REPLACED INTRAVENOUSLY

For general guidance regarding intravenous fluid replacement see local guidance or [JBDS guidance](#) available here.

⚠ **Initial 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)

| | RATE (ML/HR) |
|-----------------------------|--------------|
| 1st litre (given over 1 hr) | 1000 |
| 2nd litre (given over 2 hr) | 500 |
| 3rd litre (given over 2 hr) | 500 |
| 4th litre (given over 4 hr) | 250 |
| 5th litre (given over 4 hr) | 250 |

If a more cautious approach to fluid replacement is required for people who are COVID-19 positive/suspected see table below:

| WEIGHT (KG) | RATE OF 0.9% SODIUM CHLORIDE INFUSION (MLS/HR) | |
|--------------|--|------------------|
| | pH 7.1 OR LESS | GREATER THAN 7.1 |
| Less than 50 | 100 | 90 |
| 50-60 | 115 | 100 |
| 61-70 | 130 | 115 |
| 71-80 | 140 | 125 |
| 81-90 | 150 | 135 |
| 91-100 | 165 | 145 |
| Over 100 | 170 | 155 |

Remember: Glucose-containing fluid (e.g. 10% glucose at 125 ml/hour) should be infused when the glucose is less than 14 mmol/l **and reviewed with insulin prescription when** ketones less than 0.6 mmol/l. The 10% glucose usually runs alongside the 0.9% sodium chloride solution.

For euglycaemic DKA 10% glucose should be used as the resuscitation fluid.

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 hrly
- > **Fluid balance** - record hrly, regular review and adjustment according to clinical condition
- > **Oxygen saturations** - regular assessment as a potential marker of fluid overload

ONCE 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

BASAL 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)

OR

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