

Hyperosmolar Hyperglycaemic State (HHS) SUMMARY CLINICAL GUIDELINE

SEEK SENIOR REVIEW OR DIABETES TEAM INVOLVEMENT IF NOT IMPROVING

Reference No.:
CG-T/2023/053

THE DIAGNOSTIC CRITERIA FOR HHS CAN BE DEFINED AS THE PRESENCE OF ALL OF THE FOLLOWING:

- 1) High osmolality, often 320 mosmol/kg or more
- 2) High capillary blood glucose (CBG), usually 30mmol/L or more
- 3) Severely dehydrated and unwell

If pH < 7.3 or ketones > 3mmol/L or urine ketones 2+ or more or venous HCO₃ < 15mmol/L FOLLOW DKA GUIDELINE

IMMEDIATE ACTIONS

- ABC assessment including all routine observations including GCS,
- Capillary blood glucose check and capillary ketone check
- Obtain urgent IV access and commence fluids (as per Box A action 2)
- Venous bloods obtained for U&E, bicarbonate, FBC and venous blood gas, blood cultures.
- Urinalysis for ketones (if capillary ketones not available)
- VTE prophylaxis - unless contraindicated
- Calculate osmolality (2Na + glucose + urea)

SEVERE HHS – NEEDS DISCUSSION WITH HDU/ICU

- Osmolality greater than 350mosmol/kg
- Sodium above 160mmol/L
- Venous/arterial pH below 7.1
- Hypokalaemia (<3.5mmol/L) or hyperkalaemia (>6mmol/L)
- GCS < 12 or abnormal AVPU
- SpO₂ < 92%
- Urine output < 0.5ml/kg/hr
- Serum creatinine > 200µmol/L
- Hypothermia
- Macrovascular events such as MI or stroke
- SBP < 90, pulse > 100/<60

Potassium chloride (KCl)

CONTINUOUS MONITORING OF K⁺ LEVELS IS ESSENTIAL

With VBG testing
(at 4,8,12, 24, 36 and 48hours)

| Venous potassium level (mmol/L) | Potassium Chloride (KCl) replacement |
|---------------------------------|--------------------------------------|
| > 5.3 | NONE |
| 3.5 – 5.3 | 10mmol/hr |
| < 3.5 | senior advice |

To be added to each Litre bag of NaCl according to the current measured K⁺ level
Life threatening hypokalemia can occur with insulin infusion.
If K⁺ infusion is greater than 10mmol/hr cardiac monitoring is recommended. Senior advice should be sought if cardiac monitoring unavailable.

DO NOT GIVE KCL IF PATIENT IS ANURIC

IV FLUIDS

ASSESS VOLUME STATUS

Assess patient for Bag 1 of fluids

PATIENT SHOCKED?

SBP < 90mmHg / HR > 100
1L 0.9% NaCl over 15 minutes
SBP still < 100 mmHg
Give another 500ml bolus NaCl

PATIENT NOT SHOCKED

HR/SBP – NORMAL RANGES

Continue Fluid resuscitation as follows

Note: caution in elderly, CCF, ESRF, adolescence, pregnancy

Bag 1 - 1L 0.9% NaCl +/- KCl over 2 hours

Bag 2 - 1L 0.9% NaCl +/- KCl over 2 -4 hours

At 6 hours, reassess patient in terms of HR, BP, JVP, chest auscultation. If appropriate, prescribe the following:

Bag 3 - 1L 0.9% NaCl +/- KCl over 4 -6 hours

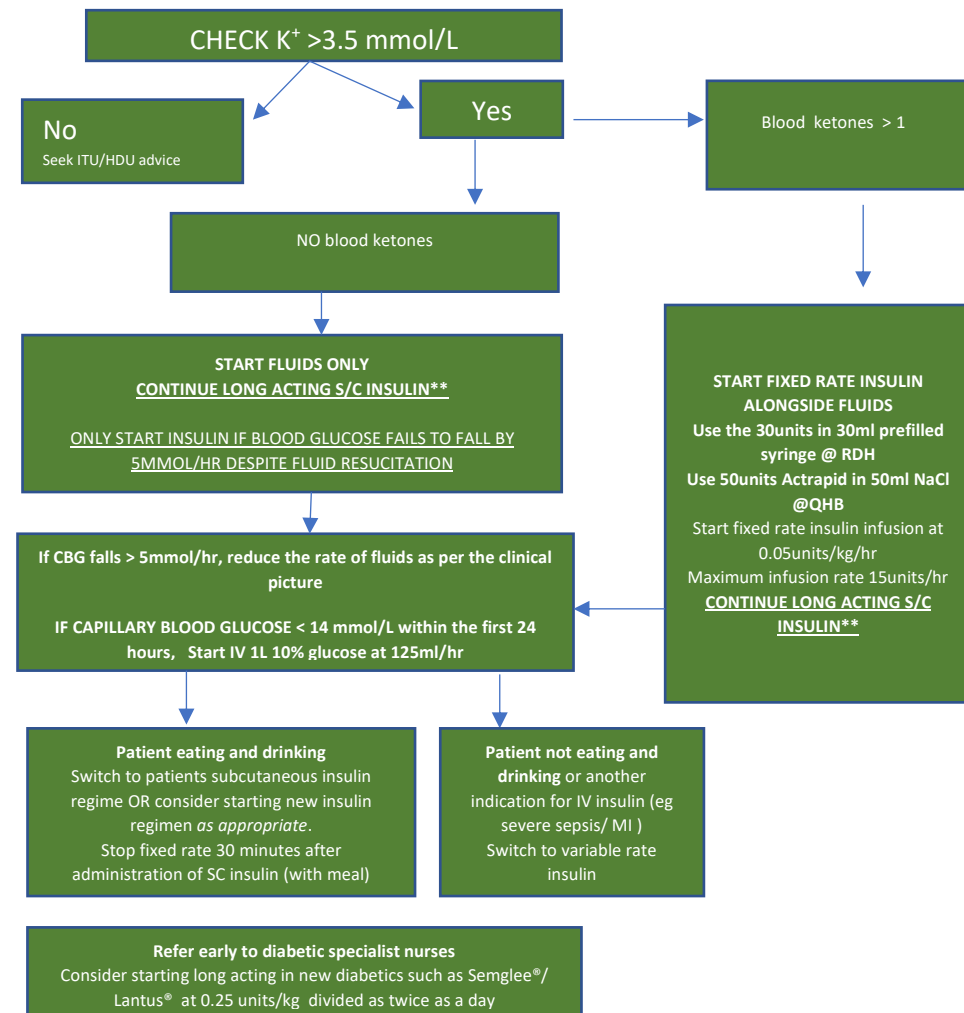
AIM TO REPLACE 3-6 LITRES IN THE FIRST 12 HOURS

Bag 4 – 1L 0.9% NaCl +/- KCl over 6-8 hours

Bag 5 - 1L 0.9% NaCl +/- KCl over 8-10 hours

Adjust rate of the 0.9% NaCl to reduce the risk of fluid overload if concerned.

INSULIN



**Long acting insulins that should be continued during treatment:

| | |
|----------------------------|-------------------------------|
| Humilin I [®] | Tresiba/Degludec [®] |
| Insulatard [®] | Toujeo [®] |
| Insuman Basal [®] | Levemir [®] |
| Lantus [®] | Semglee [®] |
| Glargine [®] | Absaglar [®] |

MONITORING

Monitoring should be performed as follows:

Osmolality – 4, 8, 12, 24, 36, 48 hours to monitor improvement

CBG/blood glucose – Hourly

Fluid balance – Hourly

NEWS – Hourly

VBG (venous) – 4, 8, 12, 24, 36, 48 hours

U&E – 4, 8, 12, 24, 36, 48 hours

AIMS**TARGETS**

- 1) Aim to reduce osmolality by 3-8 mosmol/kg/hr
- 2) Aim to reduce CBG by 5mmol per hour
- 3) Aim to reduce sodium by 10mmol/24hr
- 4) Only consider using 0.45% sodium chloride if osmolality fails to drop WITH SPECIALIST INPUT

If numbers are not improving check the patency of lines and infusion pumps before considering increasing FRII

EXIT CRITERIA**RESOLUTION OF HHS**

1. Resolution Of hyperglycaemia
2. Resolution of hyperosmolar state
3. If patient eating and drinking – restart normal diabetes medication. Insulin should be considered if not already on it
4. Triage to the diabetes ward