

The Doctors' Handbook

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Glycaemic Emergencies

You've been **bleeped:** Scenario 1a



CBG of 14. Patient has T2DM, CBGs usually 10-15 over last few days

Currently a Wednesday evening

The day team have made a referral to the DSN who has agreed to review the patient tomorrow

Patient 'feels a bit rough' and is quite thirsty. Otherwise systemically well, no polyuria, polydipsia, abdo pain or malaise. EWS - 0





What do you want to rule out here?



Diabetic Ketoacidosis

Hyperosmolar Hyperglycaemic State

How do we rule these **out**?



How do we rule these **out**?

Check ketone – preferably capillary

Capillary ketone

Urinary ketone

Significant if >0.6

Significant if ++ or more

Check osmolality

2 (Na + K) + glucose + urea

Significant if >320

Investigations

You ask them to check ketones. 15 mins later:



From today:BloodsNa 129Glu 5.0K 3.7Urea 14

2 (Na + K) + glucose + urea 2 x (129 + 3.7) + 5 + 14 = **285** (normal)



Management plan?



Impression

Uncomplicated hyperglycaemia

Management

Slow IV fluids to bring down their CBG



Ensure they get reviewed by the DSN team tomorrow

Would you give **stat insulin** in this patient?



No, <u>don't</u> give stat insulin in this instance

Raised CBGs in the short term are **not dangerous** if DKA/HHS has been ruled out

Why **don't** we give stat insulin?

1. Risk of causing **lethal hypoglycaemia**, especially overnight whilst they're asleep and so less likely to be noticed

2. Makes it more **difficult** for the Diabetes Specialist Nurse/Diabetic SpR to calculate their insulin requirements the next day



NB: The patient in this scenario is noted to have Na – 129

1. Why might that be?

2. How worried are we?



The Na – 129 is likely a pseudohyponatraemia secondary to the hyperglycaemia On it's own, it's not concerning

However, remember the slow IVFs

You've been **bleeped:** Scenario 1b



Similar but slightly different scenario, bleeped regarding a CBG of 21

This time it's out of hours on a Friday evening, so the DSN won't review the patient until the following Monday

Ketones are negative (<0.6)

Patient is clinically stable, EWS – 0



Here you could give a stat of **short-acting** insulin

1 unit of insulin will reduce someone's CBG by **approximately** 3 mmol/L

However this will vary widely between patients:

- Patients with metabolic syndrome on insulin for many years will likely need a higher dose
- Insulin naïve patients will need a lower dose
- Patients with AKI/CKD will need a lower dose due to reduced renal clearance and risk of hypoglycaemia

When writing up STAT insulin:

- Discuss with a senior
- Avoid writing it up PRN
- Ensure it's given with a meal if fast-acting
- Remember IV fluids
- Consider a basal insulin if the patient has had raised CBG levels for a while
- Ensure they'll be reviewed later by the DSN

You've been **bleeped:** Scenario 2



You are bleeped regarding a CBG of 21 38F admitted for Rt lower limb cellulitis. Background of T1DM

The nurse tells you that the patient has only recently arrived on the ward from CDU

Usually they would monitor CBGs regularly but unfortunately this was omitted on admission to A&E and hasn't been done for 2 days

You've been **bleeped:** Scenario 2a

) They tell you that the patient appears lethargic, confused and is complaining of nausea

There is reduced urine output from their catheter and she is complaining of thirst despite having drunk copious amounts of water She also has abdominal discomfort





Scenario 2



Investigations



Why this apparently normal Na **concerning** for us in this patient?

A normal sodium in the context of significant hyperglycaemia means that the patient is very **dehydrated**

The hyperglycaemia should be giving them a pseudohyponatraemia, but dehydration **concentrates** the sodium so that it appears normal

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Diagnosis?



Diagnosis



Rule out **pancreatitis** (in light of abdominal pain)



NB Can still have DKA with ketones <3.0 mmol/L. Discuss **anything** >0.6 with a senior





Priorities of management in DKA

Replacement of fluid deficit

IV insulin

Their regular SC background insulin

Other aspects of management

Involve seniors + diabetic team early

Managing electrolyte imbalances

Monitor CBGs + ketones hourly, VBGs periodically

Thromboprophylaxis

Investigate underlying cause



Fluid status and IV access

Two cannulas – one for **insulin**, one for **IV fluids**

If SBP <90mmHg

500ml NaCl 0.9% stat, then repeat BP

Repeat bolus if necessary. Involve seniors/ITU as appropriate – <u>have a low threshold for a 2222</u>

Catheterise and strict hourly fluid input/output monitoring



Insulin

Insulin infusion

Actrapid 0.1 units/kg/hour IV

Must be a fixed rate insulin infusion (FRII), <u>**not**</u> a variable rate (VRII)

Background insulin

Normal subcut basal insulin

- One of the most commonly forgotten steps ensure their normal subcut basal insulin is written up e.g. Lantus/Levemir
- Ensure that they've had their dose for today
- With-hold mixed insulin forms e.g. M3



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Management of **electrolytes**

Start replacing potassium when it reaches the upper limit of normal

If hyperkalaemic then perform an ECG (also because an MI can be the underlying cause of a DKA)

Maximum rate of KCL infusion on the ward is 10mmol/hr

Other aspects of management

Senior escalation/ITU. Involve diabetic team early

Monitor CBGs + ketones hourly, VBGs periodically

If vomiting can give IV ondansetron

Thromboprophylaxis as dehydration \rightarrow risk of VTE

Datix - In this case CBGs weren't being monitored

On a case-by-case basis, consider investigations to find underlying cause

Troponin ECG Amylase Blood cultures MSU Wound swabs INR CXR

You've been **bleeped:** Scenario 2b

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Same patient as before, but it is now 6 hours later

7.31 (7.21)

Lac2.0 (3.1)Ketones1.1 (5.5)CBG13 (21)K5.2 (5.7)



Their observations are clinically stable

How would the above affect your **management** plan?



- They're improving without the need for input from ITU
- Their CBG is <14, so start a 1L bag of 10% Glucose over 8 hours to prevent hypoglycaemia (go by local trust guidelines)
- Their potassium is <5.5, so make it a 1L bag of 10% Glucose with **40mmol KCL**

Potassium prescribing

Start to replace when it reaches the **upper limit of normal** The definition varies between hospitals but is usually **5.3 or 5.5**

Why do we involve ITU in instances of patients with DKA who have a potassium of <3.5?

Because we're giving then an insulin infusion that will make their potassium **continue** to drop

We can only replace it at a maximum speed of **10mmol/hour** on the ward, so would need to transfer the patient to HDU/ITU if they needed a **faster** infusion of potassium e.g. 20mmol/hour

You've been **bleeped:** Scenario 2c



Same patient. It's now 24 hours since DKA management started. They are:

- Sat up in bed, alert and orientated
- Eating and drinking
- Mild nausea, controlled with PO anti-emetics
- Good urine output, stable BP and HR, EWS 0



CBG Capillary ketone pH K



0.4

7.35





Stop FRII when:



Can step down to regular subcut insulin, or if not eating and drinking then a VRII. **However, this should be discussed with a senior or with the diabetes team**

Ensure they've had their background insulin and that their mealtime insulin is also prescribed

DKA criteria for referral to ITU



You've been **bleeped:** Scenario 3

66M a/w IECOPD. PMHx:T2DM on insulin Mx: IV Abx, salbutamol & ipratropium nebs, oral prednisolone Day 4 day of admission. Bleeped RE: CBG 31 First time CBG checked today as he keeps going off for cigarettes. Also missed his insulin Short staffed on the ward so the nurse wasn't able to chase him

Scenario

Which **factors** have caused his hyperglycaemia?



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'Siiii...gh'



Infection

Intercurrent illness

Insulin underdosing

Infarction

(but not in this patient)

You've been **bleeped:** Scenario 3

The nurse tells you that the patient appears to have a low output from their catheter

Complaining of thirst despite having drunk copious amounts of water He is also now behaving in a drowsy/confused manner



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GCS 14/15, confused, PEARL

CBG 31, abdomen SNT

Investigations





Osmolality

2 (Na + K) + glucose + urea 2 x (138 + 5) + 31 + 7 = **364**

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Impression?



Hyperosmolar Hyperglycaemic State

Hyperosmolar Hyperglycaemic State

Characteristic **features** of a person with HHS:

Hypovolaemia

Marked hyperglycaemia (>30 mmol/L)

Osmolality >320 mosmol/kg

But **without** a significant hyperketonaemia (<3) or acidosis (pH >7.3 and bicarbonate >15 mmol/L)

The term HHS is now used instead of HONK to account for the fact that there may be a **mild rise** in ketones, but **without** ketoacidosis

In contrast to DKA, HHS will develop over **days** rather than hours. **Infection** is usually the primary cause

Management of HHS?

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Priorities of management in HHS

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IV fluid replacement is main priority

IV insulin only if inadequate response to IV fluids, or in presence of ketonaemia



Regular subcut basal insulin – often missed

Management of electrolytes – especially sodium and potassium

Scenario

Other aspects of management

Involve seniors + diabetic team early

Monitor CBGs + ketones hourly, VBGs periodically

Thromboprophylaxis

Investigate underlying cause





IV fluids alone should reduce glucose – recommended drop of **4-6mmol/hr.** IV insulin **only** if inadequate response to IV fluids, or in presence of raised ketones

If insulin needed, use half-rate FRII of 0.05 units/kg/hour

Background insulin – as for DKA

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- One of the most commonly forgotten steps ensure their normal subcut basal insulin is written up e.g. Lantus/Levemir
- Ensure that they've had their dose for today
- With-hold mixed insulin forms e.g. M3

Management of **electrolytes**

Ensure sodium does not change by >8mmol per 24 hours

Assess for drop consciousness level (signifying cerebral oedema or Central Pontine Myelinosis) every 1-2 hours – this is the reason for a slower rate of IVF than for DKA

Manage potassium same as for DKA in previous scenario

Other aspects of management

Senior escalation/ITU. Involve diabetic team early

Monitor CBGs + ketones hourly, VBGs periodically

If vomiting can give IV ondansetron

Thromboprophylaxis as dehydration \rightarrow risk of VTE

Datix – depending on the situation

On a case-by-case basis, consider investigations to find underlying cause

Troponin ECG Amylase Blood cultures MSU Wound swabs INR CXR

Indications for ITU involvement in HHS



You've been **bleeped:** Scenario 4



38F admitted for acute appendicitis, day 2 post-op. Currently allowed clear fluids
PMHx T1DM
Has a single CBG – 3.5
GCS – 15, alert. EWS – 0

Says she feels 'a bit hypo'. Is light headed, trembling and has palpitations

What is the **severity** grade of hypoglycaemia?

Management plan?



Severity grade

Mild (3-4)

Management





Give oral Glucogel, Lucozade 120ml or fruit squash (ensure not low sugar version of Lucozade)



Identify causes and review drug chart e.g. Gliclazide



Ensure she continues to drink sugary fluids, or has 5% dextrose prescribed

What would you do if she was strictly **NBM** post-op?

100ml of 10% Dextrose IV STAT

They will likely only have 1L bags available on the ward so just use 100ml of it then use more only if you need it



What is a common cause of hypoglycaemia on **discharge**?

(Especially for patients admitted with ICOPD)

• Started on high dose steroids in hospital

- Insulin increased to account for this
- Patient gets discharged with a reducing dose of steroids, but insulin dose isn't reviewed
- Subsequently develops potentially lethal hypoglycaemia

Always ensure community diabetic follow up for these patients and **tell** the patient.

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You've been **bleeped:** Scenario 5

Bleeped re: CBG of <2

Patient is unconscious and unrousable

Management plan?



Assess/manage airway. Give **high flow O**₂

2222 for peri-arrest with anaesthetic support

IV Glucose STAT 50ml of 50% or 100ml of 20% or 200ml of 10%

Don't use oral glucose, patient unconscious so no gag reflex

Can give IM Glucagon 1mg IM/SC/IV if available

NB doesn't work in context of sulphonurea overdose or liver failure

Discuss with seniors about longer term management e.g. slow IV dextrose infusion, starchy carb diet, any modifications to insulin regimen etc

Identify possible causes of hypoglycaemia and review the drug chart

Feedback

PIZAT

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sick by Sean Maldjian from the Noun Project injection by Vectors Point from the Noun Project sugar blood level by Komkrit Noenpoempisut from the Noun Project Prescription by Dam from the Noun Project Heart by Three Six Five from the Noun Project Lungs by Focus Lab from the Noun Project Temperature by Boris from the Noun Project Blood Test by Xinh Studio from the Noun Project Doctor by Diana Militano from the Noun Project Prescription by Minh Do from the Noun Project Intravenous Drip by Fran Couto from the Noun Project coffee ring by IconsGhost from the Noun Project Checkbox by Christopher T. Howlett from the Noun Project empty checkbox by Christopher T. Howlett from the Noun Project