Case 11

You are an F2 working in the emergency department at General Hospital. Your consultant is Dr Bain.

Your bleep number is 9981

Patient name: Peter Lumley

Date of birth: 26th September 1990

Patient number: X908786534

Mr. Lumley has been brought to the emergency department by his partner, who has reported that he has been experiencing drowsiness and abdominal pain for the past six hours.

Mr. Lumley has a medical history of asthma, depression, and type 1 diabetes mellitus.

His regular medications include Salbutamol (PRN), Lantus (OD) and NovoRapid (TDS).

On examination, the patient appears pale, with normal air entry in both lungs, but rapid and deep breathing. Heart sounds are I – II + 0, and his capillary refill time is prolonged at 4 seconds. Although his abdomen is mildly tender on palpation, there is no rebound or guarding. The patient is confused and drowsy, with a Glasgow Coma Scale (GCS) score of 13/15 (Eyes 3, Voice 4, Motor 6).

Investigations

Pulse	115 beats per minute
Blood pressure	88/61 mmHg
Respiratory rate	22 breathes per minute
Oxygen saturations	99% (room air)
Temperature	36.5 degrees Celsius

Urine dip is ++ for ketones.

Chest x-ray and routine blood tests pending.

Arterial blood gas results are below:

Blood Gas

Identification

Patient ID	X908786534
Date of Birth	26th September 1990
Patient Last Name	Lumley
Patient First Name	Peter
FO2	21%
Sample Type	Arterial

Blood Gas Values

pH	7.23	(7.35 – 7.45)
PO2	13.5	(11 – 13 kPa)
pCO2	2.7	(4.7 – 6.0 kPa)

Acid Base Status

Bicarbonate	15	(22 – 26 mmol/L)
Base Excess	-11.1	(-2 to +2 mmol/L)

Electrolyte Values

Sodium	123	(133–146 mmol/L)
Potassium	5.2	(3.5–5.3 mmol/L)
Chloride	83	(95-108 mmol/L)

Metabolite Values

Glucose	22.7	(3.0-7.8 mmol/L)
Lactate	3.1	(0.5 – 2.2 mmol/L)

Task

Please report and interpret the results of the arterial blood gas on hospital notepaper.

Make sure to include the most likely diagnosis and what the next steps in management should be.

Hospital: General Hospital   **Patient name:** Peter Lumley

Ward: ED   **Date of birth:** 26/09/1990

Consultant: Dr Bain   **Hospital number:** X908786534

Date/Time	Documentation
20/03/2023 1000 *i.e. today's date*	FRED JONES FY2
	Report on ABG results for Peter Lumley, DOB 26/09/1946, taken today (20/03/23) at 0950 due to presentation with abdominal pain, confusion (GCS 13), hypotension, tachypnoea and ketonuria (++).
	Report:
	pH 7.23 – acidotic
	PaCo2 2.7 – hypocapnic
	PaO2 13.5 – normal
	HCO3 15 – low
	Glucose 22.7 – hyperglycaemic
	Lactate 3.1 – raised
	Sodium – 123 – Hyponatremia
	Chloride – 83 – Hypochloraemia
	Results show:
	Metabolic acidosis with partial respiratory compensation
	Impression:
	Diabetic ketoacidosis
	Plan:
	1. IV fluid 500mls 0.9% NaCl STAT
	2. Fixed rate insulin infusion (as per trust guidelines)
	3. Senior review *F.Jones*
	FRED JONES (FY2)

Explanation

The patient's history and symptoms are all suggestive of diabetic ketoacidosis – PMHx T1DM, drowsiness, abdominal pain, confusion, Kussmaul breathing, confusion etc.

The patient also fulfils the diagnostic criteria for DKA:

Hyperglycaemia (blood glucose >11mmol/L)

Ketonaemia (capillary or blood ketone above 3 mmol/L or significant ketonuria of 2+ or more)

Acidosis (bicarbonate less than 15 mmol/L and/or venous (arterial is fine) pH less than 7.3)

As there is no obvious cause in the history, missed insulin dose(s) is a reasonable suggestion. Precipitants such as recent infection, heavy alcohol consumption etc. might be present in similar scenarios.

The ABG supports this diagnosis, showing a metabolic acidosis (pH 7.23. HCO3 15) with partial respiratory compensation (PaCO2 2.7 – Kussmaul breathing). There is also a raised anion gap ($Na^+ - (Cl^- + HCO_3^-) = >20$) supporting the diagnosis of DKA – however, this is beyond the scope of most final year written skills examinations.

If you are struggling with ABG interpretation, this RCP article by Graham Burns is massively helpful(!): https://www.rcpjournals.org/content/clinmedicine/14/1/66

Management for diabetic ketoacidosis can be remembered with the mnemonic FIGPICK: **F**luids, **I**nsulin (fixed rate infusion), **G**lucose monitoring, **P**otassium monitoring and correction (remember: potassium will be driven into cells when insulin is given causing hypokalaemia), **C**hart fluid balance, **K**etone monitoring.

See the DiabetesUK guidelines below for more detail:

The guideline features a single-page algorithm for the management of DKA. Click here to access.

Here is the BNF treatment summary for diabetic hyperglycaemic emergencies (useful to know where to look in your actual written skills exam):

https://bnf.nice.org.uk/treatment-summaries/diabetic-hyperglycaemic-emergencies/#:~:text=DKA%20is%20characterised%20by%20hyperglycaemia,venous%20pH%20less%20than%207.3)