



OSCE 1

Candidate Instructions:

You are the Consultant in charge and a Resident has approached you with a venous blood gas from a patient they assisted with managing in ED yesterday.

The patient was a 24 year old female who presented after an argument with her mother and was thought to have taken an overdose.

She had vertigo and vomiting.

Her Vital Signs:

Temperature	36.5
HR	105
BP	110/70
RR	28
O2sats	98% RA

The VBG is available to you outside the OSCE room.

Your Tasks:

1. Interpret and explain the VBG
2. Advise on her management

Domains Examined:

Medical Expertise:

-Investigation Interpretation	50%
-Management	30%

Scholarship and Teaching	20%
--------------------------	-----

Venous Blood gas:

Normal values

pH	7.50	7.35-7.45
pO ₂	65	98-105
pCO ₂	20 mmHg	35-45
HCO ₃	15 mmHg	21-28
BE	-7	-3 to +3
Lactate	3.8	0.5 - 2.0
Na	140	135-145
K	5.0	3.5-5.5
Cl	90	95-110
Urea	9	3.5 - 10.0
Cr	90	45 - 95
Glucose	7.8	3.6-7.7



Role Player instructions

VBG - triple acid base abnormality from acute salicylate toxicity.

You are a keen junior registrar who have asked your ED consultant to explain a VBG to you from a patient that you assisted with managing yesterday.

The patient is a 24 year old female who presented after an argument with her mother and was thought to have taken an overdose.

She presented with an altered mental state, vertigo and vomiting.

Her Vital Signs were:

Temperature	36.5
HR	105
BP	110/70
RR	28
O2sats	98% RA

Opening Question: ***"This patient came through ED yesterday and I wonder if you could explain the VBG to me?"***

You have no experience with VBG interpretation and don't know what it shows.

After 4:30 mins ask: ***"What could have caused this presentation"***

At 5 mins ask: ***"How would you manage this patient?"***

VBG Interpretation:

-Respiratory Alkalosis - from increased respiratory rate

-High Anion Gap Metabolic Acidosis (HAGMA) – from – Lactate/Salicylate and ? Ketones

-Chloride responsive Metabolic Alkalosis- vomiting(HCl loss)

Alkalaemia from increased RR

Expected HCO₃ for Resp Alkalosis:

CO₂ 20 down from 40 ie 20 below normal

Acute: HCO₃ ↓ 2 (from 24) per 10 ↓ in pCO₂(Min18) – HCO₃ 2 x 2 = 20

Chronic: HCO₃ ↓ 5 (from 24) per 10 ↓ in pCO₂ (Min12) – HCO₃ 2 x 5 = 15

Measured HCO₃ 15 so either chronic resp alk or also(more likely) has metabolic acidosis

Anion Gap Na - Cl - HCO₃ = 140 - 90 - 15 = 34 (N<12) High Anion Gap Metabolic Acidosis

Delta Ratio $\Delta AG/\Delta HCO_3 = (AG - 12)/(24 - HCO_3)$

= (34-12)/(24 - 15)

= 22/9 = 2.4 ie Also Chloride responsive Metabolic Alkalosis

<0.4 NAGMA also (more change in HCO₃)

0.4-0.8 consider HAGMA + NAGMA

1-2 usual for uncomplicated HAGMA (Lactic av 1.6, DKA closer to 1.0)

>2 met alk also (less change in HCO₃)



$$\begin{aligned}\text{Expected CO}_2 &= 1.5 \times \text{HCO}_3 + 8 \\ &= 1.5 \times 16 + 8 = 30.5\end{aligned}$$

Measured CO₂ is 20, therefore CO₂ lower than expected = Respiratory Alkalosis

Management:

Supportive:

A/B - O₂

C – IVF resuscitate for vomiting loss and insensible loss

D – seizures with Benzodiazepines eg Midazolam 0.15mg/kg

Psychiatric Assessment

Specific:

-*Decontamination* – oral/NGT activated charcoal 50 g stat then 2nd dose up to 8 hours after 4 hours if serum salicylate levels continue to rise. (note if airway not protected needs intubation)

-*Enhanced elimination*

Urinary alkalinisation - 1–2 mmol/kg sodium bicarbonate IV bolus then infusion of 100 mmol sodium bicarbonate in 1000 mL 5% dextrose at 250 mL/hour, 20 mmol of potassium chloride may be added to infusion to maintain normokalaemia

Haemodialysis - effectively for severe toxicity but usually not required if early decontamination and urinary alkalinisation are implemented. Use if:

- Severe toxicity/Intubation required
- Urinary alkalinisation not feasible
- Serum salicylate levels rising to >4.4 mmol/L (>60 mg/dL) despite decontamination and urinary alkalinisation
- Severe toxicity as evidenced by altered mental status, acidaemia or renal failure
- Very high serum salicylate levels:
 - Acute poisoning >7.2 mmol/L (>100 mg/dL)
 - Chronic poisoning >4.4 mmol/L (>60 mg/dL)
 - The threshold to dialyse is lower in the elderly (>60 mg/dL)

-*Antidotes* - None available

-*Disposition* – ICU/HDU, toxicology consultation, psychiatric consultation

Note:

Salicylate level

- Therapeutic range is 1.1–2.2 mmol/L (15–30 mg/dL)
- Poor correlation between levels and severity of toxicity
- Serial levels every 2–4 hours are useful to identify ongoing or delayed absorption from a tablet bezoar or slow-release tablets



Examiner Marking Sheet

COMPONENT ASSESSMENT

For each Domain below, select the ONE best option that best represents the candidate's level of performance. The option "**minimum level of competency displayed**" represents the level of safe independent practice as a **junior FACEM** in Australasia

Very poor level of competency displayed	Well below minimum level of competency displayed	Below minimum level of competency displayed	Minimum level of competency displayed	Above minimum level of competency displayed	High level of competency displayed	Very high level of competency displayed
---	--	---	---------------------------------------	---	------------------------------------	---

Please rate ALL the following domains:

Medical Expertise - Investigation	☐	☐	☐	☐	☐	☐	☐
Medical Expertise - Management	☐	☐	☐	☐	☐	☐	☐
Scholarship & Teaching	☐	☐	☐	☐	☐	☐	☐

[Detailed assessment criteria](#)

Please use the following criteria to inform your ratings above (mandatory items in ***bold italics***)

Medical Expertise

Investigation: VBG Interpretation:

- Respiratory Alkalosis - from increased respiratory rate
- High Anion Gap Metabolic Acidosis (HAGMA) – from Lactate/Salicylate and ? Ketones
- Chloride Responsive Metabolic Alkalosis- vomiting

Alkalaemia from increased RR

Expected HCO₃ for Resp Alkalosis:

CO₂ 20 down from 40 ie 20 below normal

Acute: HCO₃ ↓ 2 (from 24) per 10 ↓ in pCO₂ (Min18) – HCO₃ 2 x 2 = 20

Chronic: HCO₃ ↓ 5 (from 24) per 10 ↓ in pCO₂ (Min12) – HCO₃ 2 x 5 = 15

Measured HCO₃ 15 so either chronic resp alk or also (more likely) has metabolic acidosis

Anion Gap Na - Cl - HCO₃ = 140 - 90 - 15 = 34 (N<12) **High Anion Gap Metabolic Acidosis**

Delta Ratio $\Delta AG/\Delta HCO_3 = (AG - 12)/(24 - HCO_3)$

= (34-12)/(24 - 15)

= 22/9 = 2.4 ie Also **Chloride responsive Metabolic Alkalosis**

<0.4 NAGMA also (more change in HCO₃)

0.4-0.8 consider HAGMA + NAGMA

1-2 usual for uncomplicated HAGMA (Lactic av 1.6, DKA closer to 1.0)

>2 met alk also (less change in HCO₃)



Expected $\text{CO}_2 = 1.5 \times \text{HCO}_3 + 8$
 $= 1.5 \times 16 + 8 = 30.5$

Measured CO_2 is 20, therefore CO_2 lower than expected = Respiratory Alkalosis

Management:

Supportive:

- A/B - O_2
- C – IVF resuscitate for vomiting loss and insensible loss
- D – Seizures with Benzodiazepines eg Midazolam

Specific:

-**Decontamination** – oral/NGT activated charcoal 50 g stat then 2nd dose up to 8 hours after 4 hours if serum salicylate levels continue to rise. (note if airway not protected needs intubation)

-Enhanced elimination

Urinary alkalisation - 1–2 mmol/kg sodium bicarbonate IV bolus then infusion of 100 mmol sodium bicarbonate in 1000 mL 5% dextrose at 250 mL/hour, 20 mmol of potassium chloride may be added to infusion to maintain normokalaemia

Haemodialysis - effectively for severe toxicity but usually not required if early decontamination and urinary alkalisation are implemented. Use if:

- Urinary alkalisation not feasible
- Serum salicylate levels rising to >4.4 mmol/L (>60 mg/dL) despite decontamination and urinary alkalisation
- Severe toxicity - altered mental status, acidaemia or renal failure
- Very high serum salicylate levels

-**Antidotes** - None available

-**Disposition** – ICU/HDU toxicology consult, psychiatry once extubated

Note: Salicylate levels - Therapeutic range is 1.1–2.2 mmol/L (15–30 mg/dL), Poor correlation between levels and severity of toxicity. Serial levels every 2–4 hours are useful to identify ongoing or delayed absorption from a tablet bezoar or slow-release tablets

Scholarship and teaching

- lesson plan
- structured approach** to VBG interpretation
- check prior** knowledge
- checks understanding
- arranges **follow-up education session**

Station Summary: Interpretation of VBG with triple acid base disturbance from salicylate poisoning and explanation of management to resident.

INFORMATION

EXAMINER NOTES (For examiner reference only)

OSCE 'incident reporting' notes: Please provide details if an issue occurs which may influence the candidate's

exam outcome e.g. protocol breach, candidate illness, etc.

GLOBAL RATING FOR STANDARD SETTING:

This scale is used in the standard setting process for the OSCE. Please rate the candidate's OVERALL performance in this OSCE. The rating should take into account the entirety of the OSCE, rather than just a sum average of the individual domain scores. This element **MUST** be completed for the standard of the examination to be set.



In terms of a **safely practicing junior emergency physician**, select the ONE option that best reflects the candidate's performance in this station:

**Well Below
Standard**

**Below
Standard**

**Just at
Standard**

**Above
Standard**

**Well Above
Standard**

☐☐☐☐☐

EXAMINER SIGNATURE: