

Acid Base Workshop

Instructor Notes

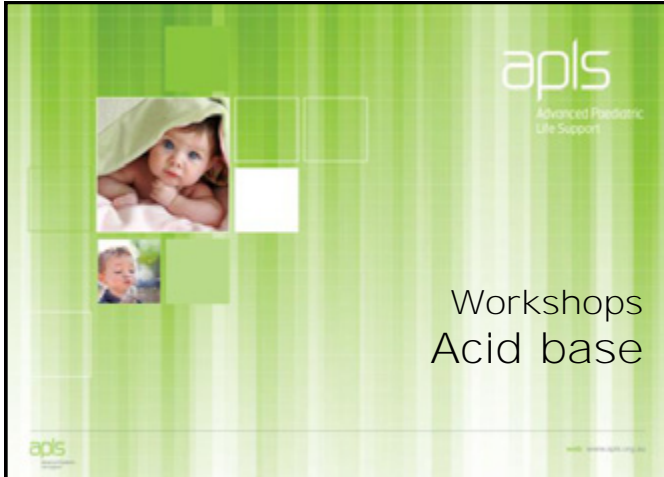
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Acid base

Systematic evaluation – the six steps

4. Compensation: Assess the appropriateness of the compensatory response

5. Formulation: Bring the information together and make the acid base diagnosis

6. Confirmation: Consider if any additional tests to check or support the diagnosis are necessary or available & revise the diagnosis if necessary:
Sometimes the diagnosis suggests additional tests
Eg. Measurement of blood salicylate level in a child which if high can confirm a clinical suspicion of a salicylate overingestion

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Acid base

Compensation

Calculate degree of compensation

- Winter's equation in metabolic problems:**
 - Expected pCO_2 in acidosis – $1.5 \times HCO_3 + 8 (+/- 2)$
 - Expected pCO_2 in alkalosis – $0.7 \times HCO_3 + 9 (+/- 3)$
- In Respiratory acidosis:**
 - Acute – **1 HCO₃ for every 10 increase in pCO_2**
 - Chronic – **4 for every 10 increase in pCO_2**
- In Respiratory alkalosis:**
 - Acute – **2 for every 10 decrease in pCO_2**
 - Chronic – **5 for every 10 decrease in pCO_2**

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Acid base

Directed case 1

Initial information
A 4-week-old baby boy is admitted to hospital with history of projectile vomiting of several days duration.

Further information
His blood gases show:
pH 7.50
 PCO_2 49 mmHg
 HCO_3 37 mEq/L

Step 1: Acidemic, alkalemic, or normal?

Step 2: Is the primary disturbance respiratory or metabolic?

Step 3: Anion gap – not necessary

Step 4: The expected PCO_2 in metabolic alkalosis is $0.7 \times HCO_3 + 20$ mmHg = $[0.7 \times 37] + 20 = 46$ mmHg.

Diagnosis?

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Acid base

Directed case 2

Initial information
A 7 year old child has been unwell for one week with a flu-like illness, a dry cough, poor appetite, and vomiting.

Further information
Arterial blood gas analysis reveals:
pH 7.05
 pCO_2 30 mmHg (4.0 kPa)
 pO_2 75 mm Hg (10.1 kPa)
 HCO_3 9.9 mmol/L
BE -17 mmol/L

Na	146 mmol/L
K	3.4 mmol/L
Cl	110 mmol/L
U	7.3 mmol/L
Cr	112 mmol/L
Gluc	35.1 mmol/L

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Directed case 3

Initial information
A 10 month old baby, who had been born prematurely at 32 weeks and who was subsequently ventilated on SCBU for 12 weeks, now presents with a 3-day history of breathing difficulties and lethargy.

Further information
Arterial blood gas analysis reveals:
pH 7.33
 pCO_2 70 mmHg (9.2 kPa)
 pO_2 60 mmHg (8.1 kPa)
 HCO_3 34.9 mmol/L
BE + 8 mmol/L

Further information
The baby has a respiratory rate of 60.

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Directed case 4

Initial information
A 12 year old boy is brought into A&E distressed and dyspnoeic, with a history of having taken 25 tablets. He does not know what they were.

Further information
Arterial blood gas analysis reveals:
pH 7.50
 pCO_2 22 mmHg (2.92 kPa)
 pO_2 104 mmHg (13.8 kPa)
 HCO_3 24.1 mmol/L
BE - 1.5 mmol/L

Further information
At 6 hours serum salicylate levels were 100 mg/L.
Paracetamol was not detected.

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Acid base

Directed case 5



Advanced Paediatric Life Support

Initial information
 A 5 year old boy fell into a lake and was dragged out by a passer-by after about 10 minutes. Basic life support was commenced and he began to breathe after 3 minutes. He is brought in unconscious, responding only to pain. He is intubated and ventilated urgently. 5 minutes later a blood gas sample is taken.

Further information
 Analysis reveals:


pH	6.95	
pCO ₂	54 mmHg	(7.2 kPa)
pO ₂	90 mmHg	(12.1 kPa)
HCO ₃	15.2 mmol/L	
BE	- 9 mmol/L	

Further information
 Rectal temperature is 32°C

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Acid base

Directed case 6



Advanced Paediatric Life Support

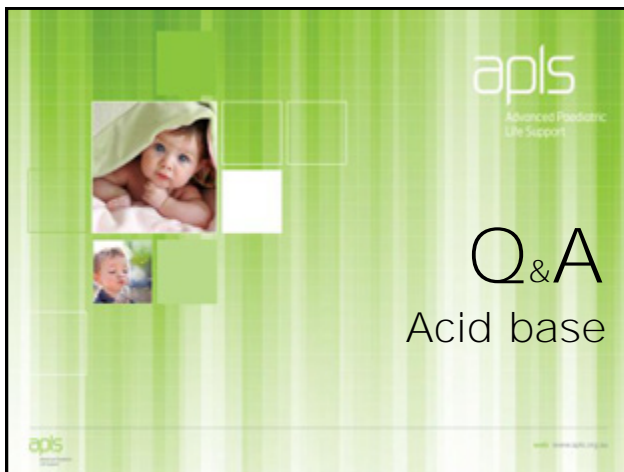
Initial information
 6 year old girl with fevers, cough and increasing SOB for 4 days. Has been off her foods for 2 days. Has not passed urine since the am.


On presentation in your ED, she is febrile to 39°C, PR 150/min, Cap refill 3secs, RR 35/min. O₂ sats on RA is 90%. She looks unwell and is lethargic and malaised.

Further information
 Analysis reveals:

pH	7.29
pCO ₂	55 mmHg
pO ₂	75 mmHg
HCO ₃	19 mmol/l
Na	132

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Advanced Paediatric Life Support


Q&A

Acid base

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Summary



Advanced Paediatric Life Support

You should now be able to:

- Interpret blood gas results
- Discuss appropriate therapies