Blood Gas Analysis Algorithm

NHS Greater Glasgow and Clyde

Step 1 Oxygenation

PaO_2

Normal Range

(10-13.3kPa)

PaO_2 <10kPa

Consider commencing or increasing oxygen therapy to aim **PaO_2 10-13 kPa**

*Risk of hypercapnic respiratory failure
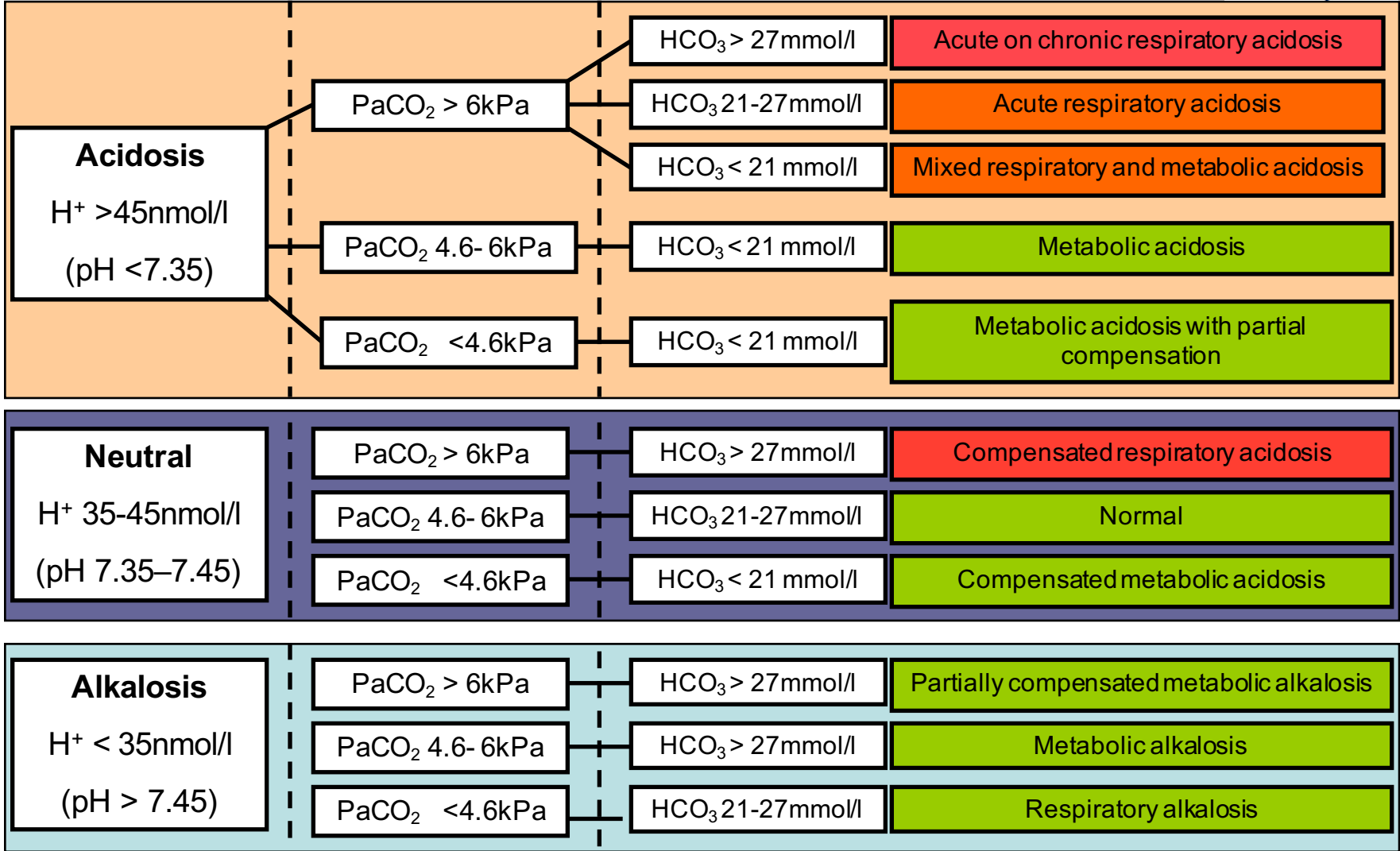**Aim:**
PaO_2 > 8 – 10kPa
until further analysis

*Risk factors for hypercapnic respiratory failure

- morbid obesity
- cystic fibrosis
- chest wall deformities
- neuromuscular disorders
- fixed airflow obstruction

Step 2 Acid-Base | Step 3 $PaCO_2$ | Step 4 Bicarbonate

Acidosis

H^+ >45nmol/l

(pH <7.35)

- $PaCO_2$ > 6kPa
  - HCO_3 > 27mmol/l → Acute on chronic respiratory acidosis
  - HCO_3 21-27mmol/l → Acute respiratory acidosis
  - HCO_3 < 21 mmol/l → Mixed respiratory and metabolic acidosis
- $PaCO_2$ 4.6- 6kPa
  - HCO_3 < 21 mmol/l → Metabolic acidosis
- $PaCO_2$ <4.6kPa
  - HCO_3 < 21 mmol/l → Metabolic acidosis with partial compensation

Neutral

H^+ 35-45nmol/l

(pH 7.35–7.45)

- $PaCO_2$ > 6kPa — HCO_3 > 27mmol/l → Compensated respiratory acidosis
- $PaCO_2$ 4.6- 6kPa — HCO_3 21-27mmol/l → Normal
- $PaCO_2$ <4.6kPa — HCO_3 < 21 mmol/l → Compensated metabolic acidosis

Alkalosis

H^+ < 35nmol/l

(pH > 7.45)

- $PaCO_2$ > 6kPa — HCO_3 > 27mmol/l → Partially compensated metabolic alkalosis
- $PaCO_2$ 4.6- 6kPa — HCO_3 > 27mmol/l → Metabolic alkalosis
- $PaCO_2$ <4.6kPa — HCO_3 21-27mmol/l → Respiratory alkalosis

Aim saturations 88-92% and PaO_2 8-10kPa

Repeat ABG at 1hr

Risk factors for chronic hypercapnic respiratory failure* aim 88-92% PaO_2 8-10

No risk factors: SpO_2 94-98% PaO_2 >10kPa

Repeat ABG at 1hr

Aim saturations 94-98% and PaO_2 > 10kPa

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