

Approach to Arterial Blood Gases (ABGs)

1. Adequate oxygenation?

Normal ABG on Room Air = 7.40 / 40 / 90 / 24

Normal pCO_2 should be $\text{pCO}_2 \approx 4-5$ (pCO_2 in room air = 30)

$\text{pCO}_2 < 5$, then expected

Possible hypoxemia

2. Define the acid-base disturbance

$\text{pH} < 7.40 =$ Acidosis

$\text{pH} > 7.40 =$ Alkalosis

See slide on
Hypoxemia, Pathogenesis and Clinical Findings

3. Identify the primary (Δ^+) process

4. Compensation mechanisms in lungs and kidneys attempt to keep/retain CO_2 or HCO_3^- to maintain normal pH. Determination of compensation is appropriate (appropriate normal ratio of change in pCO_2 : HCO_3^- is shown in green boxes). If inappropriate, there is a secondary (Δ^-) process accounting

$\Delta^+ \text{ HCO}_3^-$

$\Delta^+ \text{ HCO}_3^-$

$\Delta^- \text{ HCO}_3^-$

5. Calculate anion gap (AG) to determine the presence and type of metabolic acidosis. This is done regardless of the Δ^+ or Δ^- process, as there may also be a hidden metabolic acidosis

Calculate $\text{AG} = \text{Na}^+ - \text{Cl}^- - \text{HCO}_3^-$ (normal is ≈ 12)

Classically, the compensating anion is Cl^- , maintaining a normal AG

If a non-bicarbonate anion is present, $\Delta^- \text{ HCO}_3^-$ is compensated by Δ^+ other serum anions to maintain neutral charge

Where the cause is addition of an abnormal acid, HCO_3^- is used up as a buffer, and the compensating anion is the abnormal acid's conjugate base - which is not measured in the AG calculation

$\Delta^- \text{ HCO}_3^-$ is compensated by unmeasured anions ($\Delta^- \text{ the AG} - \text{f}$)

6. HAGMA: refer to normal blood buffer system, acid gain should match bicarbonate loss. If not, identify if another process is causing an inappropriate loss or gain of HCO_3^- .
 $\text{Gain of acid (AG)} = \text{AG} - 12$
 $\text{Loss of } \text{HCO}_3^- (\text{AHCO}_3^-) = 24 - \text{HCO}_3^-$

$\text{AG} = 12$

$\text{High Anion Gap Metabolic Acidosis (HAGMA)}$

$\text{Calculate } \text{AG} = \text{AG} - 12$

$\text{Calculate } \text{AHCO}_3^- = 24 - \text{HCO}_3^-$

7. Calculate Cation Gap (Net阳离子) or Urine net charge (Net陽離子) to narrow the etiology

$\text{AHCO}_3^- = \text{SAG}$

$\text{AHCO}_3^- = \text{SAG}$

$\text{Loss of } \text{HCO}_3^- > \text{Gain of acid}$

$\text{Loss of } \text{HCO}_3^- > \text{Gain of acid}$

Additional process causing further loss of HCO_3^-

$\text{Only acid gain from HAGMA-causing } \text{HCO}_3^- \text{ loss}$

$\text{HAGMA} + \text{HAGMA}$

HAGMA only

Toxic alcohol ingestion (Δ^- serum bicarbonate and H^+ from metabolites produced, so cation gap helps identify etiology)

$\text{Calculate cation gap to determine cause of HAGMA, } = (\text{measured serum cation} - (\text{expected serum cation} + (\text{measured serum cation} - 12) \times \text{urine} + \text{serum glucose}))$

$\text{Cation gap} > 10$ (extra cations present)

$\text{Cation gap} < 10$ (decreased)

Basic alcohol poisoning

Test for other causes

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* 16th or later of publication

See slide on Normal Anion Gap Metabolic Acidosis: Pathogenesis and Laboratory Findings

See slide on High Anion Gap Metabolic Acidosis: Pathogenesis and Laboratory Findings

Abmg Study Guide

Sebastian Brünink

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A Guide to Genetic Counseling Diane L. Baker,Jane L. Schuette,Wendy R. Uhlmann,1998-11-05 Over the past decade science has made historic progress in identifying the genetic origins of human development and functioning From Down syndrome to sickle cell anemia hereditary cancers to neurologic conditions genetic tests now exist for dozens of human conditions Research on the human genome continues apace and the already considerable demand for genetic counseling services can only intensify as new genetic tests become available The first book devoted exclusively to the principles and practice of genetic counseling A Guide to Genetic Counseling prepares genetic counselors and health care providers to meet that demand Reflecting the experiences and expertise of more than a dozen genetic counseling medical and legal professionals this book defines the theory goals and core competencies associated with the practice of genetic counseling Combining clear step by step guidelines with many fascinating and instructive case studies it tutors readers in the gamut of skills procedures and ethical legal and psychosocial considerations integral to the genetic counseling process including Obtaining family histories and interviewing clients Performing medical genetic evaluations Patient education and psychosocial counseling Developing multicultural skills Case preparation and management Medical documentation Ethical and legal conduct Making the most of computer based resources Professional development A Guide to Genetic Counseling belongs on the syllabi of all medical and human genetics and genetics counseling certification programs It is an indispensable working resource for professional genetic counselors and all health care providers charged with educating patients in genetic diseases **Reproductive Genetic Testing, Impact Upon Women** Elizabeth Jean Thomson,Karen H. Rothenberg,1993 Guide to North American Graduate and Postgraduate Training Programs in Human Genetics ,1996

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