Lecture summaries

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Semi-quantitative acid-base analysis (Resident stream)
Acid-base analysis can be a vital tool in the diagnosis and monitoring of ECC patients. Interpretation of acid-base disorders can be complex, with various techniques available; whilst these have certain commonalities (such as interpretation of Respiratory disorders), interrogation of the Metabolic component is less straightforward. This lecture will focus on this aspect, briefly revising the 'traditional' (or Henderson-Hasselbalch) approach, before covering the insights provided by the simplified Stewart method; the semi-quantitative technique will then be introduced and explored in depth through case examples, to illustrate how this approach can provide a high level of insight into the complicated mechanisms affecting acid-base balance in our most critical patients.

Learning goals

1. To revise the traditional approach to acid-base analysis, recognising its deficiencies in assessing the metabolic component;
2. Understand the principles behind the Stewart approach, and apply them to interpretation of acid-base disorders
3. Understand the influence of anionic and cationic charge on hydrogen ion flux in the extracellular milieu
4. Be aware of the quantitative effect of certain ions on Metabolic acid-base disorders
5. Apply all 3 techniques to clinical case examples, using a holistic approach to gain maximal insight into acid-base analysis

Fluid Therapy Masterclass
With Dr. David Beeston
In this interactive masterclass, attendees will learn a systematic, evidence-based approach to fluid therapy. From fundamental physiology to the management of complex disease states, this dry-lab is designed to update your knowledge and provide practical skills in patient assessment and fluid plan development.

In the first part of this lab, introductory lectures will review:

- Fluid physiology:
    - Covering the latest understanding of fluid compartment dynamics, including the revised Starling principle and the role of the endothelial glycocalyx.
- Assessment of volume status:
    - A review of the limitations of physical examination for assessment of hydration and volume status, the role of Point-of-Care Ultrasound (POCUS) for assessing volume responsiveness and tolerance, and an overview of different fluid types and vascular access options.

- Complications of fluid therapy:
    - Practical monitoring for, and management of, complications such as hypervolaemia and fluid overload.

In the second part of the lab, attendees will work through focused, case-based discussions in small groups, applying the foundational knowledge to develop practical treatment plans. Key disease topics covered will include:

- Fluid management in Septic Shock.
- Managing fluids in Acute Kidney Injury (AKI).
- Specific considerations for patients with Cardiac Disease.
- Approach to complex electrolyte and volume disorders (e.g., severe dysnatraemias, hypoalbuminaemia).

Attendees will gain immediate feedback from the instructors, leaving with the confidence to implement the most current strategies in their daily practice.

Learning goals

1. Critically evaluate and describe the current understanding of fluid physiology, including the revised Starling model and the physiological role of the endothelial glycocalyx.
2. Discuss the indications, pros, and cons for various vascular access techniques, including central and peripheral lines.
3. Differentiate between and select appropriate fluid types (balanced vs. unbalanced crystalloids, and natural colloids) based on patient needs.
4. Identify the limitations of physical examination in assessing hydration and volume status.
5. Apply Point-of-Care Ultrasound (POCUS) techniques to assess for fluid responsiveness and fluid tolerance.
6. Develop comprehensive monitoring and treatment plans to recognize and mitigate the practical complications of fluid therapy, such as hypervolaemia and fluid overload.
7. Formulate evidence-based fluid management plans for patients presenting with septic shock, cardiac disease, acute kidney injury and severe electrolyte disorders.

Blood gases, acid-base analysis & electrolytes

In this interactive masterclass, attendees will learn about the use of blood gases to help determine disorders in oxygenation and ventilation, the 'traditional' (or Henderson-Hasselbalch) method of acid-base analysis, and the role of significant electrolyte abnormalities in our most critical patients. These parameters, measured via a small blood sample processed by a point-of-care 'blood gas analyser' yield information vital to survival and difficult to obtain otherwise in a clinical setting. This dry-lab will discuss the fundamental physiology of these parameters, how they relate to complex disease states, and, by the use of case examples, how this knowledge can be applied clinically to further your diagnosis and develop more effective treatment plans.

Lectures will review:

- Blood gases and what they tell us about oxygenation and ventilation:
    - Including how to determine the need for oxygen supplementation and ventilatory support, as well as how to identify alterations in disease severity in respiratory patients

- Acid-base analysis and its application to clinical scenarios:
    - This will involve a discussion of the 'traditional' method of acid-base interpretation, what the parameters actually mean, and the sharing of a straightforward process for interrogating these results.
    - Attendees will then work through various examples from clinical cases, identifying the underlying pathologies and creating treatment plans
- Electrolytes – the common problems and the important ones:
    - A brief, practical overview of the most significant electrolyte abnormalities we might encounter in the ER or the ICU, including practical monitoring tips and therapeutic guidelines.

In the final part of the lab, attendees will work through several focused, case-based discussions, applying the foundational knowledge they have gained to develop practical and effective treatment plans, applicable to their practice once they return.

<u>Learning goals</u>

1. Understand how PaO_2 and $PaCO_2$ (respectively) reflect pulmonary oxygenation and ventilation
2. Be aware of the different techniques for calculating the efficiency and effectiveness of gas exchange
3. Understand the components of an acid-base analyser results and what they mean
4. Describe the 4 types of acid-base disorder according to the traditional model
5. Be able to perform acid-base analysis accurately and consistently using the traditional method
6. Be aware of the most significant electrolyte abnormalities in critical patients and their effects