Acid-Base Balance

Assumption
The student understands the basic physiology of acid-base regulation.

Goal
The student will be able to differentiate between the types of acid-base imbalances and how to apply this knowledge to clinical scenarios.

Objectives
By the end of the core surgical clerkship, the student will be able to:
1. List the values of pH, PaCO₂, PaO₂, and HCO₃⁻ in a normal blood gas.
2. List the factors that affect oxygen delivery and consumption.
3. Indicate the mechanisms, methods of compensation, differential diagnosis, and treatment of the following acute acid-base disorders:
   a. Metabolic acidosis
   b. Respiratory acidosis
   c. Metabolic alkalosis
   d. Respiratory alkalosis

Problems
1. A 60-year-old 70 kg. male has a long-standing history of peptic ulcer disease. Two weeks ago, he began to vomit several times a day. The emesis often contained undigested food and was free of bile. The plain abdominal x-ray demonstrated a very distended stomach.
   a. What type of acid-base disorder would you expect to find in this patient?
   b. What electrolyte abnormalities would you expect to see in this patient?
   c. Describe features of the physical examination that would fit in with the acid-base and electrolyte abnormalities.
   d. Write orders for this patient to correct the abnormalities.

2. A 74-year-old male is intubated and in the SICU with intra-abdominal sepsis from perforated diverticulitis. His ABG is as follows: pH 7.21 PaCO₂ 50, PaO₂ 150mmHg, HCO₃⁻ 18.
   a. Describe the acid-base imbalance.
   b. Propose treatment for the imbalance.

Skills
1. Conduct a focused physical examination looking for signs of dehydration, overload, electrolyte abnormality, acid-base abnormality.
2. Demonstrate the ability to:
   a. Draw venous blood from an antecubital vein.
   b. Interpret arterial blood gas results.

Teaching Hints
1. Have one student present a clinical problem where fluid and electrolyte abnormalities can be anticipated. Have half of the group describe the possible abnormalities while the other half describes the means of correction.
Acid-Base Balance (continued)

Teaching Hints (continued)
2. Introduce complicating features such as:
a. Fever, atelectasis, vomiting, and diarrhea, and have students describe how fluid and electrolyte requirements would change.
b. Have them describe the effects that these complications may have on acid-base balance.

Prevention
Discuss the causes of iatrogenic acid-base disorders.

Special Considerations
Discuss acid-base disorders as they are related to:
1. Toxic ingestions or drug overdose.
2. Electrolyte imbalance with pyloric stenosis in pediatric patients.