**Case Discussions:**

1. Fluid Management

A 50-year-old, 70kg, man presents for exploratory laparotomy and lysis of adhesions necessary due to small bowel obstruction. He has been vomiting for 5 days and has a low-grade fever. BP 110/80, P 110, R 16, T 38.5, HCT 48%

How much water is in the human body?
What fraction is intracellular? What fraction is extracellular?
How much blood (intravascular volume) is in the human body?
Is blood volume affected by age?
What determines how fluid distributes between the intravascular space and the extracellular space (capillary membrane)?
What determines how fluid distributes between the extracellular space and the intracellular space (cell membrane)?

What is maintenance fluid?
How do you calculate the maintenance fluid rate?
What is the appropriate composition of maintenance fluid?

What historical findings help you assess his volume status?
What physical findings help you assess his volume status?
Is there a difference between intravascular volume depletion (hypovolemia) and total body water depletion (dehydration)?
What are the limitations of using pulse, blood pressure and urine output as an assessment of volume status?
What are orthostatic vital signs and how are they useful?
How does fever affect fluid requirements?
What fluid orders would you write to replace the deficit caused by 5 days of vomiting?

Why must you give more fluid than the maintenance requirements and replacement of deficit?
How can you estimate these additional losses?

If, during the surgery, there was an estimated blood loss of 500cc, how would you replace that?
What if the estimated blood loss was 2000cc?

Experts debate over the role of colloid (albumin, hetastarch) versus crystalloid (lactated ringers, normal saline) in fluid resuscitation. What are the main points of the debate?

2. <u>Perioperative Complications I</u>

A 70-year-old man is undergoing total hip replacement under general endotracheal anesthesia. He has a history of hypertension and diabetes mellitus. His medications include lisinopril, hydochlorthiazide and glyburide. One hour after surgical incision, there is new 2mm ST segment depression noted in lead V5.

What is your presumptive diagnosis?
What is the differential diagnosis?
What are the initial steps in your management?
Would a 12-lead electrocardiogram be helpful?
What hemodynamic aberrations can cause this?
What drug therapy would you recommend?
How do you diagnose or 'rule out' myocardial infarction?

3. <u>Perioperative Complications II</u>

A 20-year-old man is undergoing cosmetic facial surgery under general endotracheal anesthesia. He is in good general health but smokes 2 ppd of cigarettes. Shortly after the surgeon positions the head the SpO2 (oxygen saturation by pulse oximeter) decreases from 100% to 88%.

What initial supportive measures would you perform?
What is the differential diagnosis for this problem?
How would you make the diagnosis?

On auscultation the breath sounds over the left hemithorax are diminished and the peak airway pressure has increased from 20 cmH2O to 30cmH2O.

What would you do now?

Suppose, instead, that on auscultation there is moderate diffuse wheezing with rhonchi.

What would you do now?

Suppose, instead, that on auscultation there are diffuse rales.

What would you do now?

4. Local/Regional Anesthesia

A 70-year-old, 60kg woman is undergoing a left inguinal herniorraphy under local anesthesia/field block by the surgeon. The surgeon is using bupivacaine 0.5% with epinephrine 1:200,000

What concentration of bupivacaine is being used?
What concentration of epinephrine is being used?
What is the maximum dose of local anesthetic that should be used? Milligrams? Ccs?

Suppose a portion of the dose was inadvertently injected intravenously.

What signs and symptoms might develop over the next few seconds?
What would your initial management be?

It is often said that regional anesthesia (local, nerve block, spinal, epidural) is safer than general anesthesia.

What are the potential advantages of regional anesthesia over general anesthesia?
What are the potential disadvantage of regional anesthesia over

general anesthesia?
When might a general anesthetic be preferable to a regional anesthetic?

5. Perioperative Complications III

A 35 year-old, 50kg, woman is in the PACU recovering from a breast lumpectomy and axillary node dissection. She is nauseous and has vomited twice. She is scheduled to be discharged home.

What preoperative factors increase the risk of postoperative nausea and vomiting (PONV)?
What intraoperative factors increase the risk of PONV?
What pharmacologic treatment would you recommend?
What are the side effects of this treatment?
What other drugs are available to treat PONV?
What non-pharmacologic modalities are available to treat PONV?
How are plans for postoperative analgesia affected by PONV?
How would you modify your plans for postoperative analgesia?

6. <u>Postoperative Pain Management</u>

A 60-year-old, 90kg, man is in the PACU recovering from an open cholecystectomy. He has a history of hypertension, diabetes and myocardial infarction. He is in a great deal of incisional pain especially when he takes a deep breath.

How can you quantify a patient's pain?
What complications could occur if this patient's pain is poorly controlled?
What is the physiologic response to pain?

The initial pain orders are morphine 10mg IM q4h prn pain. When you visit the patient postoperatively you find that he had adequate analgesia for 1 hour, was in pain for 2 hours, and excessively sleepy for 1 hour.

Why might this be occurring?
How can you minimize these swings?

An epidural is offered to help with this patient's analgesia.

What are the advantages of epidural local anesthetic and opioid over intravenous opioids?

What are the disadvantages?

7. <u>Coexisting Disease I - Hypertension</u>

A 74-year-old man presents for left carotid endarterectomy for asymptomatic carotid stenosis. He has a history of hypertension for 20 years treated with lisinopril and metoprolol. BP one week prior to admission in the preadmission clinic was 180/100. BP this morning is 190/110, P 70.

What perioperative risks are associated with a history of hypertension?
What other organ systems should be evaluated prior to surgery?
Is this patient's blood pressure under optimum control?
What perioperative risks are associated with hypertension (poor control)?
What are the perioperative implications of his antihypertensive medications?
What other drugs are used to treat hypertension and what are their implications?

What are the risks and benefits of proceeding with the surgery with the vital signs as given?

8. <u>Coexisting Disease II - Diabetes</u>

A 52-year-old woman presents for total abdominal hysterectomy. She has a 20 year history of diabetes mellitus treated with subcutaneous NPH insulin.

How is diabetes mellitus classified?
What is the pathophysiology of diabetes?
What evaluation (history, physical, laboratory data) should be done of the diabetes?
What other organ systems should be evaluated prior to surgery?

What is the effect of surgery on glucose metabolism?

How will you manage the patient's diabetes, insulin and glucose on the day of surgery?
What are the signs and symptoms of hypoglycemia? How are they modified by general anesthesia?
What are the signs and symptoms of hyperglycemia? How are they modified by general anesthesia?
What perioperative complications could occur if insulin was omitted?

What are the advantages of 'tight' glucose control (blood glucose < 140 g/dl) versus 'loose' glucose control (blood glucose < 200 g/dl)?

9. <u>Applied Pharmacology</u>

An otherwise healthy 24 year old medical student receives thiopental 5mg/kg intravenously to induce anesthesia.

How quickly does she fall asleep? Why?

Approximately 5 minutes later, she wakes up. Why?

Could hepatic metabolism account for a duration of action of 5 minutes?

Could renal excretion account for a duration of action of 5 minutes?

What is the clearance of a drug? What is the half-life of a drug? What is the volume of distribution of a drug? How are these related?

Suppose that thiopental was totally cleared from the liver, that is, all the thiopental that enters the hepatic artery or portal vein is removed and no thiopental is found in the hepatic venous blood (not true!). What is the clearance of thiopental?

Supposed that thiopental was very hydrophilic (not true!). If it could not cross cell membranes easily what would the volume of distribution of thiopental?

Suppose the above two extremes are true. What is the half-life of thiopental?

What opioid was used intraoperatively? Why was an opioid used intraoperatively?

What opioid will be used for postoperative analgesia (and may have been started intraoperatively)?

Why would we use fentanyl during the operation but morphine after the operation?

What properties would you want in an opioid to be used intraoperatively? What properties would you want in an opioid to be used postoperatively?

Is the fact that fentanyl is more potent than morphine (100 micrograms of fentanyl equals 10000 micrograms of morphine) an important fact?

What is the efficacy of a drug? Is the fact that fentanyl is more potent than morphine mean that it is more efficacious?

Fentanyl is generally considered a ‘short-acting’ drug while morphine is generally considered a ‘long-acting’ drug. Why are the elimination half-lives of both drugs almost the same (and fentanyl is a little bit longer!)