Vanderbilt University Medical Center
Emergency General Surgery Service
Surgical Residency Rotation and Curriculum

UNIT 10SHOCK, RESUSCITATION, AND SURGICAL CRITICAL CARE

PART B: SURGICAL CRITICAL CARE

UNIT OBJECTIVES:

1. Demonstrate knowledge of the principles associated with the diagnosis and management of critically ill patients, including knowledge of simple and complex multiple organ system normalities and abnormalities.
2. Demonstrate the ability to appropriately diagnose and treat patients with interrelated system disorders in the intensive care unit.

COMPETENCY-BASED KNOWLEDGE OBJECTIVES:

Junior Level:

Complete the coursework and testing to obtain basic and advanced cardiac life support.

Section One: General Pathophysiology--Body as a Whole

1. Describe the normal physiologic response to a variety of insults such as sepsis or surgery by associating the adaptation of the following systems from their pre-stress to post-stress states:
    a. Respiratory d. Metabolic
    b. Hemodynamic e. Endocrine
    c. Renal
2. Describe prophylactic measures routinely used in critical care such as:
    a. Gastrointestinal (GI) bleeding prophylaxis, including neutralizing, inhibitory compounds, and surface agents

b. Prophylactic antibiotics (demonstrate differences between true prophylaxis, empiric and therapeutic uses)
c. Pulmonary morbidity prophylaxis (incentive spirometry)
d. Prophylaxis against venous thromboembolic events
e. Aseptic technique
f. Universal precautions
g. Skin care protocols
h. Guidewire catheter changes for work-up of fever or change in clinical status
3 Outline the principles of postoperative fever with respect to causes, empiric diagnostic modalities, and specific therapy. How useful are these principles when considering the elderly patient?
4 Describe, apply, and revise appropriate treatment interventions based upon analysis of changes in the patient's clinical and laboratory parameters:
    a. Adjustment of intravenous fluids with respect to expected stress response, including metabolic, hormonal, cardiovascular, and renal responses to replacement of fluid losses (Describe association between

high levels of stress hormones and alterations of glucose metabolism remembering: do not volume resuscitate patients with excessive amounts of glucose.)

b. Efficacy of prophylactic measures

c. Adequacy of nutritional support in a patient with multiple sites of protein losses (e.g., fistulas, drain sites, or metabolic stressors [infection, acute lung injury {ALI}, hyperthermia, respiratory failure])

d. Analysis and treatment of postoperative fever and methods of treatment

e. Events leading to and responsible for initiation of ventilatory support

f. Differentiate low cardiac output, hypotensive/hypertensive states in terms of preload, pump, or afterload

g. Analysis and treatment of acute respiratory failure from changes in the airway, pump, or lung

Section Two: Airway-Respiration

1. Describe the pathophysiology of acute lung injury (ALI, also known as ARDS) and the management of the long-term ventilator-dependent patient to include:

a. Pneumonias (aspiration or nosocomial)

b. Prevention of malnutrition or restitution of body stores

c. Systemic Inflammatory Response syndrome (SRI, formerly Multiple Organ Dysfunction syndrome MODS or MSOF)

d. Sepsis

e. Skin care problems

Section Three: Circulation

1. Summarize the effects of appropriate volume and drug therapies to manipulate the cardiovascular system in the following patients:

a. Hypovolemic hypotensive patient

b. Hypotensive euvolemic patient

c. Hypotensive hypervolemic patient

d. Hypotensive oliguric patient

e. Hypotensive, hypervolemic oliguric patient

f. Hypovolemic oliguric patient

g. Hypotensive, oliguric hypoxic patient

Section Four: Renal

1. Review acid-base and electrolyte abnormalities common in critically-ill patients.

2. Identify, define, and classify the major categories of acid-base disturbance (metabolic acidosis and/or alkalosis, respiratory acidosis and/or alkalosis) in the context of the patient's altered physiology. Cite common clinical scenarios for their appearance:

a. Metabolic acidosis (hypovolemic shock, chloride excess resuscitation, occult ischemia)
b. Metabolic alkalosis
c. Respiratory acidosis

3. Discuss the identification and correction of complex acid-base problems such as choice of intravenous fluids for electrolyte replacement in the:
a. Hypercholoremic, metabolically-acidotic patient
b. Hypocholeremic, metabolically-alkalotic patient
c. Stuporous, dehydrated, hypoernatremic patient
d. Patient with central diabetes insipidus
e. Hyponatremic, volume overloaded patient with carbon dioxide retention

1. Discuss specific fluid compositions and the effect of the losses of such fluids as gastric, pancreatic, biliary, and succus entericus from intestinal fistulas of various levels. (Fluid should be described in terms of volume, electrolyte composition, and replacement fluid of choice.)

Senior Level:

Section Seven: General Pathophysiology--Body as a Whole

1. Distinguish between the major characteristics of septic shock and hypovolemic shock:
a. Summarize initial evaluation and presentation
b. Analyze therapeutic options
c. Revise therapeutic options based on clinical parameters obtained from monitoring devices

2 Discuss the evaluation and treatment of the following bleeding disorders:
a. Disseminated intravascular coagulopathy (DIC), defining common causes and therapy
b. Idiopathic thrombocytopenia purpura (ITP) and thrombotic thrombocytopenia purpura (TTP) as causes of thrombocytopenia (compare and contrast)
c. Heparin or Coumadin therapy misapplication
d. Advanced liver disease

Section Eight: Renal

1. Discuss the physiologic principles and define specific management aspects associated with the following complex acid-base problems:
a. Renal tubular acidosis (differentiate between Type I and II)
b. Management of high output loss states from the gastrointestinal tract in a patient with poor cardiac function
c. Management of volume excess states associated with eunatremia or hyponatremia

Section Nine: Gastrointestinal/Hepatic

1. Review and summarize the management of hepatic and renal failure, including:
    a. Utility/disutilit y of disease-specific nutritional formulations
    b. Adjustment or elimination of toxic substances (antibiotics, contrast material, narcotics)
    c. Current means for support of renal failure, high dose diuretics, continuous veno-venous hemofiltration (CVVH), continuous veno-venous hemodialysis (CVVHD), dialysis (peritoneal and hemodialysis)

Section Ten: Endocrine

1. Describe and specify therapy for the following endocrine-related problems associated with critical care:
    a. Hypothyroidism/hyperthyroidism
    b. Hyperparathyroidism/hypoparathyroidism (changes in calcium and magnesium values)
    c. Adrenal cortical excess (Cushing's disease and syndrome)
    d. Adrenal cortical deficiency states (Addison's disease)

COMPETENCY-BASED PERFORMANCE OBJECTIVES:

Junior Level:

1. Provide initial evaluation and management of the critically-ill postoperative patient.
2. Institute the following therapeutic interventions:
    a. Manage fluid orders
    b. Determine ventilator settings
    c. Order pharmacologic support drugs
    d. Determine the need for and duration of antibiotic therapy
3. Obtain ACLS certification.
4. Perform the following procedures:
    a. Orotracheal and nasotrocheal intubation, nasogastric and bladder intubation
    b. Arterial catheter insertion
    c. Central venous and pulmonary artery catheter insertion
    d. Placement of tube thoracotomy
5. Manage septic patients:
    a. Determine need for ventilation and select initial ventilator settings
    b. Compute initial and ongoing fluid requirements
    c. Establish intravenous access and maintain with appropriate sterile techniques for evaluation of fever
    d. Analyze need for operative intervention
    e. Determine need for ongoing ICU management
    f. Identify appropriate antibiotic therapy distinguishing between

prophylactic, empiric, and therapeutic uses
g. Monitor hemodynamic data

Senior Level:

1. Direct all surgical management of patients in the ICU, including taking direct responsibility for admission and discharge.
2. Manage invasive monitoring catheters, interpret the data obtained, and manipulate the hemodynamic variables toward calculated goals.
3. Manage the following situations:
    a. Multiple organ system failure; providing support for failing, failed, or normal organs
    b. Life threatening surgical infections (e.g., ascending myonecrosis or gangrene)
    c. Hypovolemic shock
    d. Renal failure
    e. Nutritional failure
    f. Liver failure
4. Manage the nutritional and metabolic components of the patient's illness.