I. Course Number: PAR 102

Course Title: Pathophysiology and Life Span Development

Department: Allied Health & Biological Sciences

Date of review/revision: Spring 2015

Date of last review/revision: Fall 2011

Applicable Programs: Emergency Medical Technician-Paramedic (PAR)

Required in: Emergency Medical Technician-Paramedic (PAR)

SUNY Gen Ed Appendix: Non Applicable

3 hrs. Lec. 0 hrs. Lab 3 Cr. Hrs.

II. Course Description

a. Description
   This is an introductory course in pathophysiology as it relates to out of hospital medicine. This course focuses on human responses to illness expressed at the physiologic, pathophysiologic, experiential and behavioral levels. Human responses are examined in terms of assessments appropriate to selected problems, rationale for paramedic and medical interventions, and therapeutic effectiveness. Topics include general principles of pathophysiology and life span development.

b. Pre-Requisites: Current NYS EMT Certification and BIO 115 with a grade of “C” or better.

III. DCC Institutional Student Learning Outcomes (ISLOs)

   2. Written Communication Outcome: Students will produce writing that is well developed and coherent with regard to subject, purpose and audience.

IV. Course Student Learning Outcomes

   Introduction

   1. The student will recognize the Correlation of Pathophysiology with disease process.
   2. The student will identify classes, functions, components of cells and the various types of tissues.
   3. The student will recall the instances that result in alterations to Cells and Tissues.
   4. The student will state the distribution of body fluids and how aging affects distribution of these fluids.
   5. The student will explain water movement.
      A. Between ICF and ECF
      B. Between plasma and interstitial fluid
      C. Edema
   6. The student will recall the interaction of water balance and the role of electrolytes.
   7. The student will discuss acid-base balance.
8. The student will recognize factors causing disease and analyze disease risks.
9. The student will differentiate between common familial disease and associated risk factors. (ISLO #2)
10. The student will discuss Shock. (ISLO#2)
    A. Definition
    B. Anatomy and physiology
    C. Essential components for normal perfusion
    D. Tissue hypoperfusion
    E. Physiologic response to shock
    F. Stages of shock
11. The student will differentiate specific types of shock.
    A. Hypovolemic
    B. Distributive
    C. Cardiogenic
    D. Obstructive/mechanical
    E. Respiratory
12. The student will explain the complications of shock.
13. The student will summarize the effects of cellular metabolism impairment.
14. The student will discuss the immune response.
15. The student will differentiate between humoral and cell-mediated immune response.
16. The student will differentiate fetal and neonatal immune function.
17. The student will discuss the differences with aging and the immune response in elderly.
18. The student will define the triggers and response of an acute inflammatory response.
19. The student will describe the cellular components of inflammation and their functions and will explain the role of MAST cells as part of this process.
20. The student will describe the Plasma protein system.
21. The student will explain the causes and characteristics of acute, chronic and local inflammation responses.
22. The student will describe the phases of wound resolution, repair and dysfunctional wound healing.
23. The student will indicate changes related to aging and self-defense mechanisms.
24. The student will discuss the elements of hypersensitivity.
25. The student will discuss immunity and inflammation deficiencies.
26. The student will define the concepts associated with stress and explain the aspects of stress responses.
27. The student will compare the physiological and psychosocial development of the following age groups: (ISLO#2)
    A. Infancy-birth to 1yr
    B. Toddler-12-36 months and preschool age-3-5 years
    C. School age-6 to 12 years
    D. Adolescence-13 to 18 years
    E. Early adulthood-20-40 years
    F. Middle adulthood-41-60 years
    G. Late adulthood-61 years and older.

V. Course Outline indicating
   a) Topics Covered

Lecture Topics:
1. Basic Cellular Review
2. Alterations in Cells and Tissues
3. The Cellular Environment
4. Genetics and Family Diseases
5. Hypoperfusion
6. Self Defense Mechanisms
7. Inflammation
8. Variances in Immunity
9. Stress and Disease
10. Life Span Development Birth to 1 Year
11. Life Span Development Preschool / School Age
12. Life Span Development Early Adult
13. Life Span Development Late Adult

Lecture Outline:

**Introduction**

I. The student will recognize the Correlation of Pathophysiology with disease process.
   A. Cell appearance in multicellular ”social” organism
   B. Cellular communication
   C. Coordination of specific bodily functions

II. The student will identify
    A. Major classes of cells
    B. Chief cellular functions
    C. Cellular components
    D. Tissue types.

III. The student will recall the instances that result in alterations to Cells and Tissues.
    A. Cellular adaptation.
    B. Cellular injury including,
       1. Hypoxic injury
       2. Chemical injury
       3. Infectious injury
       4. Immunologic and inflammatory injury
       5. Injurious genetic factors
       6. Injurious nutritional imbalances
       7. Injurious physical agents
    C. Manifestation of cellular injury
       1. Cellular manifestations
       2. Systemic manifestations
    D. Cellular death/necrosis

**The Cellular Environment**

I. The student will state the distribution of body fluids.
   A. Intracellular fluids
   B. Extracellular fluids
   C. Total body water

II. The student will recall how aging affects distribution of body fluids.
    A. Birth
    B. Infancy
    C. Childhood
    D. Adulthood
    E. Elderly

III. The student will explain the following points of water movement.
    A. Between ICF and ECF
    B. Between plasma and interstitial fluid
    C. Edema
       1. Pathophysiology
       2. Clinical manifestations
       3. Evaluation and treatment

IV. The student will recall the interaction of water balance and the role of electrolytes.
A. Water balance
B. Sodium and chloride balance
C. Alterations in sodium, chloride and water balance
D. Alterations in potassium, calcium, phosphate and magnesium

V. The student will discuss Acid-base balance.
A. Hydrogen ion and pH
B. Buffer systems
C. Acid-based imbalances

Genetics and Familial Diseases
I. The student will recognize factors causing disease.
A. Genetic
B. Environmental
C. Age and gender

II. The student will analyze disease risk.
A. Disease rates
   1. Incidence
   2. Prevalence
   3. Mortality
B. Risk factor analysis

III. The student will infer combined effects of interactions among risk factors.

IV. The student will differentiate between common familial disease and associated risk factors.
A. Immunologic
B. Cancer
C. Endocrine
D. Hematologic
E. Cardiovascular
F. Renal
G. Gastrointestinal
H. Neuromuscular
I. Psychiatric

Hypoperfusion
I. The student will discuss Shock.
A. Definition
B. Anatomy and physiology
C. Essential components for normal perfusion
   1. Functioning pump
      a. Stroke volume
         i. Starling’s law
      b. Cardiac output
      c. Blood pressure
      d. Baroreceptors
      e. Nervous control of heart
         i. Sympathetic
         ii. Parasympathetic
   2. Adequate volume
   3. Intact container/vessels
      a. Vessel capacity
      b. Sympathetic control of vessel
      c. Blood flow control by cellular tissue demands
      d. Sphincter control
D. Tissue hypoperfusion  
E. Physiologic response to shock  
   1. Cellular  
      a. Fick principle  
      b. Waste removal  
      c. Aerobic metabolism/glycolosis  
      d. Anaerobic metabolism  
   2. Cardiovascular system implications  
      a. Preload/afterload  
      b. Cardiac output  
      c. Peripheral vascular resistance/systemic vascular resistance  
      d. Blood pressure  
      e. Mean arterial pressure  
      f. Pulse pressures  
      g. Starling’s law  
      h. Chemoreceptors  
      i. Baroreceptors  
   3. Sympathetic nervous system and endocrine implications  
   4. Kidneys  
      a. Renin  
      b. Angiotensin  
      c. Aldosterone  
   5. Pituitary gland and hypothalamus  
      a. Arginine vasopressin (AVP)  
      b. Adrenocorticotrophic hormone cortisol system (ACTH)  
      c. Somatotropin  
   6. Pancreas  
   7. Spleen  
   8. Osmosis  
F. Stages of shock  
   1. Compensated  
   2. Decompensated  
   3. Irreversible  

II. The student will differentiate specific types of shock.  
A. Hypovolemic  
   1. Hemorrhage classifications  
   2. Stages of hemorrhage  
B. Distributive  
   1. Neurogenic  
   2. Anaphylactic  
   3. Septic  
   4. Psychogenic (vasovagal)  
C. Cardiogenic  
   1. Intrinsic causes  
      a. Heart muscle damage  
      b. Dysrhythmia  
      c. Myocardial insufficiency  
      d. Valvular disruption  
   2. Extrinsic  
      a. Cardiac tamponade  
      b. Tension pneumothorax
D. Obstructive/mechanical
   1. Pulmonary emboli

E. Respiratory

III. The student will explain the complications of shock.
   A. Acute renal failure
   B. Acute adult respiratory distress syndrome
   C. Hematologic failure
   D. Hepatic failure
   E. Multiple Organ Dysfunction Syndrome (MODS)
      1. Sepsis
      2. Acute Respiratory Distress Syndrome (ARDS)
   F. Disseminated Intravascular Coagulation (DIC)

IV. The student will summarize the effects of cellular metabolism impairment.
   1. Oxygen impairment
   2. Impaired glucose use

Self-Defense Mechanisms

I. The student will explain “lines of defense”.
   A. Anatomic barriers
   B. Inflammatory response
   C. Immune response

II. The student will differentiate between the various characteristics of the immune response.
   A. Natural versus acquired
   B. Primary versus secondary
   C. Humoral versus cell-mediated

III. The student will discuss the immune response.
   A. Antigens and Immunogen
   B. Histocompatibility antigens (HLA antigens)
   C. Blood group antigens

IV. The student will discuss the Humoral immune response.
   A. B-cell lymphocytes
   B. Immunoglobulins
   C. Secretory immune system

V. The student will outline the cell-mediated immune response.
   A. T-cells
   B. Major effects of cell-mediated immune response

VI. The student will recognize cellular interactions in the immune response.
   A. Cytokines
   B. Antigen processing, presentation and recognition
   C. T-cell and B-cell differentiation

VII. The student will differentiate fetal and neonatal immune function.
   A. Fetal immunological capabilities
   B. Antibody levels
   C. Trophoblasts

VIII. The student will discuss the differences with aging and the immune response in elderly.
Inflammation

I. The student will define the triggers and response of an acute inflammatory response.

II. The student will explain MAST cells.
   A. Degranulation of vasoactive amines and chemotactic factors
   B. Synthesis of leukotrienes and prostaglandins

III. The student will describe the Plasma protein system.
   A. Complement system
   B. Clotting system
   C. Kinin system
   D. Control and interaction of the plasma protein system

IV. The student will describe the cellular components of inflammation and their functions.

V. The student will define the structure, production and actions of the following cellular products.
   A. Interleukins
   B. Lymphokines
   C. Interferon

VI. The student will describe the systemic responses of acute inflammation.

VII. The student will explain the causes and characteristics of a chronic inflammation response.

VIII. The student will explain the vascular changes and products of a local inflammation response.

IX. The student will describe the phases of wound resolution, repair and dysfunctional wound healing.

X. The student will indicate changes related to aging and self-defense mechanisms.

Variances in Immunity and Inflammation

I. The student will discuss the elements of hypersensitivity.
   A. Definitions
   B. Mechanisms of hypersensitivity
      1. Immediate versus delayed reactions
      2. IgE reactions
      3. Tissue-specific reactions
      4. Immune-complex mediated injury
      5. Cell-mediated tissue destruction
   C. Targets of hypersensitivity
      1. Allergy
      2. Autoimmunity
      3. Isoimmunity
   D. Autoimmune and isoimmune diseases

II. The student will discuss immunity and inflammation deficiencies.
   A. Congenital immune deficiencies
   B. Acquired deficiencies
   C. Replacement therapies for immune deficiencies

Stress and Disease

I. The student will define the concepts associated with stress.
   A. Triad of manifestation
   B. General adaptation syndrome (Selye)
   C. Psychologic mediators and specificity
II. The student will explain the aspects of stress responses.
   A. Psychoneuroimmunologic response
   B. Neuroendocrine regulation
      1. Catecholamines
      2. Cortisol
      3. Other hormones
      4. Role of immune system

III. The student will define stress, coping and illness interrelationships.
   A. Stress as interdependent process
   B. Potential stress effects
      1. Healthy individuals
      2. Symptomatic individuals
      3. Medical interventions

Life Span Development
I. The student will compare the physiological and psychosocial development for the following age groups:
   A. Infancy - birth to 1yr
   B. Toddler-12-36 months and preschool age-3-5 years
   C. School age-6 to 12 years
   D. Adolescence-13 to 18 years
   E. Early adulthood-20-40 years
   F. Middle adulthood-41-60 years
   G. Late adulthood-61 years and older.

b) Instructional Methods
   Lectures may include the use of video, computer aided multimedia, and demonstration to achieve the didactic knowledge level desired.

c) Course Requirements
   The course consists of three hours per week of lecture. Attendance at all class periods is required and conforms with college policy.

d) Grading Practices
   Grades will be in accordance with college policy. Criteria used to determine the final course grade will include:

   1. Attendance/Participation/Affective 20%
   2. Homework 20%
   3. Quizzes 20%
   4. Midterm / Final Exams 20%
   5. Term Paper (ISLO#2) 20%
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<td><strong>100 - 95</strong></td>
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<td><strong>Interaction</strong></td>
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e) Required text (s)
Textbook and Workbook

f) Supplementary readings


g) Supplies and Required Technology
Jones & Bartlett, NAVIGATE electronic platform.

VII. Additional Items of Importance
None
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