

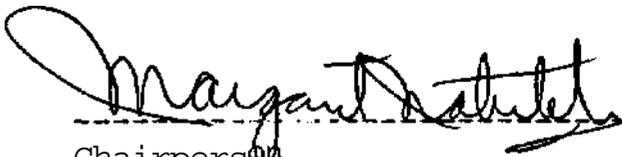
SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: CELLULAR_HOMEOSTASIS
Code No.: NUR_401 _____
Program: - ~~B.Sc. in CRITICAL-CARE~~ CARS NURSING PROGRAM
Date: MAY 1, 1987 _____
Author: .SJ^EIQI^H^QOeiaN

New: X Revision

APPROVED:


Chairperson

|th-'|'-^^^_
E te Q

CELLULAR HOMEOSTASIS
Course Name

NUR 401
Course Number

COURSE DESCRIPTION:

This unit serves as the foundation for all theoretical and clinical components. Discussion is directed at areas of normal fluid and electrolyte concentrations and their role as well as normal acid-base balance. It expands from normal to abnormal in terms of edema formation, dehydration, electrolyte imbalance, and acid-base disturbances.

Methods of nursing intervention and management are related to the pathological conditions.

A practice session of hypothetical situations on assessment of fluid and electrolyte balance and interpretation of acid-base disturbances is provided. Intravenous equipment and therapy as well as central venous pressure line maintenance and measurement is incorporated.

•
TERMINAL COURSE OBJECTIVES:

Utilizing the Nursing Process in the management of the critically ill patient, the critical care nurse will:

- a) systematically assess the functions of all body systems;
- b) incorporate knowledge of the inter-relatedness of all body systems?
- c) recognize the clinical presentation and related diagnostic findings of various pathological conditions;
- d) provide the essential elements of nursing care that will meet the needs of patients with multiple problems;
- e) anticipate potential complications of patients with multi-system problems;
- f) adapt nursing care according to phases of growth and development;
- g) adjust nursing care in accordance to the psychological manifestations of the patient;
- t h) justify the nursing diagnosis, plan treatment modalities and interventions required;
- i) administer and evaluate patients* response to nutritional, fluid and electrolyte therapy;

CELLULAR HOMEOSTASIS
Course~Naine

NUR 401
Course"Number

- j) appropriately administer and evaluate patient response to pharmacological agents;
- k) assist in the maintenance of optimal airway patency and circulation integrity;
- l) ensure the operation and effectiveness of machines and specialized equipment;
- ra) provide the appropriate care for patients on continuous ventilatory or circulatory support systems;
- n) perform essential nursing care related to the patient with invasive monitoring;
- o) report accurately and record assessment data, changes in patient status and responses to therapy in accordance with policies of the employing agency;
- p) communicate effectively with patients, families, and members of the health care team;
- q) participate in the design and implementation of patient and family education;
- r) evaluate the impact of the critical care environment on patients, family members and staff;
- s) collaborate with patient, family and other members of the health care team in planning care from admission through to rehabilitation;
- t) assume the responsibility for creating an environment of safe practice;
- u) comply with legislation and regulations governing nursing practice;

It is the responsibility of each nurse to maintain nursing competencies by continuously assessing his/her skills and knowledge by participating in formal and informal learning activities, when appropriate*

Course Content**Course Objectives****A) The Cell**

- 1) The Cell Membrane
- 2) Cellular Properties and Functions
- 3) Na-K (sodium-potassium)
- 4) Action Potential
- 5) Energy Metabolism
 - aerobic
 - anaerobic
 - protein and fat

describe the normal structure and function of the cell membrane

discuss the Na-K pump mechanism in relationship to action potential

outline each of the methods of energy metabolism

B) Body Fluids

- * 1) IC and EC compartments
- * 2) IC and EC electrolytes

identify the major fluid compartments and the electrolyte concentrations found in each

C) Transport Mechanisms

- 1) Osmosis
- 2) Diffusion - simple
- facilitated
- 3) Active Transport

explain each of the transport objectives

D) Solutions

- 1) Isotonic
- 2) Hypertonic
- 3) Hypotonic
- 4) Def, Osmolality

differentiate between isotonic, hypertonic and hypotonic solutions in order to safely administer
define osmolality

E) IC-EC Fluid Shift

- 1) Swelling, Shrinking of Cells

utilizing the knowledge of solutions, explain the fluid shifts that occur to result in the swelling or shrinking of cells

* 1) intracellular and extracellular

* 2) intracellular and extracellular

t

CELLULAR HOMEOSTASIS

NUR 401

Course Name

Course Number

Course Content

Course Objectives

F) Fluid Pressures

- 1) Capillary Hydrostatic Pressure
- 2) Plasma Oncotic Pressure
- 3) ISF Oncotic Pressure
- 4) Interstitial Fluid Pressure

explain the four fluid pressures that relate to capillary fluid shifting

G) Capillary Fluid Dynamics

- 1) Starling's Law

H) Water Balance

- 1) Intake-Output
- 2) Daily Weight
- 3) Infant and Adult

outline methods of determining fluid balance and of accurate recording

I) Regulation of Water Balance

- 1) Hormonal
 - Antidiuretic Hormone
 - Aldosterone
 - Renin Angiotensin in System
- 2) Nervous
- 3) Renal
- 4) Effect of Diuretics

discuss the renin-angiotensin system and its role in relation to ADH and aldosterone in the regulation of arterial blood pressure
explain the effect of major diuretics

J) Electrolytes

- 1) Amount, Distribution, Function and Regulation of Na⁺, K⁺, Ca⁺⁺, Mg⁺⁺, Cl⁻, HCO₃⁻, Proteins

describe the regulation of each of the major cations and anions

K) Acid-Base Balance

- 1) Definition of Terms Acidosis, Alkalosis, Hypoxemia, Hypoxia, pH, pCO₂, HCO₃⁻, BE, PO₂, O₂ sat
- 2) Sources of Acids
 - fixed volatile

define the major terminology in acid-base interpretation

CELLULAR HOMEOSTASIS

NUR 401

Course Name

Course Number

Course Content

Course Objectives

- | | |
|--|---|
| 3) Buffer Systems Carbonic Acid Buffering System - Phosphate - Proteins | describe three buffer systems employed to maintain acid-base balance |
| 4) Regulation - Lungs - Kidneys | differentiate between renal and respiratory regulation of acid-base balance |

L) Formation of Edema Due To

- | | |
|---|--|
| 1) Increased Capillary Hydrostatic Pressure | discuss the factors that influence the formation of edema |
| 2) Changes in Capillary Membrane Permeability | state the appropriate nursing interventions for the patient with edema |
| 3) Low Blood Protein | |
| 4) Lymphatic Blockage | |

M) Dehydration

- | | |
|-----------------------|--|
| 1) Causes | list the signs and symptoms of overload and dehydration and relate to the underlying pathophysiology |
| 2) Signs and Symptoms | |

N) Overload

- | | |
|-----------------------|---|
| 1) Causes | develop a nursing care plan to assist in the care of the patient with dehydration |
| 2) Signs and Symptoms | |

O) C.V.P. Lines and Measurement (Central Venous Pressure)

discuss the use of C.V.P. measurements to determine an indication of venous return to the right heart

P) Electrolyte Imbalances

- | | |
|--|---|
| 1) Hypernatremia - Hemo-concentration - Na+ Excess | describe each of the electrolyte imbalances with reference to etiology, pathophysiology |
| 2) Hyponatremia - Hemodilution - Na+ Deficit | diagnostic studies, clinical presentation and management |
| 3) Hyperkalemia, Hypokalemia | formulate a plan for nursing intervention to assist in the maintenance |

f

CELLULAR HOMEOSTASIS

Course Name "

NUR 401

Course Number

TEXTBOOKS;

- 1) Burke, Shirley, The Composition and Function of Body Fluids The C.V. Mosby Co., Toronto, 1980.
- 2) Weldy, Norma Jean, Body Fluids and Electrolytes* The C.V. Mosby Co., Toronto, 1984.

CLASS SCHEDULE:

Week #1

Reading Assignments

The Cell
Body Fluids
Transport Mechanisms
Solutions
IC-EC Fluid Shift

Part 1 (Weldy)
Chapters 1, 3, 4, 10, pp 173-179
(Burke)

Week #2

Fluid Pressures
Capillary Fluid Dynamics
Water Balance
Regulation of Water Balance

Part 1 (Weldy)
Chapters 1, 3, 6 (Burke)

Week #3

Test #1 (1 1/2 hours)
Electrolytes

Test #1 (Content A-I)
Part 1 (Weldy)
Chapter 5 (Burke)

Week #4

Electrolytes
Electrolyte Imbalances

Part 1, 4 (Weldy)
Chapter 5 (Burke)

Week #5

Acid-Base Balance
Acid-Base Imbalances

Part 2 (Weldy)
Chapters 8, 9 (Burke)
Article: "Interpreting ABG's"
(On Reserve in Library)

CELLULAR HOMEOSTASIS

NUR 401

Course Name

Course Number

Week «6

Reading Assignments

Formation of Edema
Dehydration
Overload
C.V.P.

Part 3 (Weldy)
Chapters 2, 3, 10 (Burke)

Week 17

Test #2

Test #2 (Content J-0)

REFERENCE LIST;

Burke, Shirley, The Composition and Function of Body Fluids The
C.V. Mosby Co., Toronto, 1980,

Goldberger, Emanuel, A Primer of Water, Electrolyte and Acid-Base
Syndromes. Lea and Febiger Co., New York, 1980.

Guyton, Arthur, Human Physiology and Mechanisms of Disease, 3rd Ed.,
W.B. Saunders Co., Philadelphia, 1982.

Hamilton, Helen, Monitoring Fluid and Electrolytes Precisely. Intermed
Communications, Inc., Pennsylvania, 1979•

Hudak, C-, Lohr, T., and Gallo, B., Critical Care Nursing.
J.B. Lippincott Co., Philadelphia, 1982.

Kee, Joyce, Fluids and Electrolytes with Clinical Applications. John
Wiley & Sons, Inc., New York, 1978.

Kenner, C, Guzzetta, C, and Dossey, B. , Critical Care Nursing Body,
Mind, Spirit. Little, Brown and Co., Boston, 1985.

Keyes, Jack, Fluid Electrolyte and Acid-Base Regulation. Wadsworth
Health Sciences Division, Inc., California, 1985.

Meyer, Nancy, Nursing the Critically ill Adult, Applying Nursing
Diagnosis. Addison-Wesley Publishing Co., California, 1984.

Reed, G., and Sheppard, V. , The Regulation of Fluid and Electrolyte
Balance. W.B. Saunders Co., Philadelphia, 1977.

Stolar, Vera, Human Acid-Base Chemistry. The American Journal of
Nursing Co., New York, 1973.

CELLULAR HOMEOSTASIS

Course Name

NUR 401

Course Number

Urrows, Susan, The Nursing Clinics of North America. W.B. Saunders Co., Philadelphia, 1980.

Weldy, Norma Jean, Body Fluids and Electrolytes. The C.V. Mosby Co., Toronto, 1984.