RSPC A280: ADVANCED MONITORING, PROCEDURES AND THERAPIES IN CRITICAL CARE

Item	Value
Curriculum Committee Approval Date	09/11/2019
Top Code	121000 - Respiratory Care/Therapy
Units	2 Total Units
Hours	36 Total Hours (Lecture Hours 36)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)

Course Description

Theory, use, and application of medical techniques used to monitor cardiopulmonary status. Advanced procedures and therapies used in the diagnosis and treatment of the critically ill cardiopulmonary patient. Includes capnography, transcutaneous assessment and hemodynamic monitoring. PREREQUISITE: RSPC A270. COREQUISITE: RSPC A286. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Describe and apply advanced monitoring techniques, therapies, and procedures to the critical cardiopulmonary patient including capnography, transcutaneous assessment, and hemodynamic monitoring.

Course Objectives

- 1. Describe factors that cause changes in SVO2 and cite examples.
- 2. Identify normal and abnormal percentage of SvO2 and when anaerobic metabolism begins.
- 3. Given clinical situations, interpret data obtained from SvO2 monitoring and suggest appropriate changes.
- 4. Describe the operation and measurements of transcutaneous monitors.
- 5. Explain the purpose for heating skin, the physiologic/anatomic changes that occur and the resulting effect on transcutaneous measurements.
- 6. Describe the relationship between arterial and transcutaneous values for oxygen and carbon dioxide, and correlate to the cardiac index.
- 7. Define cardiac index.
- 8. Describe the set up and application of the transcutaneous sensor.
- 9. Identify the difference between real time and trending transcutaneous monitoring strips.
- 10. Given clinical situations and monitoring strips, interpret data obtained from transcutaneous monitoring.
- 11. Define deadspace, types of deadspace and cite examples for increased and decreased deadspace.
- 12. Describe the correlation of arterial to end tidal carbon dioxide values.
- 13. Identify the different areas of the normal capnogram waveform and determine end-tidal carbon dioxide levels.
- 14. Describe and identify end tidal carbon dioxide data in normal physiology, as well as in conditions of shunt and deadspace.
- 15. Recognize, interpret, and state causes for abnormal capnographic waveforms in both real time and trending modes.
- 16. Describe cardiac anatomy and functional physiology including cardiac output, preload, afterload and contractility.
- 17. Describe catheters and equipment used in hemodynamic monitoring.
- 18. Identify sites and hazards of arterial or venous catheter insertion,recognize location of catheter and pressure being monitored by waveform analysis.
- 19. State normal values for hemodynamic pressures and determine systolic, diastolic and mean pressures from arterial, central venous, pulmonary artery and pulmonary capillary wedge waveforms.
- 20. Interpret waveforms and pressures in relation to patient condition to recognize and troubleshoot artifact, or identify the presence of pathology and suggest appropriate intervention.
- 21. Describe cardiac output studies and their significance.
- 22. Describe the placement, composition, synchronization, physiologic benefit, indications, contraindications, hazards, and weaning of the intra-aortic balloon pump.
- 23. Identify and describe advanced therapies and procedures used in the diagnosis and treatment of the critically ill cardiopulmonary patient including; ECMO, HBO, EBUS, navigational bronchoscopy, esophageal pressure monitoring, inhaled NO and thoracic ultrasound.

Lecture Content

A. SvO2 1. Definition 2. Measurement a. Normal levels b. Lactic acidosis 3. Factors that cause changes a. Increase b. Decrease i. Physiologic examples of each 4. Clinical application B. Transcutaneous monitoring systems 1. Barriers to transcutaneous measurements a. Anatomical alterations to skin barriers b. Physiological alterations to skin barriers 2. Equipment a. Equipment design and set up b. Calibration c. Proper operation d. Troubleshooting 3. Interpretation of measured values a. Real time versus Trending reports b. Causes for variations in measured values c. Identifying erroneous measurements 4. Correlation a. Relationship between transcutaneous and arterial O2 and CO2 values b. Relationship between transcutaneous values and cardiac index i. Definition ii. Adults iii. Neonates 5. Effect of PEEP on transcutaneous and arterial O2 and CO2values. a. Clinical Appl ication C. Capnography 1. Deadspace a. Definition b. Factors that cause changes i. Increase ii. Decrease a. Physiologic examples c. Clinical application 2. Measuring Exhaled CO2 a. Terminology b. Systems i. Mainstream versus Sidestream a. Equipment set up and calibration c. Waveform i. Real time versus Trending ii. Individual parts of the normal waveform a. End Tidal CO2 d. Normal End Tidal CO2 values e. Correlation i. Relationship between end tidal and arterial CO2 values ii. Relationship in conditions of increased and decreased deadspace f. Identiy abnormal waveforms and the associated pathology D. Hemodynamics 1. The heart a. Anatomy b. Blood flow c. Pressures 2. Cardiac cycle a. Systole n bsp; b. Diastole c. ECG 3. Cardiac Output a. HR b. Stroke Volume i. Preload and afterload ii. Definitions

iii. Factors that cause changes a. Increase b. Decrease 1a.Physiologic examples of each c. Clinical application c. Contractility d. Frank Starling Law e. Relationship to sarcomere length E. Cardiac Output Studies F. Hemodynamic Monitoring 1. Types of invasive catheters a. Arterial b. Central Venous c. Swan-Ganz i. location ii. lumens iii. physiologic pressure measurement of each d. Hazards of insertion e. Waveforms and pressures i. Monitoring set up ii. Calibration iii. Normal Pressure values iv. Identify waveform s a. Arterial Blood Pressure b. Central Venous Pressure c. Right Atrial Pressure d. Right Ventricular Pressure e. Pulmonary Artery Pressure f. Pulmonary Capillary Wedge Pressure f. Identification, interpretation, and calculation of systolic, diastolic and mean pressures, where applicable, from waveforms i. Arterial ii. Central Venous iii. Pulmonary Artery iv. Pulmonary Capillary Wedge g. Abnormal hemodynamic conditions i. Increased pressures ii. Decreased pressures iii. "V" notch on waveform iv. Respiratory Artifact h. Waveform Artifact i. Causes ii. Troubleshooting 2. Non-invasive Hemodynamic Monitoring a. Echocardiography G. Vascular resistance 1. Pulmonary Vascular resistance 2. Systemic Vascular resistance 3. Calculation of resistance values 4. Interpre tation of abnormal values H. Circulatory Assist Device 1. Intra-Aortic Balloon Pump a. Insertion b. Balloon Composition 2. Synchronization a. Cardiac cycle b. Counterpulsation 3. Physiologic Benefits 4. Indications for circulatory assist 5. Contraindications for circulatory assist 6. Hazards of circulatory assist 7. Weaning of circulatory assist I. Advanced Therapies and Procedures 1. ECMO 2. HBO 3. EBUS 4. Navigational bronchoscopy 5. Esophageal Pressure Monitoring 6. Inhaled NO 7. Thoracic Ultrasound

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)

Instructional Techniques

Lecture and application of ideas Problem solving Video film Computer assisted instruction and simulations

Reading Assignments

Students will spend 2 hours per week reading from assigned textbooks.

Writing Assignments

Students will spend 2 hours per week completing written homework assignments to apply knowledge of advanced critical care monitoring techniques, therapies and procedures covered in the course. Students will spend 2 hours completing a critical care monitoring article critique following instructor guidelines and outlined rubric. Students will demonstrate critical thinking skills and apply knowledge of advanced monitoring techniques, therapies and procedures to the critical cardiopulmonary patient through satisfactory completion of in-class written exams containing multiple choice and short answer questions, identifying and labelling diagrams, waveforms, performing mathematical calculations, and identifying examples of monitoring strips.

Out-of-class Assignments

Students will spend 2 hours per week completing written homework assignments to apply knowledge of advanced critical care monitoring techniques, therapies and procedures covered in the course.

Demonstration of Critical Thinking

Written and objective examinationsWritten assignments, problem solving exercises, and case studies

Required Writing, Problem Solving, Skills Demonstration

Written assignments, problem solving exercises, and case studies Critical care monitoring article critique

Eligible Disciplines

Respiratory technologies: Any bachelor's degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Cairo, J.M.. Mosby's Respiratory Care Equipment, 10th ed. Elsevier, 2018 2. Required Hodges, R. . Real World Nursing Survival Guide: Hemodynamic Monitoring, 1 ed. Saunders, 2005 Rationale: This is an optional text for students to use to supplement their primary, required textbook. The book does an excellent job of breaking down challenging subject material into digestible, understandable chapters that end with questions and clinical application and case studies.