# 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 |
| 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

SvO2 Definition Measurement Normal levels Lactic acidosis Factors that cause changes Increase Decrease Physiologic examples of each Clinical application Transcutaneous monitoring systems Barriers to transcutaneous measurements Anatomical alterations to skin barriers Physiological alterations to skin barriers Equipment Equipment design and set up Calibration Proper operation Troubleshooting Interpretation of measured values Real time versus Trending reports Causes for variations in measured values Identifying erroneous measurements Correlation Relationship between transcutaneous and arterial O2 and CO2 values Relationship between transcutaneous values and cardiac index Definition Adults Neonates E. Effect of PEEP on transcutaneous and arterial O2 and CO2values. Clinical Application Capnography Deadspace Definition Factors that cause changes Increase Decrease Physiologic examples Clinical application Measuring Exhaled CO2 Terminology Systems Mainstream versus Sidestream Equipment set up and calibration Waveform Real time versus Trending Individual parts of the normal waveform End Tidal CO2 4. Normal End Tidal CO2 values 5. Correlation Relationship between end tidal and arterial CO2 values Relationship in conditions of increased and decreased deadspace 6.Identiy abnormal waveforms and the associated pathology IV. Hemodynamics The heart Anatomy Blood flow Pressures Cardiac cycle Systole Diastole ECG Cardiac Output HR Stroke Volume Preload and afterload Definitions Factors that cause changes Increase Decrease Physiologic examples of each Clinical

application Contractility Frank Starling Law Relationship to sarcomere length D. Cardiac Output Studies IV. Hemodynamic Monitoring Types of invasive catheters Arterial Central Venous Swan-Ganz location lumens physiologic pressure measurement of each Hazards of insertion Waveforms and pressures Monitoring set up Calibration Normal Pressure values Identify waveforms Arterial Blood Pressure Central Venous Pressure Right Atrial Pressure Right Ventricular Pressure Pulmonary Artery Pressure Pulmonary Capillary Wedge Pressure Identification, interpretation, and calculation of systolic, diastolic and mean pressures, where applicable, from waveforms Arterial Central Venous Pulmonary Artery Pulmonary Capillary Wedge Abnormal hemodynamic conditions Increased pressures Decreased pressures "V" notch on waveform Respiratory Artifact Waveform Artifact Causes Troubleshooting Non-invasive Hemodynamic Monitoring Echocardiography Vascular resistance Pulmonary Vascular resistance Systemic Vascular resistance Calculation of resistance values Interpretation of abnormal values Circulatory Assist Device Intra-Aortic Balloon Pump Insertion Balloon Composition Synchronization Cardiac cycle Counterpulsation Physiologic Benefits Indications for circulatory assist Contraindications for circulatory assist Hazards of circulatory assist Weaning of circulatory assist Advanced Therapies and Procedures ECMO HBO EBUS Navigational bronchoscopy Esophageal Pressure Monitoring Inhaled NO 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 bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

## Textbooks Resources

1. Required Cairo, J.M.. Mosbys 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.