

Introduction to Critical Care in Emergency Medicine (ICCEM) 2023 Syllabus

Welcome to the Introduction to Critical Care in Emergency Medicine Course! Below is the course syllabus and objectives that are to be completed prior to graduation. This course is meant to be an overview of Critical Care and assist your personal goals as a medical student or resident. Those who receive a certificate of completion will have the opportunity to add this to their CV, showing their interest in the field and possibly creating additional talking points while interviewing for a residency or fellowship.

Course Directors



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Course Syllabus

This course delves into the fundamentals of critical care to prepare medical students and interns for the rigors of the specialty as it pertains to emergency medicine. Subjects covered will include arterial blood gas/CBC/BMP interpretation, oxygen therapy and mechanical ventilation, drug therapy (pertaining to analgesics, sedatives and paralytics), intra-aortic balloon pump therapy and extracorporeal membrane oxygenation, pediatric and neonatal critical care, hemodynamic and intracranial pressure monitoring, cardiac pacing and implantable cardiac devices and lastly, fluid therapy and massive transfusion. An optional POCUS course is also included. This course will be run either for self-education (quizzes not required) or to gain a certification of completion (quizzes required). The timeline for this course will be:

Online: Over 2 months (February-April, 2023), with bi-monthly zoom sessions (2 hours in duration each)

and quizzes (2 bi-monthly).

In-person (practical): Over one weekend (Saturday for 5 hours) as a preconference course.

Books

There are no mandatory texts for this course. However, *Critical Care Transport*, the *Pediatric and Neonatal Critical Care Transport Course* and the *University of Florida' Critical Care Paramedic Program* were utilized heavily based on previous theoretical knowledge gained, and therefore assisted in induction of this course.

Course requirements

- 1) 100% attendance for all Zoom lectures and in-person practical sessions at AAEM23 (unless extraneous circumstances are encountered).
- 2) The minimum pass rate for quizzes is 80%, with a 100% completion rate (due the Sunday prior to the Zoom session).
- 3) Zoom cameras must be ON during the sessions.
- 4) Active engagement in discussions.

Failure to meet any of the above requirements will result in an incompleteness of the curriculum.

Course Dates

***All 2023 dates are Sunday's, and times are 8:00pm EST / 7:00pm CST (2 hours in length) ***

Course start date with introductory video – **February 1st** (no formal Sunday session)

Lectures 1 and 2 - **February 19th** (lectures and quizzes sent February 6th, reminder to finish quiz the Monday before the Sunday session)

Lectures 3 and 4 - **March 5th** (lectures and quizzes sent February 20th, reminder to finish quiz the Monday before the Sunday session)

Lectures 5 and 6 - **March 19th** (lectures and quizzes sent March 6th, reminder to finish quiz the Monday before the Sunday session)

Lectures 7 and 8 - **April 2nd** (lectures and quizzes sent March 20th, reminder to finish quiz the Monday before the Sunday session)

Lecture 9 (optional – POCUS) - **April 9th** (lecture and quiz sent April 3rd, reminder to finish quiz the Friday before the Sunday session)

Objectives

1. Analgesics, Sedatives and Paralytics

1.1 - List the three types of NSAIDS and their mechanism of action

1.2 - List the non-narcotic analgesics and their mechanism of action

- 1.3 - Rationalize Tylenols reversal medication, Mucomyst
- 1.4 - List the various narcotic analgesics, along with their mechanism of action and reversal medication
- 1.5 - Explain the purpose behind inhaled anesthetics, and the various drugs in this category
- 1.6 - List the various benzodiazepines, and their mechanism of action and reversal medication
- 1.7 - List the various barbiturates and non-barbiturates along with their own mechanism of action
- 1.8 - List the primary depolarizing paralytic, its mechanism of action and reversal medication
- 1.9 - Explain malignant hyperthermia, and the procedure to deal with its onset
- 1.10 - List the various non-depolarizing paralytics, their mechanism of action, and reversal medication
- 1.10 - List the various vasopressors, their mechanism of action and indications

2. Arterial Blood Gas (ABG's), Basic Chemistry Panel, and CBC Interpretation

- 2.1 - Explain the rationale for completing an ABG
- 2.2 - Explain the procedure for completing an ABG
- 2.3 - Determine the normal values found when reading an ABG
- 2.4 - Interpret pathological values found in an ABG
- 2.5 - Explain the rationale for completing a basic chemistry panel
- 2.6 - Explain the procedure for completing a basic chemistry panel
- 2.7 - Determine the normal values found in a basic chemistry panel
- 2.8 - Interpret pathological values found in a basic chemistry panel
- 2.9 - Explain the rationale for a complete blood count
- 2.10 - Explain the procedure involved in obtaining a complete blood count
- 2.11 - Interpret the normal values involved in a complete blood count
- 2.12 - Interpret pathological values found in a complete blood count
- 2.13 - Explain the general rules involved with pH, CO₂ and K⁺
- 2.14 - Explain the osmolar effects of glucose on sodium levels, lactate and anion gap calculations

3. Oxygen Therapy and Ventilation

- 3.1 - Discuss the anatomy behind airway interventions
- 3.2 - Discuss invasive vs. non-invasive means of ventilation
- 3.3 - Cover the 7P's of orotracheal intubation and rapid sequence intubation in
- 3.4 - Discuss the differences between cricothyroidotomy and tracheostomy
- 3.5 - Explain the purpose of using a ventilator
- 3.6 - Locate the various parameters on both a transport and in-hospital ventilator
- 3.7 - Explain each parameter on a ventilator
- 3.8 - Differentiate between the various modes of artificial ventilation
- 3.9 - Differentiate the various pathologies due to a high or low-pressure alarm
- 3.10 - Explain a plan of action for acute respiratory decompensation while on a ventilator
- 3.11 - Understand the various special circumstances during artificial ventilation

4. Intra-aortic Balloon Pumps (IABP) and Extracorporeal Membrane Oxygenation (ECMO) and Central Line Insertion

- 4.1 - Describe the goals of Intra-aortic balloon pump therapy

- 4.2 - Describe the procedure of intra-aortic balloon pump placement
- 4.3 - Describe the uses and contraindications of intra-aortic balloon pump therapy
- 4.4 - Demonstrate the ability to understand an IABP waveform
- 4.5 - Describe the different timing errors involved with IABP therapy
- 4.6 - Describe the two forms of ECMO therapy
- 4.7 - Describe the indications and contraindications for ECMO therapy
- 4.8 - Describe the indications and contraindications for central line insertion
- 4.9 - Determine the various locations and landmarks for central line insertion
- 4.10 - Define the Seldinger technique of central line insertion

5. Pediatric and Neonatal Critical Care

- 5.1 - Describe the pediatric triangle and the three factors it entails
- 5.2 - Describe adult vs. pediatric anatomical differences
- 5.3 - Describe various respiratory and cardiovascular interventions used in pediatrics
- 5.4 - Describe the general rule for pediatric care
- 5.5 - Describe common injury patterns in pediatrics
- 5.6 - Demonstrate understanding of mechanical ventilation specific to pediatrics
- 5.7 - Describe the APGAR score
- 5.8 - Compare and contrast cyanotic vs. acyanotic lesions in neonates
- 5.9 - Describe the various diseases in neonates
- 5.10 - Follow the resuscitation guideline for neonates
- 5.11 - Describe mechanical ventilation techniques for neonates

6. Hemodynamic and Intracranial Pressure Monitoring

- 6.1 - Describe the purpose and concepts behind arterial hemodynamic monitoring
- 6.2 - Describe the procedure behind arterial hemodynamic monitoring
- 6.3 - Illustrate the normal arterial line waveform
- 6.4 - Review the intracranial hemorrhages
- 6.5 - Differentiate between ischemic vs. hemorrhagic strokes
- 6.6 - Describe the purpose and procedure behind intracranial pressure monitoring
- 6.7 - Describe the ICP waveform and any pathologies that may occur with it

7. Cardiac Pacing and Implantable Cardiac Devices

- 7.1 - Describe the indications for pacing
- 7.2 - Differentiate between voltage, rate, pacing spike, and capture
- 7.3 - Differentiate between the two modes of pacing
- 7.4 - Describe reasons to consider and the procedure behind non-invasive cardiac pacing
- 7.5 - Describe reasons to consider and the procedure behind invasive cardiac pacing
- 7.6 - Describe the pulse generator
- 7.7 - Describe reasons to consider and the procedure behind temporary epicardial pacing
- 7.8 - Define NASPE and NGB codes
- 7.9 - Determine normal and abnormal atrial and ventricular pacing strips

8. Fluid Therapy and Massive Transfusion

- 8.1 - Describe the body's intrinsic mechanisms for hemostasis during trauma
- 8.2 - Describe indications for fluid therapy and massive transfusion in the emergent and critical care setting
- 8.3 - Identify the differences between normal saline (0.9% and 0.45%) and Ringer's lactate
- 8.4 - Describe indications and the complications from administering Packed Red Blood Cells (PRBC's)
- 8.5 - Describe indications for administering Fresh Frozen Plasma (FFP)
- 8.6 - Describe indications for administering Platelets
- 8.7 - Describe indications for administering Cryoprecipitate
- 8.8 - Describe the indications for administering Albumin
- 8.9 - Describe the indications for administering Tranexamic acid
- 8.10 - Briefly describe the transition of an acute infection progressing to sepsis and ultimately disseminated intravascular coagulation if untreated
- 8.11 - Describe the various transfusion reactions that can occur and the signs and symptoms that underlie them

9. POCUS Course (optional)

- 9.1 - Understand the physics of ultrasonography
- 9.2 - Understand basic ultrasound knobology
- 9.3 - Identify, describe and understand reasons to complete echocardiography in POCUS ultrasonography
- 9.4 - Identify, describe and understand reasons to complete a pulmonary evaluation via ultrasonography
- 9.5 - Identify, describe and understand reasons to complete an abdominal evaluation via ultrasonography
- 9.6 - Identify, describe and understand reasons to complete a pelvic evaluation via ultrasonography
- 9.7 - Identify, describe and understand reasons to complete a vascular evaluation via ultrasonography
- 9.8 - Identify, describe and understand reasons to complete a soft-tissue evaluation via ultrasonography
- 9.9 - Identify, describe and understand reasons to complete intravenous access via ultrasonography
- 9.10 - Identify, describe and understand reasons to complete a RUSH exam via ultrasonography
- 9.11 - Identify, describe and understand reasons to complete an e-FAST/FAST via ultrasonography
- 9.12 - Understand the advanced topics of ultrasonography, including TEE, MSK, DVT and ocular evaluations