# Wisconsin Critical Care Transport Paramedic Curriculum

Developed Cooperatively by the:

Wisconsin Department of Health Services
Division of Public Health
Emergency Medical Services Section

And the

University of Wisconsin Hospital and Clinics
Emergency Education Center
Madison, Wisconsin

UW Health
Emergency Education Center
uwhealth.org/ems

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## Introduction

As health care changes continue in the new millennium, one issue is the utilization of *Critical Care Transport* (CCT) services. CCT's are used primarily to transport critically ill and injured patients from one health care facility to another. The increased patient acuity for this level of transport dictates the need for highly qualified individuals. Increased knowledge and skills are required to handle these types of patients. This has led to the development of standardized training for the *Critical Care Transport Paramedic* (CCTP). The State of Wisconsin Emergency Medical Services Section (WEMS) in conjunction with the University of Wisconsin Hospital and Clinics (UWHC) Emergency Education Center (EEC) has developed this curriculum to meet the training needs of transport health care professionals within the State of Wisconsin. This will ultimately better service this patient population.

## Development

In 2006 a pilot course was conducted by the UWHC Emergency Education Center, utilizing parts of the 1996 version of the WEMS Critical Care Paramedic curriculum. UW physicians and nurse specialists then reviewed the curriculum and developed teaching materials for the course.

The feedback from the pilot course, along with surveys performed of Critical Care Transport Ambulance Services guided the development of the template for a new CCP curriculum in 2007. The UW Critical Care Transport Paramedic curriculum development committee was comprised of the following individuals:

Jan Beyer, RN, BSN, CCRN, EMT-B
UW Health Emergency Education Center

Marvin Birnbaum, MD, PhD
UW Health Emergency Education Center

Tom Brazelton, MD
American Family Children's Hospital, Pediatric Intensive Care Unit

Michael Hofmann, MD
University of Wisconsin Medical Foundation, Nephrology and MedFlight

M. Bruce Lindsay, MD
University of Wisconsin Medical Foundation, Emergency Medicine and MedFlight

Patricia Padjen, RN, MS, PhD
Director of UW Health Emergency Education Center

In 2008, the State of Wisconsin EMS Section (WEMS) created an adhoc committee comprised of RN's and Paramedics who are active in the field of Critical Care patient transport. The curriculum was revised by the following individuals:

Dana Sechler, NREMT-P, CCEMTP, Project Coordinator
Wisconsin Department of Health Services, Division of Public Health
Emergency Medical Services Section

Jan Beyer, RN, BSN, CCRN, EMT-B
UW Health Emergency Education Center

Jason Baumgartner, NREMT-P, CCEMTP
Divine Savior EMS

Cathy Etter, RN, NREMT-P, CCEMTP
Independent EMS Consultant

Angela Guden, RN, BSN, MBA
Spirit Medical Transportation / Ministry Health Care

Jennifer Hanson, EMT-P, CCEMTP
Baraboo District Ambulance Service

Ryan Homman, NREMT-P, PNCCT
Oshkosh Fire Department

Fred Hornby, NREMT-P, CCEMTP
Bell Ambulance

Deb Martin, RN, MSN, CCRN, CMTE, Flight Transport RN
Spirit Medical Transportation / Ministry Health Care

John Schindler, BS, NREMT-P, CCEMTP
Meda-Care Ambulance
WI EMS Association

When the curriculum revision was complete it was presented to the Wisconsin EMS Education Sub-committee, the Wisconsin EMS Advisory Committee and the Physician Advisory Committee (PAC) for review and comment. Based on the validation of the comments, the curriculum has been adopted as the official State of Wisconsin Critical Care Transport Curriculum.

## Student Prerequisites

Students wishing to participate in the Wisconsin Critical Care Paramedic program must meet the following prerequisites:

1. Be at least 21 years of age on the date of enrollment.
2. Possess a high school diploma or its equivalent (GED).
3. Have a valid course completion of a health care provider level CPR program that includes at a minimum, cardiopulmonary resuscitation, AED, and obstructed airway procedures for all age groups according to recognized national standards.
4. Possess a valid EMT-Paramedic license or certification with a recommendation of three (3) years experience as a Paramedic.
5. Possess a valid course completion card for Advanced Cardiac Life Support (ACLS).
6. Possess a valid course completion card for Pediatric Advanced Life Support (PALS).

All prerequisites must be met prior to enrollment into the State of Wisconsin Critical Care Transport course.

## Using the Wisconsin Critical Care Transport Paramedic Curriculum

The Wisconsin Critical Care Transport Paramedic curriculum is intended for use by an approved Wisconsin EMS Training Program. Individual training programs will be responsible for credentialing their instructors. Individuals instructing within this curriculum must be knowledgeable in the area being presented. It is highly recommended that individual instructors have experience and expertise in their topic area. It is also recommended that instructors have critical care experience. An instructor coordinator must be present during all instruction of the course.

### Course Director

The Course Director must be a State of Wisconsin Certified Instructor Coordinator appointed by the Training Center for maintaining required documentation in compliance with the State of Wisconsin EMS Office Rules and Regulations.

### Instructor Criteria

The Critical Care Transport Paramedic course instructor must be comfortable with the majority of the lecture components and skill stations, and can answer questions with credibility. Instructors must be knowledgeable regarding new developments in emergency medical services and critical care through reading, research, professional organizations, and continuing academic training. They must be strong in oral and written communication skills and relate well to a variety of professional disciplines.

### Lead Instructor

The Lead Instructor(s) shall meet the qualifications listed below specific to their professional licensure or certification. Curriculum vitae must be submitted and held on file by the course director.

**Physician Instructor qualifications:**

1. Emergency Medical or Critical Care Board Certified
2. Successfully completed AHA ACLS and PALS course
3. Minimum of 3 years teaching experience
4. Proof of EMS experience as documented in Curriculum Vitae

**Nurse Practitioner/Physician Assistant Instructor qualifications:**

1. Minimum of 5 years emergency or critical care clinical experience
2. Minimum of 3 years teaching experience
3. Successfully completed an EMT course
4. Certified instructor in:
    a. ACLS
    b. PALS or PEPP
    c. Trauma Course (TNCC, CATN, etc.)

**Registered Nurse Instructor qualifications:**

1. Minimum of 5 years emergency or critical care clinical experience
2. Minimum of 3 years teaching experience
3. Successfully completed an EMT course
4. Certified instructor in:
    a. ACLS
    b. PALS or PEPP
    c. Trauma Course (TNCC, CATN, etc.)

**Paramedic Instructor qualifications:**

1. Licensed or Certified Flight Paramedic (FP-C) or Critical Care Paramedic (CCP) for minimum of 2 years
2. Minimum of 5 years field experience
3. Minimum of 3 years teaching experience
4. Certified instructor in:
    a. ACLS
    b. PALS or PEPP
    c. PHTLS or BTLS

**Content Expert Instructor**

Course Content Expert is an authority in a specific field of medicine. Experts must have a letter of recommendation or curriculum vitae detailing the extent and percentage of time spent in their area of expertise and must be approved by the course director. Each content expert can teach up to 10% of the course. An Instructor Coordinator must be physically present during the presentation of the content expert.

## Endorsement as a Wisconsin CCTP

Individuals seeking an endorsement as a Wisconsin Critical Care Transport Paramedic must meet the following minimum criteria:

1. Successfully complete all components of the Wisconsin Critical Care Transport Paramedic program.
2. Successfully complete all evaluations in the Wisconsin Critical Care Transport Paramedic program.
3. Successfully complete all clinical and field components of the Wisconsin Critical Care Transport Paramedic program if required within the program.

Upon successful completion of all the training program's requirements, individuals may apply for Critical Care Transport Paramedic endorsement with the State of Wisconsin EMS Office.

Critical Care Transport Paramedic will be an endorsement attached to the individual's Wisconsin Paramedic license.

Once an individual has completed the requirements for endorsement as a Wisconsin CCTP, specific educational requirements will need to be met to maintain their endorsement. During their certification period as a Wisconsin Paramedic, each individual is required to complete at a minimum, 48 hours of continuing education for successful re-licensure. Individuals holding a valid endorsement as a Wisconsin CCTP and who wish to maintain their CCTP endorsement will need to complete at a minimum, 24 hours of continuing education based on the current CCTP curriculum—in addition to the required 48 hours of continuing education as a Wisconsin Paramedic. Failure to complete the 24 hours of continuing education based on the current CCTP curriculum will result in the loss of endorsement as a Wisconsin CCTP.

# Table of Contents

# State of Wisconsin
# Critical Care Transport Course

## Unit: Critical Care Interfacility Transport Overview

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Understand the role of the critical care interfacility transport teams in the patient care continuum.
2. Understand the importance of providing the highest quality of care in a timely and safe manner.
3. Understand how the needs and characteristics of patients influence and drive the competencies of critical care interfacility transport professionals.

**Cognitive Unit Objectives:**

1. Understand the history and future of critical care transport in the State of Wisconsin
2. Define and differentiate between the following:
    a. Pre-hospital Emergency Medical Services (EMS)
    b. Interfacility EMS transport
    c. Critical Care
    d. Critical Care Transport
3. Compare and contrast the role of critical care interfacility transport with the Emergency Medical Services pre-hospital system
4. Describe current configuration models and roles of team members in critical care interfacility transport
5. Describe how existing critical care professional organizations help shape the characteristics of the critical care transport professional
6. Differentiate between critically ill trauma and medical patient transport theories
    a. Scoop and run
    b. Stay and play/resuscitate
7. Describe safe transport techniques
8. Describe appropriate transport equipment necessary for various critical care interfacility transports
9. Describe the Wisconsin EMS Scope of Practice for Critical Care-Paramedic and pertinent rules and regulations for critical care paramedics in interfacility transports
10. Describe the components needed to provide the highest quality of care during critical care interfacility transport
11. Describe the importance of initial stabilization of the patient prior to transport
    a. EMTALA and COBRA laws
12. Describe how disaster and mass casualty events will affect critical care interfacility transport

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Appreciate the history and future of critical care transport in the State of Wisconsin
2. Justify the healthcare professional role in the critical care transport environment as a member of the patient care team.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Incorporate the team concept through various scenarios including
    a. Communication issues
    b. Conflict resolution
2. Assist in safe vehicle operations
    a. Secure equipment
    b. Ensure safety of team and patients in post-crash situation
3. Plan, implement and participate in table top exercises for a disaster event including, triage and transport of patients

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make team concept decisions

**Suggested Time for Module:**
Minimum 1 hour

# State of Wisconsin
# Critical Care Transport Course

## Unit: Ground Transport Safety and Air Medical

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient to assist with the decision-making regarding air medical transport vs. ground transport.

**Cognitive Unit Objectives:**

1. Ground Transport Safety
    a. Describe ways of creating and maintaining a safe work environment
        i. Vehicle checks
        ii. Equipment checks
        iii. Identify potential hazards during vehicle operations and ways to avoid or minimize them
            1. Physical hazards
            2. Stress hazards (thermal, humidity, noise, vibration, fatigue)
        iv. Safety equipment
        v. Ensure safety of passengers and patient during transport
        vi.
2. Identify different classes of aircraft
    a. Fixed wing vs. rotor wing
    b. Pressurized vs. non-pressurized
    c. Twin vs. single-engine aircraft
    d. Weight considerations and aircraft performance
3. Describe air medical transport safety awareness
    a. Landing zone
    b. Communications
    c. Coordination
4. Identify atmospheric composition of gases
5. Understand basic gas laws
    a. Four basic variables
        i. Temperature
        ii. Mass
        iii. Volume
        iv. Pressure
    b. Boyle's law
    c. Dalton's law
    d. Charles' law
    e. Gay-Lussac's Law
    f. Henry's law
    g. Graham's law

6. Identify flight stressors and interventions during air transport
    a. Decreased partial pressure of oxygen
        i. Hypoxia
    b. Barometric pressure
    c. Thermal regulation
    d. Humidity
    e. Noise and Vibration
    f. Fatigue
    g. Gravitation forces
    h. Dehydration
7. Define and identify the signs and symptoms of and list the treatments for the following in relationship to the air medical environment:
    a. Barotrauma
    b. Barosinusitis
    c. Barodontalgia
    d. Barotitis media
    e. Decompression sickness
8. Identify the effects, causes and emergency procedures for rapid decompression
9. Identify differences in patient care and equipment considerations during transport
10. Compare and contrast patient preparation activities for air transport vs. ground transport
11. Compare and contrast the benefits and limitations of air vs. ground transportation for critical care transport

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Understand principles behind constant reassessment as it pertains to air medical transport
2. Appreciate need for visual and tactile cues for ongoing patient assessment related to environmental factors

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Perform reassessment techniques and interventions specific to flight physiology

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions

**Suggested Time for Module:**
Minimum 2 hours

# State of Wisconsin
# Critical Care Transport Course

**Unit: Medical-Legal and Ethical Aspects of Critical Care Interfacility Transport**

**Terminal Objectives**:

1. At the completion of this unit, the student will be able to comprehend basic legal issues pertaining to critical care transports

**Cognitive Objectives:**

1. Explain the legal responsibilities of EMTs under Wisconsin Rules, Regulations and Statutes regarding:
    a. Patient, medical director, and public
    b. Set by legal system
        i. Statutes enacted by legislature
        ii. Rules and Regulations by governmental agencies
        iii. Scope of practice
        iv. National standards of practice
2. Explain Wisconsin's laws and regulations of licensed ambulance services
    a. Describe the Legislative Rules and Statutes governing ambulance services including minimum qualifications of required personnel
    b. Explain the legal definition and objective for the scope of practice for critical care paramedics
    c. Explain the role of the medical director and medical control as it pertains to critical care transport
3. Review legal and ethical responsibilities of EMTs
4. Identify potential organ donors as defined by current state statute
5. Define and describe the Emergency Medical Treatment and Active Labor Law (EMTALA) for hospital based ambulance services
6. Explain the role, requirements and obligations of:
    a. Sending facility
        i. Medical screening examination
        ii. Stabilization of patient
        iii. Communication
            1. Doctor to doctor
            2. Nurse to nurse
        iv. Documentation
        v. Physician Transfer orders
    b. Transport team and associated medical direction
        i. Protocol specific
    c. Receiving facility

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Defend the value of advanced medical directives
2. Support the roles, requirements and obligations of the transport team under Wisconsin Rules, Regulations and Statutes, including scope of practice
3. Understand the evolving legal process for development and implementation of Wisconsin Rules, Regulations and Statutes, including scope of practice
4. Justify the need for specialized personnel and equipment in critical care transport of neonatal to geriatric patients with special monitoring needs from the legal and ethical perspectives

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate ability to complete required documentation before, during and after a critical care transport

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**

1. Case study scenarios promoting participants to make legal and ethical decisions based upon Wisconsin Rules, Regulations and Statutes, including scope of practice

**Suggested Time for Module:**
Minimum 2 hour

# State of Wisconsin
# Critical Care Transport Course

**Unit: Diagnostic Studies: Laboratory Interpretation, Radiology**

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Gain a fundamental understanding of the diagnostic studies pertinent to critical care patients.
2. Integrate diagnostic findings into patient care decision-making for critical care transport.

**Cognitive Unit Objectives:**

1. Laboratory interpretation:
    a. Identify appropriate abbreviates for blood chemistry tests.
    b. State normal and abnormal values and correlate pathophysiological states for the following blood chemistry tests:
        i. Arterial blood gas
        ii. Blood chemistry/metabolic panel
        iii. Complete blood count
        iv. Cardiac enzymes
        v. Coagulation studies
        vi. Routine urinalysis
        vii. Cerebrospinal fluid analysis
2. Radiology / imaging
    a. Describe how to identify abnormalities on a chest x-ray such as:
        i. Pneumothorax
        ii. Widened mediastinum
        iii. Pulmonary contusion
        iv. Consolidation
        v. Skeletal fractures
    b. Discuss the clinical indicators found on X-ray used for identification of:
        i. Endotracheal tube placement
        ii. Naso and orogastric tubes
        iii. Central lines
        iv. Chest tube
    c. Correlate basic CT scan abnormalities with specific pathophysiologic conditions related to:
        i. Head
        ii. Chest
        iii. Spine
        iv. Abdomen
        v. Pelvis

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of diagnostic studies in directing appropriate decision making in patient care

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate correct interpretation of laboratory analysis in scenario based learning
2. Recognize the following utilizing radiologic and imaging diagnostic studies:
    a. Pneumothorax
    b. Pulmonary infiltrate
    c. Various invasive treatment device placement
        i. Endotracheal tube, naso and orogastric tubes, central lines, chest tube
    d. Skeletal fractures
    e. Various bleeds
        i. Head, chest, abdomen, pelvis

**Instructor Qualifications:**
Experienced critical care professional, clinical laboratory specialist, radiologist and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions in various diagnostic studies
    a. X-rays
    b. CT scans
    c. Laboratory values
2. Laboratory reference sheet

**Suggested Time for Module:**
Minimum 4 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Vascular Access, Fluid and Blood Administration

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Understand Compare and contrast the use of various catheters for vascular access
2. Conduct methods of fluid and blood administration

**Cognitive Unit Objectives:**

1. Describe the indications for use, advantages, disadvantages, and potential complications of the different types of vascular access devices
    a. Peripheral
        i. Midline
    b. Central
        i. Tunneled
            1. Hickman
            2. Broviac
            3. Groshong
            4. Dialysis
        ii. Non-tunneled (single, double or triple lumen)
            1. Internal jugular
            2. Subclavian
            3. Femoral
        iii. Ports
        iv. Peripherally inserted central catheter (PICC)
2. Describe basic techniques in using vascular access devices
    a. Multi-lumen catheter and associated line placements
    b. Access
    c. Site care
    d. Flushing
3. Identify indications, contraindications, precautions, complications, administration method for neonate through geriatric patients requiring:
    a. Packed red blood cells
    b. Whole blood
    c. Platelets
    d. Albumin
    e. Fresh frozen plasma
4. Describe signs and symptoms, timing and treatment for the following blood transfusion reactions:
    a. Hemolytic
    b. Anaphylactic
    c. Febrile
    d. Circulatory overload

5. Identify indications, contraindications, precautions, complications, administration method for adult and pediatric patients requiring non-blood volume expanders:
    a. Hetastarch
    b. Plasma protein factor
    c. Hypertonic saline

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:
1. Justify the rationale for central versus peripheral vascular access.
2. Support the rationale for fluid and blood product administration in transport.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:
1. Demonstrate the maintenance and troubleshooting of all pertinent vascular access devices for central and peripheral vascular access
2. Demonstrate vascular access, site care and flushing of all pertinent vascular access devices.
3. Demonstrate methods of administering blood products.

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Vascular access devices
    a. Peripheral
        i. Midline
    b. Central
        i. Tunneled
            1. Hickman
            2. Broviac
            3. Groshong
            4. Dialysis
        ii. Non-tunneled (single, double or triple lumen)
            1. Internal jugular
            2. Subclavian
            3. Femoral
        iii. Ports
        iv. Peripherally inserted central catheter (PICC)
        v. Dialysis
    c. Intraosseous
3. Blood product equipment

**Suggested Time for Module:**
Minimum 2 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Pharmacology

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Determine the appropriate use of pharmacological interventions as part of the overall patient management plan for neonate through geriatric critical care patients.
2. Demonstrate knowledge of specific medications common to patients requiring critical care transports
3. Demonstrate knowledge for the neonate through geriatric patient with toxic ingestion

**Cognitive Unit Objectives:**

1. Describe how to evaluate the actions, pharmacokinetics, indications, contraindications, route of administration, adverse effects, and drug incompatibilities/interactions of all medications for safe administration.
2. Explain the time response curve and dose response curve of drug use.
3. Identify the effects of drug use on the liver, in renal dysfunction, shock states, and age extremes.
4. Articulate the different methods of mathematically calculating the correct medication dose for administration
5. Describe the actions, pharmacokinetics, indications, contraindications, route of administration, adverse effects, drug incompatibilities/interactions of the following pharmaceutical classifications:
    a. Alpha blockers
    b. Analgesics – Sedatives – Hypnotics - Narcotics
        i. Antagonists
    c. Anitarrhythmics
    d. Antianginals
    e. Antibiotics
    f. Anticholinergics
    g. Anticoagulants
    h. Antiemetics
    i. Antihistamines
    j. Antihypertensives
    k. Anti-inflammatories
    l. Beta blockers
    m. Bronchodilators
    n. Calcium Channel blockers
    o. Carbohydrates, electrolytes, hormones, alkalizing agents
    p. Chronotropic agents
    q. Diuretics
    r. Dromotropic agents

s. Inotropic agents
t. IV fluids
u. Paralytics
v. Thrombolytics
w. Vasopressors
x. Volume Expanders
    i. Blood
    ii. Blood by-products

6. Toxicology
    a. Describe the epidemiology and etiology behind poison exposures
    b. Describe the role of the poison control center
    c. Explain the management of patients with poison exposures including advanced pharmaceutical interventions and antidotes
    d. Define and describe the etiology, toxic dose, presenting systems including diagnostic findings and management of patients requiring critical care transport

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Justify the use and administration of drugs to affect positive therapeutic effect
2. Support the rationale for transport of the patient with toxicology disorders

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Recognize and demonstrate need for medication antagonist in an overdose
2. Consult information resources regarding management of poisonings
3. Identify patients at risk for acute withdrawal symptoms
4. Demonstrate appropriate calculation of drip rates
5. Confirm six patient rights with medication administration

**Instructor Qualifications:**
Experienced critical care professional, clinical pharmacist and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Visual aids and resources

**Suggested Time for Module:**
Minimum 6 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Cardiovascular System

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with cardiovascular disorders.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major multi-system trauma, end stage disease presentation, acute presentation of chronic conditions and single or multi-disease etiologies.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Describe the embryologic development of the cardiovascular system
2. Explain the anatomy and physiology of the cardiovascular system
    a. Circulation
        i. Fetal circulation
        ii. Transitional circulation
        iii. Neonatal and pediatric circulation
        iv. Systemic vasculature and control of peripheral blood flow
        v. Adult and geriatric
        vi. Neurohormonal control
        vii. Variables affecting ventricular function
            1. Cardiac output / Cardiac index
                a. Preload
                b. Afterload
                c. Contractility
            2. Heart rate
            3. Stroke volume
            4. Ejection fraction
            5. Arterial pressure
                a. Regulation
                b. Factors affecting arterial blood pressure
                c. Pulse pressure
                d. Mean arterial pressure
    b. Cardiac conduction system
        i. Electrophysiology and action potential
            1. Myocardial conduction properties
            2. Excitation and contraction
            3. Refractory period
            4. Depolarization and repolarization

3. Differentiate between normal and abnormal finding in the cardiovascular assessment (neonate through geriatric)
    a. List the components of the physical exam
        i. Inspection, palpation, percussion, and auscultation
            1. heart (S1-S2-S3-S4, murmurs)
            2. extremities with comparison between
            3. pulses (bruits)
            4. pulsating masses
4. Compare and contrast multiple lead electrocardiograms (ECG)
    a. Describe ECG waveform, intervals and analysis
    b. Identify arrhythmias
    c. Identify myocardial conduction system defects
        i. Axis deviation
        ii. Hemi blocks and bifasicular blocks
    d. Identify and differentiate between ECG patterns showing myocardial ischemia, injury and infarction
        i. STEMI
            1. LBBB and pacemaker
    e. Describe potential causes of arrhythmias
    f. Identify interventions for cardiac arrhythmias
        i. Pharmacological
        ii. Electrophysiologic obliteration
        iii. Pacemaker
        iv. Cardioverter defibrillator
            1. external
            2. internal
5. Identify indications, monitoring equipment, waveforms, complications, normal and abnormal readings, pharmacological effects and methods of correcting abnormalities in hemodynamics
    a. Arterial pressure monitoring
    b. Central venous pressure (CVP) monitoring
    c. Pulmonary artery (PA) monitoring
    d. Pulmonary artery wedge/capillary pressure (PAWP)
    e. Hemodynamic automated calculation :
        i. Cardiac output
        ii. Cardiac index
        iii. Pulmonary vascular resistance
        iv. Systemic vascular resistance
    f. $SvO_2$ monitoring
6. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of cardiovascular system disorders:
    a. Cardiopulmonary failure
    b. Coronary artery disease
    c. Acute myocardial infarction
    d. Angina pectoris
    e. Heart failure

        i. Right side
        ii. Left side
    f. Congenital heart disease (CHD)
        i. Common acyanotic lesions and associated physiology
        ii. Common obstructive lesions and associated physiology
        iii. Common cyanotic lesions and associated physiology
    g. Valvular disease
        i. Stenosis
        ii. Insufficiency
    h. Hypertensive crisis
    i. Cardiomyopathy
        i. Hypertrophic
        ii. Dilated
        iii. Restrictive
        iv. Stress Induced
            1. Takotsubo cardiomyopathy (broken heart syndrome)
    j. Pericardial diseases and associated complications
        i. Pericarditis
        ii. Pericardial effusion
        iii. Cardiac tamponade
        iv. Constrictive pericarditis
    k. Acute inflammatory diseases
        i. Myocarditis
        ii. Infective endocarditis
        iii. Rheumatic fever
        iv. Kawasaki disease
    l. Cardiac transplantation
    m. Cardiac trauma
        i. Cardiac contusion
        ii. Cardiac tamponade
    n. Aortic and peripheral arterial disease
        i. Aortic aneurysm
        ii. Aortic dissection
        iii. Peripheral vascular disease
    o. Shock
        i. Cardiogenic shock
        ii. Hypovolemic shock
        iii. Obstructive shock
        iv. Anaphylactic shock
        v. Septic shock
        vi. Neurogenic shock
    p. End-stage heart disease
7. Identify the type and mode, indications, contraindications and troubleshooting for:
    a. Pacemakers
    b. Implantable cardioverter defibrillators (ICD)

8. Define and identify the common goals of therapy, indications, contraindications, effects on hemodynamics, troubleshooting and complications for cardiac assist devices:
    a. Extracorporeal membrane oxygenation (ECMO)
    b. Ventricular assist devices (VADs)
    c. Intra-aortic balloon pump (IABP)

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory analysis of the patient with cardiovascular disorders.
2. Justify the use of hemodynamic monitoring and multi-lead ECGs in the assessment and management of the patient with cardiovascular disorders.
3. Support the rationale for transport of the patient with cardiovascular disorders.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Initiate age appropriate life support guidelines
2. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with cardiovascular disorders
3. Perform, manage and/or interpret diagnostic tests and results specific to cardiovascular disorders
4. Assess and Manage shock based upon type of shock
    a. Perform rapid volume resuscitation
    b. Administer blood products
    c. Monitor urinary output
5. Demonstrate basic set-up, maintenance and/or troubleshooting of:
    a. Hemodynamic monitoring systems
    b. Transvenous pacemaker
6. Demonstrate troubleshooting of:
    a. Intra-aortic balloon pump (IABP)
    b. Ventricular assist devices (VADs)
    c. Extracorporeal membrane oxygenation (ECMO)

**Instructor Qualifications:**
Credentialed critical care professional and/or subject matter expert in the content and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Central line mannequins and equipment
3. Arterial line equipment
4. Multi-lead ECG equipment
5. Sample multi-lead ECGs

6. Intra-aortic balloon pump systems
7. Hand pump for ventricular assist devices
8. Pacemakers
9. Ventricular assist devices (VADs)

**Suggested Time for Module:**
Minimum 24 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Respiratory System

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with respiratory disorders.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major multi-system trauma, end stage disease presentation, acute presentation of chronic conditions and single or multi-disease etiologies.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Describe the embryologic development of the respiratory system
2. Discuss advanced anatomy and physiology of the respiratory system
    a. Pulmonary compliance and resistance
    b. Pulmonary vascular pressures and resistance
    c. Control and mechanics of breathing
    d. Gas exchange and transport
    e. Alveolar dead space
    f. Lung defense mechanisms
    g. Ventilation and perfusion (V/Q) abnormalities
    h. Oxyhemoglobin dissociation curve
3. Differentiate between normal and abnormal finding within the respiratory assessment (neonate through geriatric)
    a. List the components of the physical exam
    b. Identify critical diagnostic abnormalities in:
        vii. Arterial blood gas
4. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of respiratory system disorders:
    a. Acute respiratory failure
    b. Upper airway obstructions:
        i. Epiglottitis
        ii. Croup
        iii. Retropharyngeal abscess
        iv. Foreign-body aspiration
        v. Congenital lesions
        vi. Trauma
    c. Lower airway diseases
        i. Bronchiolitis
        ii. Acute laryngotracheobronchitis
        iii. Asthma

1. Status asthmaticus

iv. Chronic lung disease
1. Bronchopulmonary dysplasia
2. Chronic obstructive pulmonary disease

v. Acute respiratory distress syndrome (ARDS)
vi. Pneumonia

d. Miscellaneous respiratory diseases/injury
i. Pulmonary embolism
ii. Aspiration pneumonitis
iii. Inhalation injury
1. Steam
2. Smoke

iv. Lung transplant
v. Neoplastic lung disease
vi. Pulmonary hemorrhage
vii. Pulmonary hypertension
viii. Thoracic trauma
ix. Pneumothorax
1. Tension
2. Spontaneous

x. Hemothorax
xi. Empyema
xii. Tuberculosis
xiii. Carbon monoxide poisoning
xiv. Near drowning

5. Explain physiologic principles of oxygen delivery.
6. Discuss the indications, contraindications, advantages, disadvantages, complications, equipment, technique and maintenance of:
a. Pulse oximetry and other oxygen monitoring devices
b. End tidal $CO_2$ and other carbon dioxide monitoring devices
c. Diagnostic pulmonary function test devices (peak expiratory flow meters)
d. Oxygen delivery devices
i. Bag – valve – mask technique
1. self inflating bag with pop-off valve
2. non-self-inflating bag

e. Endotracheal intubation
f. Thoracostomy
i. Needle
ii. Chest tube
iii. Thoracic drainage system

g. Crichothyrotomy
i. Needle
ii. Surgical

h. Tracheostomy maintenance
i. Tracheobronchial suctioning

7. Identify the respiratory parameters indicating patient candidacy for mechanical ventilators.
8. Discuss appropriate patient care management, complications of, and monitoring of the neonate through geriatric patients on mechanical ventilators.
9. Define and differentiate between the various modes of mechanical ventilators:
    a. Full vs. partial support
    b. Controlled mechanical
    c. Assist/Control (A/C)
    d. Intermittent mandatory ventilation
    e. Synchronized intermittent mandatory ventilation (SIMV)
    f. Pressure regulated volume control (PRVC)
    g. Pressure support
    h. Noninvasive pressure support ventilation
        i. Continuous positive airway pressure (CPAP)
        ii. Bi-level positive airway pressure (BiPAP)
    i. Inverse I/E ratio
10. Describe and differentiate between the various ventilator settings:
    a. $FiO_2$
    b. Flow rate
    c. I/E ratio
    d. Mean airway pressure
    e. Minute volume
    f. Pauses and sighs
    g. Peak pressure
    h. Positive end-expiratory pressure (PEEP)
    i. Rate
    j. Sensitivity
    k. Tidal volume
11. Discuss alternative modes and indications for the use of the following mechanical ventilations:
    a. High-frequency ventilation
    b. High frequency jet ventilation
    c. High-frequency oscillation
    d. Inverse-ratio ventilation
    e. Nitric oxide gas delivery system
12. Correlate pulmonary disease processes with mechanical ventilator management.
13. Discuss the indications, contraindications, side effects, dosages, and routes for commonly prescribed medications used in:
    a. Pulmonary disorders
    b. Intubation
        i. Medication facilitated
        ii. Rapid sequence intubation
    c. Ventilator management

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory analysis of the patient with respiratory disorders.
2. Support the rationale for transport of the patient with respiratory disorders.
3. Justify the rationale for conducting invasive airway management interventions.
4. Appreciate the importance of precisely controlled ventilations and oxygen delivery in the management of the critically ill patient.
5. Comprehend the rationale for use of mechanical ventilators.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Initiate age appropriate life support guidelines
2. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with respiratory disorders including:
    a. Abnormal breathing patterns
    b. Inhalation injury
    c. Inspection, palpation, percussion, auscultation of chest
    d. Assess for pulsus paradoxus
3. Demonstrate appropriate interpretation of blood gas analysis
4. Demonstrate and correctly administer appropriate pharmacologic agents to specific pulmonary disorders through a variety of scenarios
5. Demonstrate appropriate assessment, technique in performing, evaluation, maintenance and troubleshooting of:
    a. All basic and advanced airway skills
        i. Bag – valve – mask ventilations
            1. Self-inflating bag with pop-off valve
            2. Non-self-inflating bag
        ii. Oral pharyngeal airways
        iii. Nasal pharyngeal airways
        iv. Dual lumen airways
        v. Laryngeal mask airway (LMA)
    b. Monitoring Devices
        i. End tidal $CO_2$ monitoring
        ii. $SaO_2$ monitoring
    c. Endotracheal intubation on an adult and pediatric manikin
        i. Oral
        ii. Nasal
        iii. Digital
        iv. Upright
        v. Rapid sequence intubation
        vi. Medication facilitated intubation
    d. Cricothyrotomy on manikins
        i. Needle

        ii. Surgical
        iii. Retrograde intubation
    e. Tracheostomies
    f. Needle decompression
6. Demonstrate set up maintenance and troubleshooting of:
    a. Thoracic drainage system
    b. Tracheostomy tube
    c. Portable ventilators
7. Demonstrate endotracheal suctioning using sterile technique

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. End tidal $CO_2$ monitoring device
3. $SaO_2$ monitoring device
4. Airway mannequins
5. Oropharyngeal airways
6. Nasopharyngeal airways
7. Self-inflating bag with pop-off valve
8. Non-self-inflating bag
9. Endotracheal intubation equipment, supplies and necessary medications
10. Cricothyrotomy equipment, supplies and necessary medications
11. Needle decompression equipment, supplies and necessary medications
12. Chest tube drainage systems
13. Suction equipment
14. Transport ventilator
15. Chest X-rays

**Suggested Time for Module:**
Minimum of 18 hours

# State of Wisconsin
# Critical Care Transport Course

**Unit: Nervous System**

**Terminal Unit Objective:**
Upon completion of this unit, the student will be able to:

1. Perform a complete history and physical exam on the critical care patient.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major multi-system trauma, end stage disease presentation, acute presentation of chronic conditions and single or multi-disease etiologies.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Describe the embryogenesis of neural development
2. Explain the anatomy and physiology of the nervous system
    a. Define and describe the divisions of the nervous system
    b. Explain the structures and function of the central nervous system (CNS) and peripheral nervous system (PNS)
    c. Explain the structures and function of the spinal cord and cranial nerves
    d. Explain the autonomic nervous system
    e. Describe the cellular structures of the nervous tissue
    f. Explain the neurophysiology of synapse and impulse transmission
    g. Explain the production and function of cerebral spinal fluid
    h. Describe the cerebral vascular circulation
        i. Compare and contrast vital sign measurements in various disease or traumatic conditions
        ii. Explain cerebral perfusion pressure (CPP) and the relationship of CPP to blood flow, mean arterial pressure (MAP), and $ETCO_2$
        iii. Describe normal cerebral perfusion values and the causes of both increased or decreased cerebral perfusion pressure
3. Differentiate between normal and abnormal finding in the neurologic assessment (neonate through geriatric)
    a. List the components of the physical exam and frequency of re-assessment
    b. Memorize the Glasgow coma scale
4. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of neurological disorders
    a. Intracranial hypertension
        i. Intracranial monitoring devices
        ii. Brain herniation
    b. Traumatic brain injury
        i. Closed head injury
            1. Local injury
            2. Diffuse injury

ii. Skull fracture
    1. Linear
    2. Depressed
    3. Basilar
iii. Hematomas
    1. Subdural
    2. Epidural
    3. Subarachnoid
iv. Spinal cord injury
    1. Level dependency
    2. Spinal cord disruption
    3. Spinal shock
    4. Autonomic dysreflexia

c. Medical
    i. Cerebrovascular accidents
        1. Thrombosis
        2. Emboli
        3. Hemorrhagic
    ii. Transient ischemic attacks
    iii. Arterial-venous malformations
    iv. Hydrocephalus
        1. VP shunt malfunctions
    v. Guillan-Barre syndrome
    vi. Myasthenia Gravis
    vii. Intracranial and spinal neoplasms
    viii. CNS infections
        1. Meningitis
        2. Encephalitis
        3. Abscess
    ix. Epilepsy and Status epilepticus

5. Define and correlate care for patient with brain death and criteria for organ procurement

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory analysis of the patient with neurological disorders.
2. Justify the use of intracranial pressure monitoring and relevant diagnostic studies in the assessment and management of the patient with neurologic disorders.
3. Support the rationale for transport of the patient with neurologic disorders.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Initiate age appropriate life support guidelines
2. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with neurological disorders including:
    a. Level of consciousness/mental status
    b. Cranial nerve assessment (basic)
    c. Assess sensation and motor function
    d. Evaluate reflexes
        i. Deep tendon reflex
        ii. Clonus
    e. Assess for nuchal rigidity
    f. Assess need for spinal immobilization
    g. Assess drainage from ears and nose for blood and/or cerebrospinal fluid
    h. Assess seizure activity and initiate seizure precautions
3. Demonstrate the maintenance and troubleshooting of an intracranial pressure monitoring device.
4. Manage appropriate ventilation for a patient with suspected head injury with $ETCO_2$ monitoring

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Intracranial monitoring devices

**Suggested Time for Module:**
Minimum 4 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Gastrointestinal System

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with abdominal disorders.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major multi-system trauma, end stage disease presentation, acute presentation of chronic conditions and single or multi-disease etiologies.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Explain the anatomy and physiology of the gastrointestinal system
    a. Define the three abdominal cavities and organs within each cavity
    b. Explain the structures of the digestive system
    c. Explain the function of the gastrointestinal system
    d. Identify and describe the accessory organs of digestion
2. Differentiate between normal and abnormal findings in the gastrointestinal assessment
    a. List the components of the physical exam for neonate through geriatric patients
3. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of gastrointestinal system disorders
    a. Gastrointestinal hemorrhage
        i. Peptic ulcer
        ii. Esophageal varices
        iii. Mallory-Weiss tear
    b. Hepatic failure: acute and chronic
        i. Hepatic encephalopathy
    c. Acute pancreatitis
    d. Acute gastroenteritis
    e. Intestinal infarction, obstruction, perforation
    f. Intussusception
    g. Ischemic bowel
    h. Acute abdominal trauma
4. Identify the indications, contraindications and maintenance of:
    a. Nasogastric / orogastric tubes
    b. Feeding tubes
    c. Ostomy devices

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory analysis of the patient with gastrointestinal disorders.
2. Justify the rationale for transport of the patient with gastrointestinal disorders.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with gastrointestinal disorders.
2. Perform nasogastric and orogastric tube insertion, irrigation, care and removal.
3. Demonstrate the maintenance and troubleshooting of feeding tubes and ostomy devices
4. Demonstrate the maintenance and troubleshooting of an esophagogastric tamponade tube.

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Airway mannequin for insertion of nasogastric tube
3. Nasogastric tubes (adult and pediatric)
4. Feeding tubes (dobhoff, percutaneous endoscopic gastrostomy tubes, etc.)
5. Esophagogastric tamponade tube
6. Suction equipment
7. Ostomy equipment

**Suggested Time for Module:**
Minimum 2 hours

# State of Wisconsin
# Critical Care Transport Course

**Unit: Renal System**

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with renal disorders.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major multi-system trauma, end stage disease presentation, acute presentation of chronic conditions and single or multi-disease etiologies.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Explain the anatomy and physiology of the renal system
    a. Explain formation of urine and elimination of waste
    b. Explain the mechanisms by which the body is able to regulate and maintain homeostasis for:
        i. Water
        ii. Electrolytes
        iii. Acid-base
        iv. Arterial blood pressure
        v. Erythrocytes
2. Differentiate between normal and abnormal finding in the renal assessment
    a. List the components of the physical exam for neonate through geriatric patients
3. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of renal system disorders
    a. Electrolyte imbalances
        i. Potassium
        ii. Sodium
        iii. Calcium
        iv. Phosphorous
        v. Magnesium
    b. Acute renal failure
        i. Pre-renal failure
        ii. Intrarenal failure
            1. Acute tubular necrosis
            2. Acute glomerulonephritis
        iii. Postrenal failure
    c. Chronic renal failure/uremic syndrome
    d. Rhabdomyolysis
    e. Renal trauma

4. Identify the indications, contraindications, and management techniques for renal replacement therapies
    a. Peritoneal dialysis
    b. Retroperitoneal dialysis
    c. Hemodialysis
    d. Continuous renal replacement therapies
5. Identify the indications, complications, necessary equipment, assessment and management of:
    a. Urinary catheters
    b. Suprapubic
    c. Ureterostomy

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory analysis of the patient with renal disorders.
2. Justify the rationale for transport of the patient with renal disorders.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with renal disorders.
2. Demonstrate urinary catheter placement, assessment and management.

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Renal dialysis equipment
3. Peritoneal dialysis equipment
4. Urinary catheter devices with mannequins

**Suggested Time for Module:**
Minimum 2 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Endocrine System

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with endocrine disorders.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major multi-system trauma, end stage disease presentation, acute presentation of chronic conditions and single or multi-disease etiologies.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Explain the anatomy and physiology of the endocrine system including associated hormones
    a. Hypothalamus
    b. Pituitary
        i. Anterior pituitary
        ii. Posterior pituitary
    c. Target organs
        i. Thyroid gland
        ii. Parathyroid gland
        iii. Pancreas
        iv. Adrenal glands
2. Differentiate between normal and abnormal findings in the endocrine assessment
    a. List the components of the physical exam for neonate through geriatric patients
3. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of endocrine system disorders
    a. Pancreatic hormone disorders
        i. Diabetes mellitus
        ii. Diabetic ketoacidosis
        iii. Hyperglycemic, hyperosmolar, nonketodic syndrome
        iv. Acute hypoglycemia
    b. Thyroid hormone disorders
        i. Hyperthyroidism
        ii. Thyroid storm
        iii. Hypothyroidism
        iv. Myxedema coma
    c. Adrenal hormone disorders
        i. Cushing's syndrome
        ii. Addison's disease

            iii. Addisonian / adrenal crisis
            iv. Pheochromocytoma
        d. Posterior pituitary
            i. Syndrome of Inappropriate Antidiuretic Hormone (SIADH)
            ii. Diabetes Insipidus
4. Identify the indications, contraindications and maintenance of
    a. Insulin drip therapy and insulin pumps
    b. Vasopressin

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory analysis of the patient with endocrine disorders.
2. Justify the rationale for transport of the patient with endocrine disorders.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with endocrine disorders.
2. Demonstrate the maintenance and troubleshooting of:
    a. Insulin drip therapy
    b. Insulin pump therapy

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Blood glucose monitoring devices
3. lnsulin pump
4. Medications associated with scenarios:
    a. D25 or D50
    b. Insulin infusion and multidose vials
    c. Glucagon
    d. Oral glucose
    e. Vasopressin

**Suggested Time for Module:**
Minimum 2 hours

# State of Wisconsin
# Critical Care Transport Course

**Unit: Hematology, Immunology and Infectious Disease**

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with hematologic and immunologic disorders.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major multi-system trauma, end stage disease presentation, acute presentation of chronic conditions and single or multi-disease etiologies.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Explain the anatomy and physiology of the hematologic and immune system
    a. Erythrocytes (RBC)
    b. Leukocytes (WBC)
        i. Neutrophiles
        ii. Eosinophils
        iii. Basophils
    c. Mononuclear phagocytes
        i. Monocytes
        ii. Macrophages
    d. Lymphocytes
        i. T cells
        ii. B cells
        iii. Natural killer cells (NK)
    e. Platelets (Thrombocytes)
    f. Plasma factors
        i. Procoagulants
        ii. Anticoagulants
2. Differentiate between normal and abnormal finding in the assessment
    a. List the components of the physical exam for neonatal through geriatric patients
3. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of hematological and immune system disorders
    a. Red blood cell disorders
        i. Anemias
        ii. Sickle cell disease
    b. White blood cell disorders
        i. Immunodeficiency disease
        ii. Immunosuppressive disorders

        iii. Neutropenia
    c. Lymphocyte disorders
    d. Coagulopathies and platelet disorders
        i. Disseminated Intravascular Coagulation (DIC)
        ii. Immune thrombocytopenia purpura (ITP)
        iii. Heparin-induced thrombocytopenia (HIT)
    e. Plasma clotting-factor disorder
        i. Hemophilia
    f. Bone marrow transplantation and blood stem cell transplantation
        i. Graft-versus-host disease (GvHD)
4. Explain the pathophysiology, causative agent, mode of transmission, signs and symptoms, pre and post exposure measure, transport precautions for patients with:
    a. Meningitis
    b. Multiple antibiotic resistant bacteria
    c. Methicillin-resistant staphylococcus (MRSA)
    d. Vancomycin resistant enterococci (VRE)
    e. Other medication resistant pathogens
    f. C-Diff
5. Relate isolation precautions to immunocompromised patients

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory analysis of the patient with hematological and immune system disorders.
2. Justify the rationale for transport of the patient with hematological and immune system disorders.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with hematological and immune system disorders.
2. Demonstrate appropriate use of designated equipment before, during, and after the transfer of a patient requiring isolation precautions
3. Demonstrate appropriate care of the patient with neutropenic precautions

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions

**Suggested Time for Module:**
Minimum 2 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Sepsis and Multiple Organ Dysfunction Syndrome

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with multisystem disorders.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with systemic inflammatory response, septic shock and multiple organ dysfunction syndrome.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Describe the physiology of the microcirculation
2. Differentiate between normal and abnormal assessment finding in the patient with systemic inflammatory response, septic shock and multiple organ dysfunction syndrome
    a. List the components of the physical exam for neonatal through geriatric patients
3. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of:
    a. Infection
    b. Systemic inflammatory response syndrome (SIRS)
    c. Sepsis
    d. Severe Sepsis
    e. Septic shock
4. Management of severe sepsis and septic shock as determined by most current International guidelines for management of severe sepsis and septic shock
    a. Initial Resuscitation (first 6 hours)
    b. Hemodynamic Support
    c. Other supportive therapy
5. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of Multi-Organ Dysfunction Syndrome (MODS)
    a. Define and explain the general sequence of organ failure and scoring methods
        i. Pulmonary failure: acute respiratory distress syndrome (ARDS)
        ii. Hepatobiliary failure
        iii. Gastrointestinal
        iv. Renal failure
        v. Neurologic compromise
        vi. Hematologic alterations

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive laboratory and diagnostic analysis of the patient with systemic inflammatory response, septic shock and multiple organ dysfunction syndrome.
2. Support the rationale for transport of the patient with systemic inflammatory response, septic shock and multiple organ dysfunction syndrome.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate performance of a thorough physical assessment of pediatric and adult patients with systemic inflammatory response, septic shock and multiple organ dysfunction syndrome.
2. Demonstrate the maintenance and troubleshooting of necessary equipment needed to maintain stability in patients with sepsis and MODS

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions

**Suggested Time for Module:**
Minimum 3 hours

# State of Wisconsin
# Critical Care Transport Course

**Unit: Trauma, Multi-system Trauma and Burn Injuries**

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with multi-system trauma and burn injuries.
2. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with major trauma, multi-system trauma and burn injuries.
3. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Differentiate between normal and abnormal assessment finding in the neonate through geriatric patients with trauma, multi-system trauma and burn injuries
    a. List the components of the physical exam
2. Define and describe the etiology, pathophysiology, presenting systems including diagnostic findings and management of:
    a. Trauma and Multi-system trauma
        i. Describe the epidemiology and etiology behind trauma and multi-system trauma
            1. Mechanism of Injury with associated injuries
        ii. Describe the appropriate steps in trauma resuscitation
            1. Initial assessment with treatment of life threats
            2. Detailed/Secondary assessment
            3. Diagnostic studies specific to multi-system trauma
        iii. Identify the pathophysiology, assessment, and management of specific traumatic injuries
            1. Neurologic injury (subdural, epidural, increased ICP)
            2. Spinal cord injuries
            3. Thoracic injuries (pneumothorax, flail chest, tamponade, myocardial rupture)
            4. Abdominal injuries (diaphragm, liver and spleen)
            5. Orthopedic injuries (pelvic, femur, spinal)
        iv. Life threatening complications of multi-system trauma
            1. Rhabdomyolosis
            2. Compartment syndrome
            3. Fat embolism syndrome
            4. Venous thromboembolism
        v. Pain management of trauma patients
    b. Burns
        i. Describe the epidemiology and etiology behind burns
        ii. Describe the anatomy and physiology of the skin

iii. Define and differentiate between various mechanisms of injury (MOI)
iv. Recognize need for Burn Center Referral Criteria (American Burn Association)
v. Describe initial assessment and management of the various phases of burn
    1. Emergent phase (1-3 days post burn)
        a. Minimize burn wound depth
        b. Cover burn
        c. Initial assessment and treatment of life threats
            i. Doppler / monitor pulses
        d. Determine total body surface area (TBSA)
        e. Pain management
        f. Detailed / Secondary assessment
            i. Diagnostic studies
            ii. Wound care
        g. Insert urinary catheter to evaluate fluid resuscitation effectiveness
    2. Acute phase (3 days to weeks post burn)
vi. Describe the pathophysiology, assessment and management for systemic responses in burns
    1. Cardiovascular response
        a. Fluid resuscitation
            i. Calculating formulas
            ii. Monitoring
    2. Respiratory response with or without Inhalation injury
    3. Hematologic response
    4. Gastrointestinal response
    5. Renal response
    6. Metabolic response
        a. Nutritional support
    7. Immune and inflammatory response
        a. Burn wound sepsis
    8. Hypothermia Risk
    9. Pain assessment and treatment

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Comprehend the significance of all inclusive diagnostic analysis of the patient with multiple trauma and burn injuries.
2. Support the rationale for transport of the patient with multiple trauma and burn injuries who meet trauma center criteria.

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Assess neurovascular status of injured and/or immobilized extremity
    a. Compartment syndrome
2. Demonstrate performance of a thorough physical assessment of neonate through geriatric patients with trauma, multi-system trauma, and burn injuries
3. Perform calculations and monitoring of fluids for circulation management in burn patients
4. Perform trauma score assessment
5. Demonstrate appropriate airway management technique for burn patients
6. Monitor and maintain core body temperature

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. Variety of immobilization equipment

**Suggested Time for Module:**
Minimum 2 hours

# State of Wisconsin
# Critical Care Transport Course

## Unit: Obstetrical Patient and Care of the Newborn

**Terminal Unit Objective:**
Upon completion of this unit, the participant shall be able to:

1. Perform a complete history and physical exam on the critical care patient with obstetrical emergencies.
2. Perform a complete history and physical exam on the critical care neonate.
3. Integrate pathophysiological principles and assessment findings to manage the treatment and transport of the critical care patient with obstetrical and neonatal emergencies
4. Communicate pertinent assessment findings and treatments to healthcare professionals involved with the patient's care.

**Cognitive Unit Objectives:**

1. Describe the stages of fetal development and correlate to maternal physiologic changes
2. Determine obstetrical and neonatal patient stability prior to transport
3. Differentiate between normal and abnormal findings in the obstetric patient assessment
    a. History
        i. Prenatal care
        ii. Gravida
        iii. Para
        iv. Full-term infants
        v. Preterm infants
        vi. Abortions
        vii. Complications with previous labor/delivery
        viii. Previous vaginal birth or C-section
    b. Uterine contractions and cervical dilation
        i. Strength, frequency, duration of contractions
        ii. Time of last cervical check
4. Differentiate between normal and abnormal findings in the neonatal patient assessment
    a. Understanding of fetal and postnatal circulation
    b. Fetal heart tones
    c. Presence of fetal movement
5. Define and describe the etiology, pathophysiology, presenting symptoms including diagnostic findings and management of obstetrical disorders
    a. Hypertension
    b. Vaginal hemorrhage
    c. Abruptio placentae
    d. Placenta previa
    e. Gestational diabetes mellitus

f. Embolism

6. Describe complications of labor and delivery
    a. Preterm labor
    b. Breech presentation
    c. Shoulder dystocia
    d. Umbilical cord prolapse
    e. Uterine rupture
    f. Postpartum hemorrhage
7. Define and describe the etiology, pathophysiology, presenting symptoms including diagnostic findings and management of neonatal disorders
    g. Hypoglycemia
    a. Hypothermia
    b. Respiratory distress and failure
    c. Shock
        i. Hypovolemic
        ii. Cardiogenic
        iii. Septic/distributive shock
    d. Cardiopulmonary arrest
8. State common pharmacological interventions utilized in OB and Neonatal transport
    a. OB: Magnesium Sulfate, Terbutaline, Labetolol
    b. Neonate: as recommended by a nationally recognized neonatal transport program/course
    c. Safe and accepted pharmaceutical interventions for OB patients:
        i. Medical
        ii. Trauma

**Affective Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Support the significance of all inclusive laboratory analysis of patients with obstetrical and neonatal disorders
2. Understand the need for appropriate crew configurations in various obstetrical and neonatal emergencies prior to transport (critical care vs. specialty and/or high risk transport)
3. Justify the rationale for transport of the patient with obstetrical or neonatal disorders
4. Determine if transport can safely be attempted or if delivery should be accomplished at the referring facility

**Psychomotor Objectives:**
Upon completion of this unit, the participant shall be able to:

1. Demonstrate performance of a thorough physical assessment of the obstetrical patient
    a. Assess fetal heart tones (Doppler)

    b. Assess gestational age
2. Demonstrate performance of a thorough physical assessment of the neonate including
    a. APGAR scoring
3. Perform emergency delivery
4. Demonstrate appropriate technique in treating obstetrical complications
    a. Pregnancy induced hypertension
    b. Hypertonic or titanic contractions
    c. Cord prolapse
    d. Placental abruption
5. Demonstrate appropriate technique in:
    a. Determining risk for delivery during transport
    b. Transporting OB patient
    c. Neonatal resuscitation and fetal distress
6. Demonstrate umbilical vein catheterization.
    a. Insertion technique
7. Demonstrate maintenance and troubleshooting of pre-existing umbilical catheters

**Instructor Qualifications:**
Experienced critical care professional and/or healthcare professional well versed in the issues and resources covered in the topic.

**Minimal Equipment Needs and Resources**
1. Case study scenarios promoting participants to make clinical decisions
2. OB mannequin
3. Neonate and infant mannequins
4. Doppler
5. Umbilical catheter insertion and maintenance

**Suggested Time for Module:**
Minimum 4 hours

**Disclaimer:**
It is recommended that high risk OB and neonates be transported by healthcare professionals who have been specifically trained and certified in nationally recognized high risk OB and neonate transport programs.