

**2019 Updates in Therapeutics®:
Critical Care Pharmacy Preparatory Review and Recertification Course
Learning Objectives**

Module I

Management of Pain, Agitation, Delirium, and Neuromuscular Blockade and Adult Intensive Care Unit Patients, Supportive and Preventative Medicine, Fluids, Electrolytes, Acid Base Disorders, and Nutrition Support

1. Develop a management strategy for the prevention and treatment of pain, agitation/sedation, and delirium, immobility, and sleep disruption (PADIS) in an intensive care unit (ICU) patient with various comorbidities.
2. Discuss relevant pharmacokinetic and pharmacodynamic considerations of PADIS medications as they pertain to disturbances in critical care physiology.
3. Identify relevant adverse effects, drug interaction, and drug withdrawal syndromes in the management of PADIS.
4. Evaluate patients in the ICU for PADIS using a validated screening tool.
5. Construct a plan for the management of delirium.
6. Identify the long-term effects of critical illness in adult ICU patients.
7. Create a management strategy for PADIS-related medications that are continued beyond ICU discharge.
8. Describe a treatment and monitoring plan for critically ill patients receiving neuromuscular blockade.
9. Identify the importance of the key components of intensive care medicine that can be applied to all critically ill patients.
10. Recommend therapeutic options to prevent stress-related mucosal disease.
11. Recommend therapeutic options to prevent venous thromboembolism in a critically ill patient.
12. Discuss therapeutic options for patients with heparin-induced thrombocytopenia.
13. Discuss medications that can be used to comfort a critically ill patient at the end of life.
14. Describe normal fluid requirements, and identify common patient conditions that alter fluid needs and homeostasis.
15. Assess hyponatremia and hypernatremia in a critically ill patient, and develop an appropriate treatment plan.
16. Discuss the causes and treatment of common intracellular electrolyte disorders.
17. Differentiate between the causative factors for metabolic acidosis and alkalosis, and construct a therapeutic treatment algorithm.
18. Specify the appropriate route (parenteral or enteral) of nutrition administration, amount of nutrients, and micronutrients to be provided to a given critically ill patient.
19. Identify appropriate markers for assessing the tolerance, safety, and efficacy of enteral or parenteral nutrition therapy.
20. Select methods for ensuring appropriate glycemic control in critically ill patients.
21. Identify pertinent drug-nutrient interactions, and provide recommendations for the safe and effective delivery of medications to patients receiving enteral or parenteral nutrition therapy.

Module II

Pulmonary Disorders, Toxicology, Acute Kidney Injury and Renal Replacement Therapy in the Critical Ill Patient, Practice Management and Development: Protocol Development and Quality Improvement, and Research Design and Literature Evaluation

1. Formulate a holistic treatment plan for a patient with acute respiratory distress syndrome that includes nonpharmacologic and pharmacologic therapies.
2. Identify appropriate drug therapies for endotracheal intubation, including agents for premedication, induction, and neuromuscular blockade.
3. Recognize key variables and commonly used modes for treatment with mechanical ventilation.
4. Recommend appropriate antibiotic therapy and recommended adjunctive therapies for patients with cystic fibrosis exacerbations.
5. Formulate a treatment plan for a patient with pulmonary hypertension.
6. Outline a treatment plan for patients with acute respiratory failure caused by asthma exacerbation or chronic obstructive pulmonary disease exacerbation.
7. Describe the epidemiology for acute poisonings in the United States.
8. Distinguish the common clinical toxidromes associated with acute poisonings.
9. Describe the general management of a patient with an acute overdose.
10. Assess the gastric decontamination strategies for an acute overdose.
11. Examine the options for the management of selected toxins.
12. Assess a patient with clinical acute overdose, and develop a patient care plan according to current evidence.
13. Identify the adverse effects and monitoring of the patient who is poisoned.
14. Define acute kidney injury (AKI).
15. List common categories and give examples of drug-induced kidney disease.
16. With respect to renal replacement therapy, define diffusion and convection and describe their role in blood purification.
17. Discuss the role of dialysate and replacement fluids in continuous renal replacement therapy (CRRT).
18. Describe drug-dosing concepts in CRRT and sustained low-efficiency dialysis/extended daily dialysis.
19. Develop policy and procedures and critical care pathways.
20. List high-risk medications and medication-related processes that are suited for a medication use evaluation (MUE).
21. Describe how to perform an MUE.
22. Differentiate quality improvement opportunities in the critically ill patient to optimize outcomes.
23. Describe how to perform a gap analysis.
24. Describe the documentation processes for clinical pharmacy services (CPS) and the types of pharmacotherapeutic interventions.
25. Describe how to justify and document the financial value of CPS.
26. Identify factors influencing the conduct of essential critical care research.
27. Judge the appropriateness of various statistical tests for a set of data.
28. Apply concepts of research design and analysis to clinical care.

Module III
Neurocritical Care, Acute Cardiac Care, and Cardiovascular Critical Care

1. Identify pertinent pathophysiologic and laboratory changes that acutely occur after neurologic injuries and require therapeutic intervention.
2. Describe monitoring devices commonly used in neurocritical care patients that help develop and optimize treatment strategies.
3. Develop an evidence-based treatment strategy for neurocritical care patients that optimizes patient outcomes and reduces the risk of adverse drug effects and drug interactions.
4. Recommend a monitoring plan to assess response to therapeutic regimens and specific therapeutic goals for neurocritical care patients.
5. Reassess and develop new plans of care for neurocritical care patients according to therapeutic and adverse outcomes and progress toward therapeutic goals.
6. Manage cardiac arrest from the initiation of basic life support to the use of post-cardiac arrest care.
7. Categorize the indications and contraindications for medication administration during cardiac arrest.
8. Illustrate the utility of targeted temperature management and the patient groups to which it should be applied.
9. Predict the common complications of targeted temperature management and explain how to ameliorate them.
10. Contrast the different presentations of hypertensive emergency.
11. Analyze the therapeutic goals and clinical indications for the medications used in hypertensive emergency.
12. Interpret a patient's hemodynamic status, accounting for cardiovascular anatomy, inherent physiologic function, and circulation, and recommend appropriate corresponding pharmacotherapeutic regimens.
13. Evaluate patients, and devise a treatment strategy for patients with cardiogenic shock, considering pharmacodynamic response to vasopressors/inotropes.
14. Evaluate and interpret the contributing effects of various cardiovascular disease states associated with cardiogenic shock.
15. Recommend appropriate pharmacotherapeutic regimens in cardiovascular diseases in critically ill patients, including, but not limited to, cardiogenic shock, coronary artery disease, heart failure, valvular disease, and cardiac surgery perioperative management.
16. Recognize the options for and roles of mechanical circulatory support and heart transplantation as advanced therapies for heart failure and/or cardiogenic shock.

Module IV
Shock Syndromes and Sepsis I: Introduction, Vasodilatory, and Sepsis, Shock and Sepsis II: Hypovolemic, Critical Bleeding, and Obstructive, Hepatic Failure/GI/Endocrine Emergencies, and Infectious Diseases I & II

1. Identify critical determinants affecting oxygen delivery.
2. Distinguish between the various shock syndromes on the basis of a patient's clinical and hemodynamic parameters.
3. Interpret hemodynamic data from monitoring devices and markers of perfusion.
4. Devise a treatment strategy for when to use intravenous fluids and/or vasopressors in a patient with shock.

5. Develop a treatment pathway for the care of patients with sepsis or septic shock that incorporates current evidence and the Surviving Sepsis Campaign guideline recommendations.
6. Identify critical determinants affecting oxygen delivery and the physiologic response to hypovolemic and obstructive shock.
7. Evaluate resuscitation strategies and end points in the management of hypovolemic, hemorrhagic, and obstructive shock.
8. Devise a treatment strategy for pharmacotherapy adjuncts in the management of bleeding and acute coagulopathy when treating patients with hemorrhagic shock.
9. Develop a treatment pathway for the care of patients receiving anticoagulants and antiplatelet agents for a life-threatening hemorrhage or critical bleeding that incorporates current evidence and guideline recommendations.
10. Apply risk stratification to guide the approach of pharmacologic management when treating patients with acute pulmonary embolism (PE).
11. Develop a standardized approach for the effective and safe use of thrombolytic agents in the management of acute PE.
12. Define acute liver failure (ALF), and describe the most common causes for its occurrence.
13. Develop a treatment strategy to help manage and reduce the complications associated with ALF.
14. Evaluate the severity of an episode of acute pancreatitis, and construct a plan for pharmacologic, nutritional, and surgical management.
15. Identify patients at high risk for developing fistulas postoperatively, and assess the need for pharmacologic versus surgical treatment.
16. Identify risk factors and treatment options for postoperative ileus and postoperative nausea and vomiting.
17. Design a treatment plan for patients who present with an acute upper gastrointestinal bleed.
18. Differentiate between the main endocrine emergencies in the intensive care unit, and be able to design a therapeutic regimen for a patient presenting with each condition.
19. Develop risk factor–based empiric antibiotic regimens for patients with suspected ventilator-associated pneumonia.
20. Identify a definitive management strategy for central line-associated bloodstream infections.
21. Describe definitive and supportive care pharmacotherapeutic interventions for patients with severe influenza.
22. Develop empiric and definitive antimicrobial therapy plans for patients with catheter-related urinary tract infection.
23. Differentiate between location of intra-abdominal infection and respective empiric antimicrobial therapy.
24. Describe the role of antibiotic therapy in patients with acute pancreatitis.
25. Develop a definitive management strategy for critically ill patients with severe *Clostridium difficile* infection.
26. Recommend definitive antibiotic therapy for patients with postoperative wound infection.
27. Describe the role of pharmacotherapy in the management of severe cutaneous reactions.
28. Compose a plan to incorporate quality metrics into pre- and postsurgical care.
29. Identify key members of an antimicrobial stewardship team and common strategies used by the team to optimize antibiotic use.
30. Provide empiric antibiotic therapy recommendations for critically ill patients with community-acquired or health care–associated meningitis.
31. Differentiate different microbiological rapid diagnostic tests and their relative advantages and disadvantages.
32. Devise an antimicrobial management strategy using procalcitonin guidance.

33. Analyze therapeutic options for the treatment of multidrug-resistant pathogens in the intensive care unit (ICU).
34. Devise an optimal treatment plan for critically ill immunocompromised patients with infectious diseases.
35. Distinguish each of the commonly used antifungal agents and their places in therapy in an ICU setting.

Module V

Pharmacokinetics/Pharmacodynamics, Practice Management: Medication Safety and Pharmacoeconomics, Critical Care Pharmacy Evolution and Validation Practice Standards, Training, and Professional Development

1. Describe the changes in critically ill patients that alter drug absorption.
2. Explain how critical illness affects drug distribution.
3. Depict the effects of changing hepatic blood flow, intrinsic activity, and protein binding on drug metabolism.
4. Differentiate between different critically ill patient populations and the expected pharmacokinetic (PK) changes.
5. Incorporate the PK changes in a critically ill patient into the design and evaluation of an appropriate drug regimen.
6. Identify the desired pharmacodynamic variables associated with efficacy in select drugs.
7. Review pharmacoeconomic principles and their application to patient care.
8. Compare a medication error, an adverse drug event (ADE), an adverse drug reaction, and a preventable ADE.
9. Design an ADE reporting program, including committee structure, committee reporting mechanisms, and methods of detecting, reporting, and managing ADEs.
10. Outline the recommendations in the safe medication use guidelines for the ICU.
11. Describe the safety measures for drug interaction detection and prevention.
12. Develop and implement a drug formulary proposal.
13. Describe key landmark events in the evolution of critical care pharmacy as a specialty.
14. Summarize key published documents and evidence validating critical care pharmacy as a specialty for validation to other health care professionals and stakeholders.
15. List the core knowledge areas for pharmacists caring for critically ill patients.
16. Identify the elements of fundamental, desirable, and optimal pharmacist practice and pharmacy service components.
17. Summarize the findings from key studies documenting the association of critical care pharmacy services with favorable health care outcomes.
18. List the criteria for credentialing and training of pharmacists providing critical care services at the desired and optimal levels as outlined in the 2011 American College of Clinical Pharmacy (ACCP) critical care "PRN Opinion Paper," in addition to critical care training opportunities and growth.
19. Apply the standards of practice for clinical pharmacy to the critical care practice environment using a standard process of care.
20. Develop an approach to conducting a gap analysis relative to the principles and values of team-based care in a local critical care practice environment.
21. Differentiate between the conventional and nontraditional pathways of training to obtain knowledge, skills, and attitudes for critical care pharmacy practice.

22. Define the key features of a mentor-mentee (protégé) relationship and the important role of mentoring in developing and training critical care clinical pharmacists.
23. Develop an approach to lifelong professional learning to maintain competency in critical care pharmacy practice using the principles of continuing professional development.
24. Identify the many educational components or techniques that can be incorporated into a personal development plan.
25. Identify the avenues and processes for contributing to the critical care body of knowledge as a presenter, author, or peer reviewer.