

Pediatric Intensive Care Unit--Core Curriculum, objectives, and competencies

General Objectives: The pediatric resident who rotates through the PICU should obtain an appreciation of basic pathophysiologic principles related to critical illness as well as an understanding of specific disease processes which require critical management, acquire some basic technical skills which will allow him/her to resuscitate and care for a critically-ill child, and develop an appreciation and level of comfort with the multi disciplinary nature of pediatric intensive care. This will be accomplished through a combination of didactic lectures, bedside teaching, and learning through direct patient care. Optimally, the resident will rotate through the unit at different seasons each year so that clinical exposure to seasonal illnesses will be maximized.

Pediatric critical care is a multi disciplinary field, and optimal care of the critically-ill pediatric patient necessitates a cooperative, organized approach to evaluation and treatment. The pediatric resident rotating through the PICU should see this rotation as an opportunity to learn from the intensivists, nurses, respiratory therapists and consult services. The pediatric resident should appreciate and begin to develop strategies for consensus building and multi disciplinary problem solving.

It is expected that the resident will mature in his/her understanding of and comfort with critical care theory and practice over the course of his/her three year residency. During the first (PL-2) year, the resident should concentrate on communication skills and data gathering/synthesis, and understanding of basic pathophysiology. As the resident progresses, he/she will be expected to display more sophisticated clinical judgment, make more complex decisions, and develop team leadership skills. Second year residents should be able to develop the history, perform a thorough physical exam, gather appropriate data in conjunction with the senior resident and attendings, and present the patient in a comprehensive yet concise manner. The second year resident is expected to formulate a plan of care and make treatment decisions with the guidance of the attending physician. The third year resident should be able to formulate a more comprehensive plan of treatment or further evaluation for most patients, as well as coordinate the care team and triage patient acuity.

Major Topics

1. Airway

Didactic:

- a. Anatomy of the normal and difficult airway; diseases of the airway: laryngomalacia, croup, tracheitis, epiglottitis.
- b. Pathophysiologic approach to noisy breathing—the basis for understanding and evaluating stridor and wheezing.
- b. Manual support of the airway, bag-valve-mask ventilation, nasal and oral airways.
- c. Indications for intubation, techniques, drugs, complications.
- d. Indications for and management of a tracheostomy.

Competencies:

- a. The resident will understand the pathophysiology and treatment of croup, epiglottitis, and tracheitis.
- b. The resident should be able to recognize a patient with an inadequate or unprotected airway.
- c. The resident will be able to provide BVM ventilation and well as understand the use of nasal trumpets and oral airways.
- d. The resident will be able to recognize the need for intubation and the safest route to accomplish this end. Experience with intubation *per se* will depend on the nature of the patient population, and is not an essential goal of the rotation.
- e. The resident will understand the indications for and technique of tracheostomy tube change.

2. Respiratory

Didactic:

- a. Pathophysiology of lung disease, ie pneumonia, atelectasis, ARDS. Pertinent issues include lung mechanics, normal and abnormal gas exchange, and evaluation of blood gases.
- b. Basic understanding of ventilatory support in the post-operative patient, the patient with neurological disease, and the patient with lung disease. Issues to be covered include modes of conventional ventilation (SIMV, pressure control, pressure support), weaning strategies, and complications associated with mechanical ventilation.
- c. Basic understanding of non-conventional modes of pulmonary support available for severe lung disease--de, HIFOV, ECMO, liquid ventilation.

Competencies

- a. The resident should be able to determine the need for ventilatory support based on a combination of blood gas analysis and clinical course.
- b. The resident should be able to decide on initial ventilator settings in consultation with the attending intensivist.
- c. The resident should be able to make basic ventilator adjustments according to blood gas analysis, clinical exam, pulmonary mechanics, and clinical course.

3. Asthma

Didactic:

- a. Pathophysiology of severe asthma.
- b. Drugs used for severe asthma~beta agonist inhalational agents, iv terbutaline, anesthetics (isoflurane), heliox, steroids.
- c. Ventilator management of severe asthma.

Competencies:

- a. The resident should recognize the patient with severe asthma, and be able to prescribe escalation of treatment.
- b. The resident should recognize the patient in respiratory failure due to asthma, and indications for intubation.
- c. The resident should understand the issues involved in ventilating the severe asthmatic.

4. Cardiovascular

Didactic:

- a. Pathophysiology of shock—septic shock, cardiogenic shock, hypovolemic shock.
- b. Cardiorespiratory interactions, with emphasis on the interaction between positive pressure ventilation and cardiovascular status.
- c. Understanding the use of various inotropic agents, afterload reducing/augmenting agents, and manipulation of the cardiovascular system with pressors and volume.
- d. Understanding the indications for and available modes of cardiovascular monitoring—arterial lines CVP monitor, pulmonary artery catheter.

Competencies

- a. The resident should be able to recognize and begin treatment for shock differentiating between distributive, cardiogenic, and hypovolemic shock.
- b. Ideally, the resident will have an opportunity to place arterial lines and gain experience in obtaining venous access in critically-ill patients. The resident should understand indications for and technique for placement of an intraosseous line.
- b. The resident should be able to order basic adjustments in hemodynamically active infusions, in conjunction with the intensivist as necessary.

5. CNS-Resuscitation

Didactic

- a. Initial evaluation of the comatose child—Glasgow coma scale, vital signs, brain-stem evaluation.
- b. Basic understanding of pathophysiology of injury to the intracranial vault—de, normal/abnormal cerebral blood flow, cerebral edema, and subsequent alterations in the setting of injury or disease.
- c. Understanding methods of manipulation of cerebral blood flow and cerebral edema; theories of cerebral resuscitation.
- d. Understanding of the indications and limitations of monitoring of the CNS—ICP, EEG, CT, etc.

Competencies

- a. The resident should be able to recognize and grade severity of coma (Glasgow coma scale)
- b. The resident should have a working knowledge of initial resuscitation methods (safe intubation and hyperventilation, mannitol), as well as indications for more invasive monitoring.

6. CNS-Seizure

Didactic

- a. Recognition and treatment of status epilepticus—antiepileptic medications.
- b. Management of the airway during a seizure.

Competencies

- a. The resident should be able to initiate treatment of a seizure, recognize the need for airway support, and initiate further investigation (is, CT, LP, EEG) as necessary.

7. Renal

Didactic:

- a. Pathophysiology of acute renal failure; fluid and electrolyte derangements in the critically ill patient; complications of chronic renal failure requiring critical care.
- b. Understand the indications for renal replacement therapy and available modalities (hemodialysis, peritoneal dialysis continuous modes of filtration and dialysis).

Competencies

- a. The resident should be able to recognize and initiate an evaluation of acute renal failure.
- b. The resident should be able to manipulate and manage fluid and electrolyte status with replacement therapy and diuretics
- c. The resident should understand the indications for acute renal replacement therapy.

8. GI/Nutrition

Didactic

- a. Indications for parenteral nutrition, early enteral nutrition.
- b. Pathophysiology of acute and decompensated chronic liver failure.
- c. Evaluation and treatment for acute gastrointestinal bleeding.

Competencies

- a. The resident should be able to develop and implement a nutritional plan for a critically-ill child, taking into account caloric and substrate needs, as well as fluid issues.
- b. The resident should be able to initiate evaluation and treatment of severe gastrointestinal hemorrhage.

9. Sedation/paralysis

Didactic

- a. Indications for narcotics, sedatives, and paralytics.
- b. Understanding of complications of such drugs, as well as treatment of withdrawal.
- c. Conscious sedation

Competencies

- a. The resident should be able to provide conscious sedation for imaging studies or simple procedures.
- b. The resident should be able to monitor and adjust more profound sedation in the critically-ill patient using narcotics and sedatives in an effective and safe manner.
- c. The resident should understand the indications for neuromuscular blockade and be able to choose the indicated drug.

10. Hematologic emergencies

Didactic:

- a. Management of Sickle Cell Disease crises--chest syndrome, stroke, splenic sequestration.
- b. Coagulation disorders and blood product replacement

Competencies

- a. The resident should be able to evaluate and begin treatment of the patient with chest syndrome.
- b. The resident should develop a working knowledge of blood product replacement---Cells, FFP, platelets, and individual products, as well as complications of transfusion.

11. Cardiopulmonary resuscitation

Didactic

- a. Organization of the code team and discussion of the role of the code team leader.
- b. Algorithms, management sequences for airway, breathing and cardiovascular management.
- c. Termination of CPR

Competencies

- a. The resident should be able to respond in the appropriate fashion to a respiratory and cardiorespiratory arrest, initiating ABC's.
- b. The resident should know drug sequences for bradycardia, SVT, and VT.

12. Ethical dilemmas in critical care.

Didactic

- a. Determining level of care, withdrawal of support, resource allocation, issues of futility.
- b. Techniques for discussing these issues with the care team and family.
- c. Brain death, organ donation.