

The University of Arizona Pediatric Residency Program

Primary Goals for Rotation

Pediatric Critical Care

1. **GOAL:** Recognize the critically ill patient and initiate appropriate stabilization and/or resuscitative measures.
2. **GOAL:** Evaluate and manage, under the supervision of an intensivist, common signs and symptoms seen in critically ill infants, children and adolescents in the intensive care setting.
3. **GOAL:** Recognize and manage, under the supervision of an intensivist, conditions that commonly present to the intensive care unit, using consultation when appropriate.
4. **GOAL:** Utilize common diagnostic tests and imaging studies appropriately in the intensive care unit, obtaining consultation as indicated for interpretation of results.
5. **GOAL:** Understand how to use the physiologic monitoring, special technology and therapeutic modalities used commonly in the intensive care setting.
6. **GOAL:** Demonstrate high standards of professional competence while working with patients in the Pediatric Intensive Care Unit.

1. GOAL: Recognize the critically ill patient and initiate appropriate stabilization and/or resuscitative measures.

- A. Explain and perform steps in resuscitation and stabilization, particularly airway management, volume replacement and resuscitative pharmacology.
- B. Describe the common causes of acute deterioration in the previously stable patient in the PICU.
- C. Function appropriately in codes and resuscitations as part of the PICU team.

2. GOAL: Evaluate and manage, under the supervision of an intensivist, common signs and symptoms seen in critically ill infants, children and adolescents in the intensive care setting.

- A. Evaluate and manage, under supervision of an intensivist, patients with signs and symptoms that present commonly to the intensive care unit.
 - 1. Cardiovascular: acute life-threatening event, bradycardia, cardiopulmonary arrest, congestive heart failure, cyanosis, hypertension, hypotension, poor capillary perfusion, rhythm disturbances, tachycardia
 - 2. Endocrine: signs and symptoms suggestive of hypo- and hyperglycemia and adrenal insufficiency/crisis
 - 3. GI: abdominal distension, hematemesis and melena, icterus, peritoneal signs, vomiting
 - 4. Hematologic: pallor, petechiae, purpura, uncontrolled bleeding
 - 5. Infectious Diseases: endotoxic shock, fever
 - 6. Neurologic: acute weakness, altered mental status, coma, delirium, encephalopathy, seizures, tetany, thermoregulatory abnormalities
 - 7. Renal: anuria, hematuria, oliguria, polyuria, severe electrolyte disturbance
 - 8. Respiratory: apnea, cyanosis, dyspnea, hemoptysis, hypercarbia, hyperpnea, hypoxemia, increased or decreased respiratory effort, poor air movement, pulmonary edema, respiratory failure, stridor, tachypnea, wheezing

3. GOAL: Recognize and manage, under the supervision of an intensivist, conditions that commonly present to the intensive care unit, using consultation when appropriate.

- A. Evaluate and manage, under the supervision of an intensivist, patients with conditions that present commonly to the intensive care unit.
 - 1. General: burns (thermal, electrical), common intoxications, drug overdose, shock (cardiogenic, hypovolemic, distributive, toxic), inhalation injury, malignant hyperthermia, non-accidental trauma, submersion injury, toxic or caustic ingestion or inhalation injury, toxic shock syndrome
 - 2. Allergy Immunology: anaphylaxis, life-threatening angioedema, Stevens Johnson Syndrome
 - 3. Cardiovascular: arrhythmias, cardiac tamponade, congestive heart failure, cyanotic congenital heart disease, malignant hypertension, myocarditis/cardiomyopathy

4. Endocrine: diabetes insipidus and adrenal insufficiency/crisis, diabetic ketoacidosis, hypo- and hyperglycemia, syndrome of inappropriate antidiuretic hormone (SIADH)
5. Fluids, electrolytes, metabolic: inborn errors of metabolism, severe dehydration (hyper-, normo-, or hyponatremic), severe acid-base disturbances, severe electrolyte disturbance
6. GI/Surgery: abdominal trauma (blunt/penetrating), acute abdomen, acute GI bleeding, fulminant hepatic dysfunction, hepatic dysfunction, pancreatitis, pre- and post-operative management, stress ulcer
7. Hematologic: anemia (severe), disseminated intravascular coagulopathy (DIC), Deep venous thrombosis (DVT), neutropenia, sickle crisis, polycythemia, thrombocytopenia, tumor lysis syndrome
8. Infectious disease: encephalitis, infant botulism, meningitis, nosocomial infections, sepsis
9. Neurologic: acute increased intracranial pressure, brain death, cerebral edema, cerebrovascular accident (CVA), coma, encephalopathy, Guillain-Barre, head injury, spinal muscle atrophy, status epilepticus
10. Pulmonary: acute respiratory distress syndrome (ARDS), epiglottitis, pulmonary edema, pneumothorax, respiratory failure/impending respiratory failure, severe croup and bacterial tracheitis, status asthmaticus, upper airway obstruction (infectious, structural, foreign body)
11. Renal: acute renal failure, hemolytic uremic syndrome

4. GOAL: Utilize common diagnostic tests and imaging studies appropriately in the intensive care unit, obtaining consultation as indicated for interpretation of results.

A. Demonstrate understanding of common diagnostic tests and imaging studies used in the PICU by being able to:

1. Explain the indications for and limitations of each study
2. Know or be able to locate readily age-appropriate normal ranges (lab studies)
3. Apply knowledge of diagnostic test properties, including the use of sensitivity, specificity, positive predictive value, negative predictive value, likelihood ratios, and receiver operating characteristic curves, to assess the utility of tests in various clinical settings
4. Discuss cost and utilization issues
5. Interpret the results in the context of the specific patient
6. Discuss therapeutic options for correction of abnormalities

B. Use appropriately the following laboratory and imaging studies when indicated for patients in the PICU setting:

1. CBC with differential, platelet count, RBC indices
2. Blood chemistries: electrolytes, glucose, calcium, magnesium, phosphate
3. Renal function tests
4. Tests of hepatic function (PT, albumin) and damage (ammonia, bilirubin, liver enzymes)
5. Serologic tests for infection (e.g., hepatitis, HIV)
6. C-reactive protein, erythrocyte sedimentation rate

7. Therapeutic drug concentrations
8. Coagulation studies: platelets, PT/PTT, fibrinogen, FSP, D-dimers, "DIC screen"
9. Arterial, capillary, and venous blood gases
10. Detection of bacterial, viral, and fungal pathogens
11. Urinalysis
12. CSF analysis
13. Gram stain
14. Stool studies
15. Toxicologic screens/drug levels
16. Other fluid studies (e.g., pleural fluid, joint fluid)
17. Chest X-ray
18. Abdominal series
19. Skeletal survey
20. Cervical spine films
21. CT scans of abdomen, chest and head
22. MRI scans
23. Basic concepts of cerebral blood flow studies

5. GOAL: Understand how to use the physiologic monitoring, special technology and therapeutic modalities used commonly in the intensive care setting.

A. Demonstrate understanding of the monitoring techniques and special treatments commonly used in the PICU by being able to:

1. Discuss the indications, contraindications and complications
2. Have a basic understanding of the general techniques (e.g., Seldinger technique for central venous line placement)
3. Interpret the results of monitoring

B. Use appropriately the following monitoring techniques in the intensive care unit under supervision of an intensivist:

1. Central venous pressure monitoring
2. Invasive arterial blood pressure monitoring
3. Intracranial pressure monitoring
4. Pulse oximetry
5. End-tidal carbon dioxide monitoring

C. Use appropriately or be familiar with the following treatments and techniques in the intensive care unit, including monitoring effects and anticipating potential complications specific to each therapy:

1. Oxygen administration by cannula, masks, hood
2. Positive pressure ventilation, including non-invasive modalities such as nasal/mask BiPAP/CPAP, bag and mask ventilation
3. Principles of ventilator management, intubation and extubation procedures and criteria
4. Analgesics, sedatives, and paralytics
5. Enteral and parenteral nutrition

6. Blood and blood product transfusions
7. Vasoactive drugs (pressors and inotropes)

6. GOAL: Demonstrate high standards of professional competence while working with patients in the Pediatric Intensive Care Unit.

A. Competency 1: Patient Care. Provide family-centered patient care that is development- and age-appropriate, compassionate, and effective for the treatment of health problems and the promotion of health.

1. Use a logical and appropriate clinical approach to the care of critically ill patients, applying principles of evidence-based decision-making and problem-solving.
2. Provide sensitive support to patients with serious illness and to their families, and arrange for on-going support or preventive services if needed.

B. Competency 2: Medical Knowledge. Understand the scope of established and evolving biomedical, clinical, epidemiological and social-behavioral knowledge needed by a pediatrician; demonstrate the ability to acquire, critically interpret and apply this knowledge in patient care.

1. Demonstrate a commitment to acquiring the knowledge base expected of general pediatricians caring for seriously ill children under the guidance of an intensivist.
2. Know and/or access medical information efficiently, evaluate it critically, and apply it appropriately to care of patients in the PICU.

C. Competency 3: Interpersonal Skills and Communication. Demonstrate interpersonal and communication skills that result in information exchange and partnering with patients, their families and professional associates.

1. Provide effective and sensitive communication with patients and families in the intensive care setting.
2. Participate effectively as part of an interdisciplinary team in the intensive care unit to create and sustain information exchange, including communication with the primary care physician.
3. Maintain accurate, timely and legally appropriate medical records on complex and critically ill children.

D. Competency 4: Practice-based Learning and Improvement. Demonstrate knowledge, skills and attitudes needed for continuous self-assessment, using scientific methods and evidence to investigate, evaluate, and improve one's patient care practice.

1. Use scientific methods and evidence to investigate, evaluate and improve one's patient care practice in PICU setting.
2. Identify personal learning needs, systematically organize relevant information resources for future reference, and plan for continuing acquisition of knowledge and skills.

E. Competency 5: Professionalism. Demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles and sensitivity to diversity.

1. Demonstrate a commitment to carrying out professional responsibilities while providing care in the PICU setting.
2. Adhere to ethical and legal principles, and be sensitive to diversity in the care of critically ill children.

F. Competency 6: Systems-Based Practice. Understand how to practice high quality health care and advocate for patients within the context of the health care system.

1. Identify key aspects of health care systems, cost control, and mechanisms for payment as they relate to the intensive care setting.
2. Recognize the limits of one's knowledge and expertise and take steps to avoid medical errors.

Procedures

A. GOAL: Technical and therapeutic procedures. Describe the following procedures, including how they work and when they should be used; competently perform those commonly used by the pediatrician in practice.

1. Anesthesia/analgesia: conscious sedation
2. Anesthesia/analgesia: pain management
3. Arterial puncture
4. Bladder: catheterization
5. Burn: acute stabilization of major burn
6. Cardioversion/defibrillation
7. Central line: use/care
8. Chest physiotherapy
9. Chest tube placement
10. Endotracheal intubation
11. Endotracheal intubation: rapid sequence intubation
12. Gastric lavage
13. Gastric tube placement (OG/NG)
14. Gastrostomy tube replacement
15. Intravenous line placement
16. Intraosseous line placement
17. Lumbar puncture
18. Medication delivery: endotracheal
19. Medication delivery: IM/SC/ID
20. Medication delivery: inhaled
21. Medication delivery: IV

22. Medication delivery: rectal
23. Pulmonary function tests: peak flow meter
24. Pulse oximeter: placement
25. Seldinger technique
26. Sterile technique
27. Suctioning: tracheostomy
28. Thoracentesis
29. Tracheostomy tube: replacement
30. Ventilation: bag-valve-mask
31. Ventilation support: initiation
32. V-P shunt external taps

B. GOAL: Diagnostic and screening procedures. Describe the following tests or procedures, including how they work and when they should be used; competently perform those commonly used by the pediatrician in practice.

1. ECG: emergency interpretation
2. ECG: perform
3. Electroencephalogram (EEG)
4. Monitoring interpretation: cardiac
5. Monitoring interpretation: pulse oximetry
6. Monitoring interpretation: respiratory
7. Monitoring interpretation: Capnometry/end-tidal CO₂
8. Radiologic interpretation: abdominal ultrasound
9. Radiologic interpretation: abdominal X-ray
10. Radiologic interpretation: cervical spine X-ray
11. Radiologic interpretation: chest X-ray
12. Radiologic interpretation: CT of head
13. Radiologic interpretation: extremity X-ray
14. Radiologic interpretation: GI contrast study
15. Radiologic interpretation: lateral neck X-ray
16. Radiologic interpretation: MRI of head
17. Radiologic interpretation: renal ultrasound
18. Radiologic interpretation: skeletal X-ray (incl. abuse)
19. Radiologic interpretation: skull film for fracture

Adapted From

Kittredge, D., Baldwin, C. D., Bar-on, M. E., Beach, P. S., Trimm, R. F. (Eds.). (2004). APA Educational Guidelines for Pediatric Residency. Ambulatory Pediatric Association Website. Available online: www.ambped.org/egweb.