

# CURRICULA

## MEDICAL INTENSIVE CARE UNIT

Trainee's Name \_\_\_\_\_

Month \_\_\_\_\_

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
06:00-06:45	Intern pre-rd	Intern pre-rd	Intern pre-rd	Intern pre-rd	Intern pre-rd	Intern pre-rd
06:45-08:00	WR/Sign-in	WR/Sign-in	WR/Sign-in	WR/Sign-in	WR/Sign-in	WR/Sign-in
08:00-12:00	AR	AR	AR	AR	AR	AR
12:00-8:00	ptcare	ptcare	ptcare	ptcare	ptcare	ptcare
19:00-20:00	Sign-out	Sign-out	Sign-out	Sign-out	Sign-out	ptcare

### I. PGY1 Objectives

#### Patient Care

- Gathers pertinent and accurate patient data including old and EMS records
- Written work is complete and organized in a problem-centered format
- Careful follow-up of patient's problems
- Begins to develop appropriate problem-based diagnostic and therapeutic plans
- Organized long and 5-minute oral presentations
- Provides clear instructions about plans of care and follow-up
- Procedures – Competently performs basic procedures<sup>1</sup> (ABG, bladder catheterization, gynecologic exam) and practices proper sterile technique.

#### Knowledge

- Commitment to CME
- Demonstrates adequate knowledge for common inpatient and outpatient medical conditions
- Begins to apply knowledge appropriately and effectively

#### Communication

- Caring, respectful behaviors
- Works well with team and consultants; follows and acknowledges all disciplines' input
- Works and communicates effectively and collegially with nursing and ancillary staff
- Teaches medical students

#### Practice-based learning

- Appreciates the limitations of his/her medical knowledge and asks for help when needed
- Independent study and learns from mistakes
- Responsive to constructive criticism
- Able to use the computerized patient database (Powerchart) effectively to obtain information
- Capable of performing a literature search to obtain some medical information

#### Professionalism

- Vigorous patient advocate; knows ALL the facts about patients
- Honesty, reliability, responsibility, cooperativeness and timeliness
- Shows respect, compassion, and integrity in working with patients, peers and attendings, and hospital staff
- Follows the rules of the residency program (e.g., work hour regulations)

#### Systems-based practice

- Actuates care and discharge plans expeditiously and completely
- Participates constructively with disposition planning

\_\_\_\_\_  has successfully achieved the above-listed objectives of this rotation OR  
 \_\_\_\_\_  has not successfully achieved the objectives highlighted above.

\_\_\_\_\_ (Electronic Signature of Attending Physician)

I had the opportunity to review my evaluation objectives form with the attending physician. I had sufficient opportunity to meet the above objectives during the rotation. (Electronic Signature of Resident)

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06:45-08:00	WR/Sign-in	WR/Sign-in	WR/Sign-in	WR/Sign-in	WR/Sign-in	WR/Sign-in
08:00-12:00	AR	AR	AR	AR	AR	AR
12:00-8:00	ptcare	ptcare	ptcare	ptcare	ptcare	ptcare
19:00-20:00	Sign-out	Sign-out	Sign-out	Sign-out	Sign-out	ptcare

**I. PGY2 Objectives for MICU** The PGY2 will demonstrate mastery of the objectives outlined for the PGY1 rotation AND additionally:

Patient Care

- Identifies, prioritizes and synthesizes patient's problems appropriately
- Appreciates and considers alternatives for diagnoses and treatment
- Able to independently develop and carry out management plans in MICU, but always validates/confirms with attending first
- Orders appropriate tests and interprets results of tests and procedures properly
- Triage patients to appropriate location; primary admitting caregiver for patients requiring 3:1 nursing
- Participates constructively on the hospital REV team
- Procedures - Knowledge of procedural indications, complications, and contraindications; obtains informed consent; receives supervision of procedure when skill level requires; documents a complete procedure note in chart and procedure log<sup>1</sup>

Knowledge

- Commitment to CME
- Integrates progressive knowledge in Bayesian synthesis
- Understands and responds to social and behavioral issues

Communication

- Ensures that the primary physician and MICU attending are kept apprised of the patient's status as appropriate

Practice-based Learning

- Appreciates limitations of his/her medical knowledge and asks for help when needed
- Continues to seek to improve self as a physician
- Addresses and uses evidence from primary scientific studies to guide patient care; provides team with at least one original article

Professionalism

- Understands ethical principles pertaining to medical care
- Sensitive to patient's culture, age, gender, and disabilities

Systems-based Learning

- Appreciates the resources within the hospital and mobilizes them efficiently to serve the needs of patients
- Shows awareness of cost and length of stay issues and the need to be prudent in utilizing resources

\_\_\_\_\_  has successfully achieved the above-listed objectives of this rotation OR

has not successfully achieved the objectives highlighted above.

\_\_\_\_\_ (Electronic Signature of Attending Physician)

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06:00-06:45	Intern pre-rd	Intern pre-rd	Intern pre-rd	Intern pre-rd	Intern pre-rd	Intern pre-rd
06:45-08:00	WR	WR	WR	WR	WR	(Hosp)AR
08:00-09:00	AR	AR	AR	AR	AR	(TC)AR
09:00-10:30	MR	MR	MR	MR	MR	AR
10:30-12:00	WR/ptcare		TAR	TAR	TAR	ptcare
12:00-13:00	Conference	Conference	Conference	Conference	Conference	ptcare
03:00-17:00	ptcare	ptcare	ptcare	ptcare	ptcare	ptcare
17:00-20:00	Sign-out	Sign-out	Sign-out	Sign-out	Sign-out	ptcare

## (Daytime) PGY3 Objectives for MICU

The PGY3 will demonstrate mastery of the objectives outlined for the PGY1&2 rotation AND additionally:

### Patient Care

- Shows reasonable judgement in ambiguous situations (i.e., calls for help appropriately).
- Thoughtfully adjusts management plans according to information obtained in follow-up
- Directs and supervises patient care and teaching of junior residents/students.
- Procedures – Demonstrates facility with invasive procedures and teaches proper techniques.

### Knowledge

- Commitment to CME
- Applies progressive knowledge sufficient to manage with minimal supervision
- Demonstrates analytical thinking and ability to develop well-formulated differential diagnoses for patients with multiple problems; independent Bayesian synthesis
- Communication

### Practice-based Learning

- Effectively discusses end of life care issues with patients and their families
- Acts as a consultant in internal medicine to other clinical services
- Provides the team with more than one original article and/or review articles that inform diagnosis or management of active patients

### Professionalism

- Appreciates the limitations of his/her medical knowledge and asks for help when needed

### Systems-based Learning

- Aware of community resources that can assist and enhance patient care objectives
- Actively balances quality of patient care with costs and length of stay

\_\_\_\_\_  has successfully achieved the above-listed objectives of this rotation OR  
 has not successfully achieved the objectives highlighted above.

\_\_\_\_\_ (Electronic Signature of Attending Physician)

I had the opportunity to review my evaluation objectives form with the attending physician. I had sufficient opportunity to meet the above objectives during the rotation. (Electronic Signature of Resident)

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09:00-10:30	MR	MR	MR	MR	MR	AR
10:30-12:00	WR/ptcare		TAR	TAR	TAR	ptcare
12:00-13:00	Conference	Conference	Conference	Conference	Conference	ptcare
03:00-17:00	ptcare	ptcare	ptcare	ptcare	ptcare	ptcare
17:00-20:00	Sign-out	Sign-out	Sign-out	Sign-out	Sign-out	ptcare

## I. (Nightfloat) PGY3 Objectives for MICU

The PGY3 will demonstrate mastery of the objectives outlined for the PGY1&2 rotation AND additionally:

### Patient Care

- Shows reasonable judgement in ambiguous situations (i.e., calls for help appropriately).
- Thoughtfully adjusts management plans according to information obtained in follow-up
- Directs and supervises patient care and teaching of junior residents/students.
- Accurately AND efficiently presents new patients during off-hours.
- Formulates own differential diagnoses, diagnostic plan and therapeutic plan BEFORE seeking attending's prescriptions
- Procedures – Demonstrates facility with invasive procedures and teaches proper techniques.

### Knowledge

- Commitment to CME
- Applies progressive knowledge sufficient to manage with minimal supervision
- Demonstrates analytical thinking and ability to develop well-formulated differential diagnoses for patients with multiple problems; independent Bayesian synthesis
- Communication

### Practice-based Learning

- Effectively discusses end of life care issues with patients and their families
- Acts as a consultant in internal medicine to other clinical services
- Provides the team with more than one original article and/or review articles that inform diagnosis or management of active patients

### Professionalism

- Appreciates the limitations of his/her medical knowledge and asks for help when needed

### Systems-based Learning

- Participates in daily rounds – presenting new patients – to ensure that information is transmitted accurately to enhance patient care/disposition

\_\_\_\_\_  has successfully achieved the above-listed objectives of this rotation OR

\_\_\_\_\_  has not successfully achieved the objectives highlighted above.

\_\_\_\_\_ (Electronic Signature of Attending Physician)

I had the opportunity to review my evaluation objectives form with the attending physician. I had sufficient opportunity to meet the above objectives during the rotation. (Electronic Signature of Resident)

## **II. Educational Purpose of Rotation:**

The purpose of the MICU rotation is to expose and instill a reasonable working knowledge and problem-solving skill-set required to optimally care for patients requiring critical care.

A) Knowledge -Over the course of three years, the resident will develop an increasingly in-depth knowledge with regard to the pathogenesis, clinical manifestations, natural history, diagnosis, and management of a wide variety of medical problems that lead to critical illness. On the general medical inpatient service, this will include problems involving, but not limited to: infectious diseases, the cardiovascular, respiratory, gastrointestinal, endocrine, genitourinary, musculoskeletal, and neurological systems. The incremental knowledge gained is experiential. For every patient admitted to the resident's service, he/she is expected to know all the facts about and learn (through the teaching by more senior residents, attending staff, and readings), in detail, about all of the medical and related psychosocial problems experienced by that patient.

B) Skills: From the experiences gained during the rotation, the resident will:

1) Refine his/her skills in medical history taking (especially synthesizing family members' reports, EMS records and ED records) and physical diagnosis, 2) Learn to prioritize tasks, 3) Use time efficiently, 4) Learn the principles of medical decision making, 5) Learn to cost-effectively order diagnostic studies and provide therapeutic interventions.

C) Attitudes: Desirable attitudes in the trained internist. He/she should:

1) Assume primary responsibility for patients' welfare – knowing every detail of their history (including old records), physical examination, laboratories, diagnostic/therapeutic plan, 2) Access the opinions of attending physicians and consultants ONLY AFTER thinking about a case and offering their best effort at synthesis and a plan, 3) Appreciate the role of the general internist, his capabilities as well as limitations with respect to caring for critically ill patients, 4) Value helping each patient to achieve the best attainable level of physical, mental, and social functioning, 5) Value cost-effective medicine, 6) Value the role of medical ethics in the medical decision making process.

**III. Principal Teaching Methods:** Residents will learn by having progressively increasing responsibilities for the care of the inpatients on the MICU service. The PGY-1 will perform admission history and physicals, write all orders on his/her patients, formulate a problem list with appropriate differential diagnosis and management plans. But his/her primary role is “reporter” – to gather the evidence and begin thinking about synthesis. PGY-2 and –3 residents are expected to formulate comprehensive differential diagnoses, diagnostic plans and therapeutic plans THEN share these with attending physicians-of-record for approval/fine-tuning. In addition to these constant, daily interactions (resident-intern, resident-attending), trainees will also learn through:

1. Teaching Attending and Combined Management Rounds - Daily (8-12:00)
2. Noon conference lecture series – 5 days/week, July-September is a repeating course of core topics, while October-June includes specialty and sub-specialty lectures comprising a 2-year cycle that covers most fundamental topics for each discipline.

A detailed description of teaching methods, in University of Rochester (i.e. competency-specific) format, is included toward the end of this curriculum.

**IV. Patient Characteristics** – All patients admitted to the Medical Intensive Care Unit. These patients include nearly equal numbers of men and women, ranging in age from 18 to over 100 years and of average age in the mid 60's and average APACHE II score of 20. Roughly 20% of patients have no insurance of Medicaid. The remaining have Medicare or private insurance. The socioeconomic demographic mirrors that of the community (20-30% poor, 70-80% middle class). Patients are admitted with a broad array of multiple and complex medical illnesses. In addition, the MICU Service also inherits primary inpatient care of postoperative patients if surgical issues are quiescent and Surgery and Medicine physicians agree. Rarely, patients with active surgical issues will be admitted to the MICU Service primarily with Surgery consultation and follow-up. The only training site for MICU is Bridgeport Hospital.

**V. Procedures** - Residents will have the opportunity to perform all procedures on their patients including: arthrocentesis, paracentesis, thoracentesis, placement of central vein catheters, lumbar puncture, bone marrow aspirates, arterial catheterization and biopsies. All will be performed under the supervision of residents or attendings who are certified in these procedures (see Institutional Procedures Credentialing Policy).

**VI. References** – Hall, Schmidt, Wood, *Principles of Critical Care*; Computerized data-bases available throughout the hospital at every terminal: *Up-to-Date* and *MD-Consult*. All trainees are expected to use one of these or similar resources to master topics that are germane to their patients every day. \*All trainees are required to have reviewed and mastered the Critical Care Evidence-Based Medicine Practices Syllabus (located in hard-copy in MICU and electronically at: [http://internalweb/admin/docs/Web\\_Pages/Library/MICU.htm](http://internalweb/admin/docs/Web_Pages/Library/MICU.htm)). In addition, PGY-2's and -3's are expected to support the teams with original articles, using Pub-Med or Ovid searches (also available hospital-wide), that are applicable to and inform patients' care.

#### **V. Methods of Evaluation**

Residents and interns are evaluated by their teaching and work-rounds attending physician. Residents will also evaluate each other.

Residents and interns will evaluate each other, the quality of the rotation, their work-rounds attending physician and the degree to which they had the opportunity to meet objectives (listed above). When students are on-service, residents and interns will provide timely evaluations of the students' performance. All evaluations will be performed on-line, by email, using the E-value system. A resident shall not receive credit for a rotation until he has evaluated the rotation, attending and the degree to which he had opportunity to complete the objectives.

## **DETAILED CURRICULUM**

### **FACULTY (for MICU):**

CA Manthous, MD  
David Kaufman, MD  
Add Armand Wolff, MD  
John Ayala, MD  
Adeel Salam, MD  
Daniel Rudolph, MD  
Jeffrey Kwon, MD

### **Curriculum for Critical Care Medicine**

### **Teaching Objectives**

#### **Topics that the trainee is expected to master –**

##### **1. Circulatory disorders –**

##### **Bedside approach to the patient with shock.**

- a. Septic shock
  - b. Cardiogenic shock
  - c. Hypovolemic shock
  - d. Management of hypertensive emergencies.
2. Respiratory disorders –
    - a. Hypoxemic RF
    - b. Hypercapnic RF
    - c. Basic ventilator management
    - d. Assessment of the airway
  3. Infectious diseases
    - a. Approach to the patient with septic shock
    - b. Nosocomial infections
  4. Renal disorders –
    - a. Acid-base and electrolyte disorders
    - b. Approach to the patient with acute, chronic and acute on chronic renal failure
  5. Gastrointestinal disorders –
    - a. Gastrointestinal hemorrhage
    - b. Stress ulcer and critical care gastropathy
    - c. Motility disorders of critical illness
    - d. Nutrition
  6. Endocrine and metabolic disorders –
    - a. Management of hyperglycemia, DKA, HONKC
    - b. Adrenal insufficiency
    - c. Thyroid disease in the ICU
    - d. Toxic ingestions
  7. Neurologic disorders –
    - a. Approach to coma, delirium and encephalopathy
    - b. Meningitis
    - c. Approach to the patient with cerebral vascular accident
  8. Hematologic disorders –

- a. ICU-related thrombocytopenia
  - b. Disseminated intravascular coagulation
  - c. Thromboembolic disease and prophylaxis
9. End-of-life issues –
- a. Living wills and advance directives
  - b. Addressing “code status”
  - c. Components of end-of-life discussions

**Procedures and Techniques –**

1. Central venous catheterization – femoral and internal jugular approaches
2. Arterial catheterization – radial approach
3. Paracentesis
4. Lumbar puncture

## **I. Patient-Based Experience-**

1. Primary Patient Responsibility - Interns and residents in the medical intensive care unit work closely with the patients' primary care physicians and assigned intensivist to provide comprehensive care from the time patients come to the emergency room to their transfer to the floor. The trainees are responsible for obtaining the clinical history and daily physical examinations and write the only daily comprehensive system-oriented progress notes regarding patient care. They also write the formal admission note for each patient. Communication with patients' families are shared between attending, PGY-3 and PG-I.

### 2. Responsibilities:

Interns are responsible for gathering all appropriate patient data and presenting it in a formal and cogent systems-oriented fashion to the resident, fellow and attending physician. They are expected to have formulated a tentative care plan for each patient, each day. They are also responsible for performing critical care procedures including arterial and venous catheterizations, thoracenteses, paracenteses and when possible right heart catheterization performed under the supervision of the resident, fellow or attending physician.

Residents are responsible for assuring that interns perform their responsibilities while playing a general oversight role in the MICU. They are the first to assess critically ill patients and usually, with the input of the primary physician, decide whether a patient is to be admitted to the MICU. They generally write admitting history/physical for each patient. They also participate in refining management plans and in planning discharge from the MICU. The night-float resident rounds on all patients between 5 and 7 AM, writing brief SOAP notes in preparation for detailed sign-outs at 7 AM.

## **B. Patient-Based Teaching**

1. Rounds - Formal teaching rounds are conducted by a trained pulmonologist/intensivist each day. These rounds are interdisciplinary and include the patient's bedside nurse, and occasionally a medical librarian and/or a clinical pharmacist. Rounds generally last between 2 and 3 hours each day and are followed by teaching radiology rounds. After presentation of each patient, the team may go to the bedside to examine the patient and to continue further bedside teaching points. Discussion of patient related issues includes historical, physical examination, hemodynamic, respiratory and laboratory data integrated to formulate a cohesive and comprehensive plan for patient management for the day.

From an educational standpoint, Bridgeport Hospital is large enough so that each trainee will gain significant experience in the management of the major common critical illnesses. In addition, the patient mix allows our residents to become very comfortable with the general principles, including hemodynamics and ventilator management, of critical care. The medical intensive care unit averages 45 admissions per month with an average daily census of **10-14** patients. The acuity of illness of our patients is high; the average APACHE is around 17-18. Thus, our trainees are afforded an excellent patient base for their educations.

2. Clinical conferences - See below.

## **C. Didactics/Clinical Conferences**

Critical care didactic sessions occur on afternoons when clinical activity allows. In addition the entire housestaff receives a similar list of lectures again during noon conferences administered over the course of the year (1-2 lectures/month).

See attached curriculum.

#### **D. Strengths and Weaknesses of the Institution**

Strengths - There is an abundance and great spectrum of critical illness at Bridgeport Hospital. There are 5-6 intensivists on staff here who can serve as a constant resource to our trainees. The nurses are excellent and aide in educating our residents; they attend rounds daily. The ICU is a state of the art new facility.

Weaknesses - Because of ABIM requirements, no more than 2 interns are available for the critical care block in any given month. Though, the patient load can be overwhelming at times, we attempt to limit each intern to no more than 5 patients at a time. They probably average 3-4 patients for whom they have primary responsibility on any given day.

Name \_\_\_\_\_

### Principles of Critical Care Self-Examination

1. In patients with acute hypoxemic respiratory failure, the goal of PEEP therapy should be to determine
  - A. the maximum PEEP that results in peak airway pressures  $< 40$  cmH<sub>2</sub>O
  - B. the minimum PEEP that allows  $\geq 90$  percent saturation of arterial blood on a nontoxic FiO<sub>2</sub> with an adequate cardiac output
  - C. the PEEP that results in maximal compliance of the respiratory system
  - D. none of the above.
  
2. Which of the following interventions is most useful in determining whether the cause of hypoxemia is ventilation-perfusion mismatch or shunt?
  - A. Determining the response to an FiO<sub>2</sub> of 100%
  - B. Insertion of a pulmonary artery catheter
  - C. Performance of a ventilation-perfusion scan
  - D. Measurement of static and dynamic compliance on the ventilator.
  
3. A 70 year-old man with an unknown medical history is intubated because of hypoxemia refractory to a 100% nonrebreather mask. On assist control with FiO<sub>2</sub> of 40%, tidal volume of 500 mL, respiratory rate of 15 bpm, and an inspiratory flow of 40 L/min, the arterial blood gas is pH=7.36, PO<sub>2</sub>=120, PCO<sub>2</sub>=50. Peak pressure is 60 cmH<sub>2</sub>O, pause pressure is 30 cmH<sub>2</sub>O and intrinsic PEEP is 15 cmH<sub>2</sub>O.  
The calculated resistance is
  - A. 60 cmH<sub>2</sub>O/lps
  - B. 45
  - C. 30
  - D. 15
  
4. Given the above data, possible explanations to account for this patient's respiratory mechanics and arterial blood gas include
  - A. pulmonary edema
  - B. pneumonia
  - C. pulmonary embolism
  - D. bronchospasm
  
5. All of the following statements are true regarding autoregulation of cerebral blood flow EXCEPT
  - A. mean systemic blood pressures below 50 to 60 mmHg are associated with linear decreases in blood flow with pressure
  - B. elevations in blood pressure have little effect on cerebral blood flow
  - C. chronic hypertension can result in decreases in blood flow at values of blood pressure usually associated with normal flow.
  - D. acidosis and head trauma affect blood pressure limits of autoregulation.
  
6. A 24-year-old man is found unconscious. Arterial blood gases are PO<sub>2</sub>=70, PCO<sub>2</sub>=60 and pH=7.24. The acid-base disorder is
  - A. metabolic acidosis
  - B. respiratory acidosis and metabolic alkalosis

- C. respiratory acidosis and metabolic acidosis
- D. acute respiratory acidosis
- E. respiratory alkalosis and metabolic alkalosis

7. A 23-year-old man with right middle lobe pneumonia was intubated for progressive hypoxemia. After intubation, the peak pressure alarm soundd and breath sounds were not heard over the left hemithorax.

The first response should be to

- A. order a chest x-ray to evaluate the situation further as long as the patient is stable
- B. insert a needle into the left chest to rule out pneumothorax
- C. pull back the endotracheal tube slightly
- D. add positive end-expiratory pressure (PEEP) in increments of 3 to 5 cm H<sub>2</sub>O to treat left lung atelectasis, a common finding in mechanically ventilated patients
- E. decrease tidal volume to lower peak airway pressure.

8. The most common cause of multiple systems organ failure is

- A. trauma
- B. iatrogenic complications
- C. liver failure
- D. sepsis

9. Positive end-expiratory pressure (PEEP) is often used in the therapy of the adult respiratory distress syndrome. While PEEP is often useful in reducing shunt and allowing the use of a less toxic oxygen concentration, it may also have deleterious effects. The potential deleterious effects of PEEP include all the following EXCEPT

- A. reduction of venous return in hypovolemic patients
- B. hyperinflation of nonflooded alveoli with the risk of barotrauma
- C. increased left ventricular afterload
- D. increased right ventricular afterload
- E. increased dead space in patients with hypovolemia

10. Narcotic use and possible overdose can be suggested by all the following EXCEPT

- A. a reversal of respiratory depression with naloxone but negative urine assays for narcotics.
- B. seizures and irregular respiratory pattern in a patient with metastatic cancer who is receiving morphine for pain control
- C. miosis and coma
- D. hypotension and hypoventilation
- E. noncardiogenic pulmonary edema in a known abuser of intravenous drugs

11. The major cause of mortality in patients with fulminant hepatic failure is

- A. sepsis
- B. variceal hemorrhage
- C. acute hypoxemic respiratory failure
- D. cerebral edema
- E. the intial precipitant of fulminant hepatic failure

12. The pentad of findings that characterizes thrombotic thrombocytopenic purpura (TTP) includes all the following EXCEPT

- A. fever
- B. microangiopathic hemolytic anemia
- C. renal dysfunction

D. abnormal liver function profile

13. Which of the following should be included in the differential diagnosis of dyspnea in a patient with malignancy?

- A. Pulmonary embolism
- B. Radiation pneumonitis
- C. Constrictive pericarditis
- D. Superior vena cava syndrome
- E. All of the above

14. A 38-year old white man with an unremarkable past medical history presents after the acute onset of severe headache and coma. The most probable cause of this patient's neurologic event is

- A. embolic stroke
- B. intracerebral hemorrhage
- C. seizure
- D. subarachnoid hemorrhage

15. Which level of PEEP results in the greatest static lung compliance (assuming no change in tidal volume)?

Static Pressure (cmH <sub>2</sub> O)	PEEP (cmH <sub>2</sub> O)
A. 40	5.0
B. 41	7.5
C. 42	10.0
D. 46	12.5
E. 50	15.0

16. What is the cardiac output of a patient with an oxygen consumption of 250 mL/min and an arterial-venous content difference of 5 mL/dL?

- A. 2.5 L/min
- B. 3.0
- C. 4.5
- D. 5.0
- E. 7.5

17. Clinical signs of severe asthma include all the following EXCEPT

- A. absence of wheezing
- B. subcutaneous emphysema
- C. pulsus paradoxus > 15 mmHg
- D. dyspnea that precludes speech
- E. metabolic alkalosis

18. The best noninvasive test for the presence and degree of pulmonary hypertension is

- A. hilar-to-thoracic ratio and diameter of the right descending pulmonary artery on posteroanterior chest x-ray
- B. "sonspirometry" of the inferior vena cava
- C. physical examination
- D. Doppler-aided echocardiography

- E. phonocardiography
19. Common causes of arrhythmia in critically ill patients include all the following EXCEPT
- A. electrolyte abnormalities
  - B. catecholamine excess
  - C. myocardial ischemia
  - D. infiltrative cardiomyopathies
  - E. drug intoxications
20. Ventilation-perfusion scans can be difficult to interpret in critically ill patients. However, there are some instances in which they can be extremely useful. All the following ventilation-perfusion results are useful EXCEPT
- A. a normal perfusion scan in a 50-year old man with chest pain
  - B. multiple matched subsegmental ventilation and perfusion defects in a 65-year-old woman with COPD
  - C. complete lack of perfusion to one lung in 32-year-old neurosurgical patient with shock
  - D. a single matched ventilation and perfusion defect in a patient with fever, leukocytosis, purulent sputum, and an infiltrate on chest x-ray in the same region as the ventilation and perfusion defects.
  - E. a segmental perfusion defect in a patient with a clear chest x-ray who has developed new-onset atrial fibrillation and hypoxemia after hip replacement
21. Regarding CNS dysfunction with sepsis syndrome, which of the following is true?
- A. Most episodes of neurologic dysfunction are related to direct infectious involvement of the CNS
  - B. The response of cerebral blood flow to PaCO<sub>2</sub> seems preserved
  - C. Owing to protective alterations in autoregulation, perfusion abnormalities have not been implicated
  - D. Studies on metabolic changes have failed to disclose any alterations in amino acid concentrations or neurotransmitter concentrations
  - E. CNS dysfunction in sepsis syndrome is uncommon.
22. Complications of smoke inhalation include all of the following EXCEPT
- A. bronchospasm
  - B. pneumothorax
  - C. pulmonary edema
  - D. upper airway obstruction
23. Initial daily caloric requirements for a critically ill patient with respiratory failure would most likely be
- A. 500 kcal
  - B. 1500 kcal
  - C. 2500 kcal
  - D. 3500 kcal
  - E. 4500 kcal
24. All the following clinical data portend a poor prognosis in patients with pneumococcal pneumonia EXCEPT
- A. age greater than 70 years

- B. multilobar involvement on chest x-ray
- C. neutropenia
- D. pleural effusion
- E. hypoxemia

25. A 68-year old man with an anterior wall myocardial infarction has a pulmonary capillary wedge pressure of 16 mmHg and a low cardiac output. He is started on dobutamine and his blood pressure falls from 93/70 to 87/55 mmHg. What is the best response?

- A. Stop dobutamine and start dopamine
- B. Continue dobutamine and add dopamine
- C. Give a bolus of 500 ml normal saline
- D. Start norepinephrine (Levophed)
- E. Consider an intraaortic balloon pump

Match the factors below with the appropriate acid-base status.

- A. Metabolic acidosis with elevated anion gap
- B. Metabolic acidosis with normal anion gap
- C. Metabolic alkalosis

26. Administration of acetazolamide

27. Nasogastric suctioning

28. Diarrhea

29. Aspirin overdose

Match the following hemodynamics with the diseases listed in 30-34

	BP	RA	RV	PA	PCWP	CO	MVO <sub>2</sub>
A.	95/63	18	32/16	33/20	19	6.4	72%
B.	92/59	19	53/17	53/35	16	2.7	52%
C.	85/52	16	36/14	36/14	14	9.2	78%
D.	89/64	18	33/19	33/19	18	2.5	61%
E.	76/40	17	66/15	66/44	24	5.4	68%

30. Pericardial tamponade

31. Massive pulmonary embolism

32. Ruptured ventricular septum

33. Cor pulmonale with sepsis

34. Cirrhosis with renal failure

Match the following

- A. Acute hypoxemic respiratory failure
- B. Acute ventilatory failure
- C. Both
- D. Neither

35. Therapy with PEEP
36. PaCO<sub>2</sub>=70 mmHg after bronchoscopy with midazolam sedation
37. Somnolent patient with systemic weakness and vital capacity reduced to 30 ml/kg
38. ARDS with excessive spontaneous work of breathing and increasing paCO<sub>2</sub>

Match the following

- A. Small reactive pupils
- B. Large, nonreactive pupils
- C. Pinpoint, reactive pupils
- D. Unilateral, large, nonreactive pupils
- E. Mid-sized reactive pupils

39. Narcotic overdose
40. Uncal herniation

Answers:

- |       |       |
|-------|-------|
| 1. B  | 21. B |
| 2. A  | 22. B |
| 3. B  | 23. C |
| 4. D  | 24. D |
| 5. B  | 25. C |
| 6. D  | 26. B |
| 7. C  | 27. C |
| 8. D  | 28. B |
| 9. C  | 29. A |
| 10. B | 30. D |
| 11. D | 31. B |
| 12. D | 32. A |
| 13. E | 33. E |
| 14. D | 34. C |
| 15. C | 35. A |
| 16. D | 36. B |
| 17. E | 37. B |
| 18. D | 38. C |
| 19. D | 39. C |
| 20. B | 40. D |

## **Critical Care Core Curriculum - Overview (13 hours)**

### **I. The Pathophysiology of Critical Illness**

1. The Respiratory System/Respiratory Failure (1 hour): Manthous
2. The Cardiovascular System/Shock (1): Manthous
3. The Central Nervous System (1): Raju
4. Acid-Base and Electrolyte Homeostasis (1): Choi

### **II. Fundamental Problems in Critical Care**

1. Sepsis, Sepsis Syndrome, Septic Shock and MOF (1): Manthous
  2. ICU Logistics (1): R. Smith
  3. Drug Interactions, Ulcer prophylaxis and ICU sedation (1): Huang (Pharmacy)
  4. Mechanical Ventilation/Modes with simulation (1): DeMichiel (RT)
  5. Myocardial Ischemic Disease & Arrhythmias (Overview) (1): Pulmonary Fellow
  6. Nutrition (1): S. Smith (Nutrition services)
  7. Ethical Considerations/Death and Dying (1): Pulmonary Fellow
  8. Gastrointestinal hemorrhage (July to December) (1): GI Fellow
  10. Poisonings/Intoxications (January-June) (1): Haddad
- 
- Texts:
1. Principles of Critical Care, Hall, Schmidt, Wood, 1992

#### Texts:

1. Principles of Critical Care, Hall, Schmidt, Wood, 1992
2. Principles of Critical Care Companion Handbook, Hall, Schmidt, Wood, 1998.

## **Guidelines for Critical Care Education – Department of Medicine Curriculum Revisions 2006**

**To:** All teaching attendings in the medical intensive care unit.

**RE:** Goals for teaching attendings in the ICU – Minimal requirements for trainees during the rotation and suggestions for how to achieve them. All trainees should, by the end of their first rotation, be proficient at presenting cases and daily follow-ups in a concise and systems-oriented fashion. Notes should be written in the SOAP format with system-by-system assessments/plans. Specific disease processes can be addressed on a case-by-case basis. However, the goal is to assure that trainees have attained a basic “tool-box” for approaching a broad array of clinical problems in critically ill patients that will also serve them in caring for other hospitalized and out-patients.

Many of these issues have been presented in lectures; daily repetition is the best method of assuring that trainees make these part of their tool-boxes. The goals listed below complement the formal didactic curriculum and represent the minimum that each trainee is exposed to; specific disease states can be discussed on a case-by-case basis as they present. All of the objectives listed below are for both interns and residents – we should expect our PGY-3’s to have mastered most of this material and thus when interns are unable to answer correctly, consider giving the resident the opportunity to answer. Topics preceded by a star are also covered in the didactic lecture series. We also suggest that attendings either walk round or make contact with the PGY-3 toward the end of each day to assure that the day’s objectives have been met and that no new issues require attention on the night shift. The following are “talking points” – we should repeat thinking aloud about the concepts until the residents can do so themselves and/or spontaneously without solicitation.

### **1. Circulation/Cardiovascular Pathophysiology:**

- a. **\*Shock** – Residents and interns should be able to define whether the patients present with high-output or low-output shock and if in low-output whether it is heart full or heart empty. This can be scrutinized in rounds when trainees present a patient with shock and whenever possible a visit at the bedside to confirm the impression. The utility of echocardiography and Swan Ganz catheterization to decipher cases of uncertain type or mixed shock can be examined.

**Residents should be familiar with the commonly used cardiovascular inotropes and pressors (dopa, dobu, norepi, neo), dosing schema and their actions, as well as when to use each.**

- b. **\*Arrhythmia** – A basic understanding of the pathophysiology and treatment of common arrhythmias including atrial fibrillation, atrial flutter, AV nodal re-entrant tachycardia, ventricular tachycardia and ventricular fibrillation. Examination of rhythm strips and 12-lead electrocardiograms of patients with arrhythmia during daily rounds should serve as the steppingstone to criteria for diagnosis and management.
- c. **Cardiopulmonary arrest** – Although all trainees have undergone training and been certified in ACLS, consider constant reinforcement of pathways of treatment, emphasizing team leadership during a code. When patients present after a CP arrest trainees should be able to define the primary mechanism of the arrest (respiratory versus cardiac), what may have precipitated it and how it was treated. This subject is covered extensively in the CPR course that all trainees take and in-services that occur during the summer. However, we can provide feedback for improvement to PGY-3’s following Codes that we observe.
- d. **Intravascular monitoring** – Trainees should become facile at interpretation of both CVP and Swan Ganz data through daily discussion of these values (in patients who have them) and how to use them to make therapeutic decisions regarding volume infusion vs. diuresis. They should also be given the opportunity to do at least 3-4 central line placements under the supervision of either the Attending or Fellow.

### **2. Respiratory Pathophysiology:**

- a. **\*Respiratory failure** – Trainees should be able to define whether patients are placed on mechanical ventilators for hypoxemic (Type 1), hypercapnic (Type 2) or mixed respiratory failure. Each day that the patient remains on the ventilator, the trainee should be able to define which type binds the patient to the ventilator. For hypoxemic RF, they should understand that flooding (with blood, pus, fluid) or atelectasis are the principle causes. For hypercapnic respiratory failure and/or for rapid shallow breathing during spontaneous breathing trials, they should be able to dissect the elements of respiratory neuromuscular capacity and quantify respiratory loads (resistance, compliance and minute volume) that have become misbalanced and aim treatments accordingly.
- b. **\*Mechanical Ventilation** – Trainees should be able to describe how assist control, pressure support and CPAP support patients. They should be able to write ventilator orders in components: Mode/respiratory rate/tidal volume/inspired oxygen concentration/PEEP. The roles of different modes (AC and IMV during repair of respiratory failure; pressure support and CPAP during weaning). Each day, by reviewing the ventilator settings, blood gases and respiratory mechanics the team should scrutinize the appropriateness of the settings (using ACCP Consensus Guidelines to adjust tidal volumes that yield plateau airway pressures 20-25 cmH<sub>2</sub>O and almost never above 35 cmH<sub>2</sub>O etc.). The risks of mechanical ventilation should be emphasized – leading to daily interrogation of patient readiness for liberation from mechanical ventilation.
- c. **\*Weaning** – Although different practitioners use different techniques, daily examination of the patients for readiness by the team helps emphasize this point: Patients not in shock or with evolving MI and who have a PaO<sub>2</sub>>60 mmHg on an FiO<sub>2</sub>≤0.5 on a PEEP≤5 cmH<sub>2</sub>O are candidates for measurement of the RSBI which if below 125 bpm/L can lead to a spontaneous breathing trial (pressure support<8 cmH<sub>2</sub>O, CPAP or T-piece) to determine readiness for liberation. If they pass the trial – going to the bedside to observe passed and failed trials helps emphasize criteria of failure and success. Then consider endotracheal extubation as a separate, second issue (emphasizing the difference between need for the ventilator and need for the airway and factors that determine need for an ETT).
- d. **Pneumonia** – When cases present, discussion can center on the differences (of etiology and how to treat) between community- and hospital-acquired pneumonia.
- e. **Exacerbations of COPD** – When cases present, rounds should include discussion of the pathogenesis of exacerbations (bronchospasm, bronchitis, pneumonia), how to measure airway resistance and dynamic hyperinflation on the ventilator (bedside exercise) and management. It is especially important that trainees be facile at identifying acute vs. chronic vs. acute on chronic hypercapnia (which can be tied into blood gas interpretation, See above).

### 3. Nephrology

- a. **Acute renal failure** – **The aim in morning rounds is to identify new and/or worsening azotemia as renal, prerenal or post-renal using physical examination (bedside rounds can be used to help confirm the trainee’s impression regarding intravascular volume status) and laboratories/radiologic procedures.**
- b. **\*Acid-base** – Daily interpretation of arterial blood gases serves as the point of departure for differential diagnosis of various acid base abnormalities. Over the course of a month, trainees are likely to be exposed to a broad cross-section of acid-base problems.
- c. **Electrolytes** – Daily presentation of electrolytes and discussion of common reasons and treatments of common electrolyte problems.

### 4. Gastrointestinal Diseases

- a. **\*Gastrointestinal bleeding** – Common causes for gastrointestinal bleeding can be discussed on a case-by-case basis. Essential components of management – including vascular access, vascular monitoring, resuscitation, correction of coagulopathies and direct treatments (upper endoscopy for UGI bleeding and angiography for LGI bleeding). We should stress the need for some method of

monitoring for the adequacy of intravascular volume. Beyond monitoring of blood pressure, heart rate and urine output, trainees should understand that either CVP monitoring or frequent checks for postural changes in heart rate/blood pressure are essential monitoring in ICU patients with GI bleeding.

**This section should include daily discussion of whether each patients requires gastric protective treatments and if so which agent is being used and how is success of therapy being monitored (pH checks etc.).**

- b. \*Nutrition – Nutrition should be discussed each day – route of administration, amount of feeding and progress (via regular prealbumin checks) can be part of the routine daily presentations, integrating the clinical nutritionists comments who rounds with the ICU team thrice weekly.

## 5. Infectious Diseases

- a. Nosocomial infections – Since many of the ICU patients originate from the hospital wards and infectious diseases commonly precipitate initial transfer or complicate care, trainees should understand how to work up patients for infection *without overusing the laboratory* and which empiric antibiotics to use in which situations. This is especially important with regards to ventilator associated pneumonia and the risk factors for resistant pathogens (MRSA, VRE).

## 6. Neurology

- a. Approach to the Patient with Encephalopathy – This common problem should be addressed on a case by case basis. Differential diagnoses for encephalopathy can be formulated and tests ordered to determine etiology when possible. Emphasizing the low yield of head CT when focal neurologic deficits are absent.
- b. Maintaining comfort in the ICU – Sedation and analgesia. Each day, patients who are mechanically ventilated should be examined for their level of sedation and analgesia (to assure that adequate levels of both are achieved) – Inclusion of reports of the Ramsay scores (by nurses or interns) in the daily rounds is helpful in this regard.
- c. Brain Death – In patients with severe brain injury, criteria for brain death versus profound neurologic damage should be examined at the bedside and discussed/reinforced.

## 7. Ethics and End of Life Issues

- a. Code Status – All trainees should be facile with our hospital's directives system. The Code status of each patient should be readdressed in Rounds at regular intervals and/or as circumstances dictate.
- b. Family Meetings – The intern and resident should attend family meetings, both to observe (in the first few of each month) for techniques of conducting the family meeting and to be aware of family issues and the evolution of Code directives. If possible, third year residents should conduct one or two family meetings with the attending present to help in the meeting and to provide feedback for improvement.
- c. Advance Directives – Trainees should understand what a Living Will is and how it affects Code Status.

## 8. Endocrinology

- a. Diabetes – All trainees should be proficient at management of diabetic ketoacidosis, hyperosmolar coma and basic daily management of hyperglycemia (through sliding scale insulins). Daily discussion of glucose control in diabetics should be routine in Rounds as appropriate.

## 9. Hematology

- a. Disseminated intravascular coagulation – A common complication of critical illness can be discussed in Rounds on a case-by-case basis.

- b. Drug-induced thrombocytopenia – A common complication in critical illness can also be discussed, with differential diagnosis, as cases arise.

### **Principle Educational Goals by Relevant Competency**

**\*Legend for Learning Activities**

AR- ICU interdisciplinary team Rounds	DPC-Direct Patient Care	JC-Journal Club
GR-Grand Rounds	MR-Morning Report	
CD- Clinical Duties	NC-Noon Conference	
JRC -Joint Resident Conference	EBS-Evidence-based syllabus	

**1) Patient Care**

Principle Educational Goals	Learning Activities
Coordination of multiple consultants’ and allied health personnel suggestions.	AR, CD
Recognition and appropriate responses to cardinal manifestations of severe illness.	CD, AR, DPC, MR, NC
Provision of comprehensive, holistic, humane care	CD, AR, DPC
Accurate physical examination skills	AR, CD
Obtains well-documented informed consent and practices optimal sterile and procedural technique for invasive procedures	NC

**2) Medical Knowledge**

Principle Educational Goals (level of competence for practicing general internist)	Learning Activities
Appreciation of cardinal features of unstable ABCs (airway, breathing, circulation).	AR, DPC, NC
Evidence-based prevention for all/most ICU patients	AR, EBS, NC
Presentation of cases using a multi-system approach	AR
Approach to the patient with shock	AR, DPC, NC, MR
Approach to the patient with respiratory failure	AR, DPC, NC
Approach to the patient with renal failure/renal replacement therapy	AR, DPC, NC, MR
Approach to fever in critically ill patients	AR, DPC
Interpretation of arterial blood gases	AR, NC, DPC
Basic ventilator management	AR, NC, DPC, MR
Fundamentals of nutrition	AR,

3) **Practice-Based Learning and Improvement**

Principle Educational Goals	Learning Activities
Begin to analyze own practices/patient care to improve future performance.	AR
Location and clinical application of appropriate medical literature to patient care and/or team rounds.	AR
Facilitation of learning of ICU team members.	AR
Understanding the hierarchy of study designs in using available literature to guide patient care.	JRC, AR

4) **Interpersonal Skills and Communication**

Principle Educational Goals	Learning Activities
Effective and respectful communication with allied health care personnel on the multi-disciplinary ICU team	AR, lectures
Humane interactions with disturbed and/or grieving families	Family meetings, AR
Detailed and complete verbal case presentations.	AR, MR, CD, NC
Detailed written communication skills.	CD, NC

5) **Professionalism**

Principle Educational Goals	Learning Activities
Respect patient autonomy and privacy.	AR, DPC, JRC
Learn how to use alternative sources of relevant patient information (family, employers, friends) to improve history or assessment of care while respecting patient privacy and autonomy.	AR, DPC
Works respectfully and collaboratively with other members of the ICU team.	AR, DPC
Demonstrates a commitment to identify areas of weakness for self-improvement.	AR
Appropriate appearance	AR
Timeliness	AR, DPC
Develops empathic relationships with patients and families	DPC, AR

6) **Systems-Based Practice**

<b>Principle Educational Goals</b>	<b>Learning Activities</b>
Appropriate choices and frequency of laboratory and radiologic tests	AR, DPC, EBS
Understand the different care models of critical care (open, closed, hybrid)	AR, lectures, EBS
Relates well to all allied healthcare personnel on the team – understanding the value and including the recommendations of various disciplines who contribute to the team approach	AR, lectures (by allied personnel)

Trainees evaluate the rotation and individual attendings using IM program evaluation forms.

**Trainees are evaluated by:** 1. Direct feed back during rounds, 2. Exit interview with ICU attending, 3. 360° evaluations. The global evaluation form, used by attendings to evaluate residents, is included at the end of this document. They also complete a national standardized test, created for resident-trainees, of basic ventilator techniques.

**Recommended Resources**

φ All residents are expected to read about their patients in an appropriate general medicine or CCM text. Because it is frequently updated, extensively referenced, and includes abstracts of referenced articles, the program highly recommends UpToDate as a primary resource.

- Supplementary recommended reading resources include Standard Medicine Texts sections of Harrison’s Textbook of Internal Medicine. There is online access to current Cardiology literature through PubMed, NHLB and online Journal sites for most Medicine journals. There are also audiotapes, DVD’s and CD-ROM’s on ICU topics. Additional resources at Health Resources Library Bridgeport, linked to Yale Medical School Library (refer to their site).