



## Curriculum in Critical Care Medicine (Housestaff)

Welcome to the MICU at the University of Colorado Denver Hospital!

The purpose of your MICU rotation is to learn how to manage critically ill patients. Throughout the month, a “hands-on” approach will be continually supplemented by teaching rounds, formal didactics and a review of the key literature.

### Specific Competency Objectives

#### I. Overview of Responsibilities: Patient Care

- a. All residents, together with the attending and fellow, are considered to be a unified “physician team” with the same goals: provision of excellent patient care, and an increase in knowledge for all team members. Each resident (PGY-I or PGY-II) should have a basic understanding of the medical problems faced by every patient cared for by the team, regardless of which resident is the “primary” resident for a given patient. *Every patient is a patient for the entire team consisting of an attending, a fellow, and the PGY-1/PGY-2 groups on alternating days.* These buddy teams are integral to managing patients for their initial admitting team post-call and when the initial admitting team members are busy, or not available due to other required duties (e.g. clinic).
- b. A thorough history and physical exam will be performed on every patient, and will likely include information from sources other than the patient, such as the patient’s family, records from prior hospitalizations, and contact with the patient’s primary care physician. *Old records are frequently critical to the management of these patients.* It is also probable that the physical examination may need to be adapted given the decreased level of consciousness found in many ICU patients.
- c. Residents at all levels of training will record data in a legible, thorough, systematic manner. History and physicals from new admissions or consults, as well as progress notes, *should be completed prior to morning rounds.* Progress notes should be completed on MICU-specific pages (yellow sheets); this is not optional. The notes and H&Ps should be placed on the patient’s chart in a timely fashion. Residents at all levels of training will perform a comprehensive physical examination describing the physiological and anatomical basis for normal and abnormal findings. PGY-IIs will demonstrate knowledge of maneuvers that can elicit findings not otherwise present, and routinely adapt the physical exam for patients with diminished levels of consciousness or cooperativeness.
- d. **Medical Decision Making, Clinical Judgement, and Management Plans:** All residents will demonstrate improving skills in assimilating information that they have gathered from the history and physical exam. Primary management of all patients admitted to the medical intensive care unit service will be performed by the housestaff, under the direct supervision of a Pulmonary/Critical Care faculty member and fellow.
  - i. PGY-I residents should be able to create a problem list for each patient, and develop a prioritized differential diagnosis. They will begin to develop therapeutic plans that are evidence- or consensus-based. Additionally, they will learn to perform additional necessary testing (i.e., CT scanning, echocardiography) in an orderly succession based on available data. Correct administration of drugs, accounting for drug-drug interactions, is

expected. A doctor of pharmacy is available to physicians virtually all of the time for additional assistance, and his or her input is strongly encouraged.

- ii. PGY-II residents will be able to perform all tasks as a PGY-I, but are additionally important in the development of an appropriate differential diagnosis with the PGY-I. They should be able to weigh alternatives bearing in mind risks and benefits to the patient, as well as patient preferences. They should be familiar with the most recent evidence-based literature to guide their management decisions. They will consistently monitor and follow-up patients, and realize that they may need to see their patients more than once per day. Teaching (particularly in day to day patient matters) of the PGY-I by PGY-II residents is imperative. Teaching sessions for the entire team are encouraged as well.
- e. **Patient Counseling.** Patient and family counseling will be performed by all members of the team, and should be done in lay terms in a confidential manner. PGY-I residents should be able to describe the rationale behind the treatment plan, and to assess patient/family understanding, with clarifications when necessary. PGY-II residents should be able to explain the pros and cons of different therapeutic options, and to engage patients and families in end of life discussions. Family meetings to discuss goals of care and DNR status should ideally be scheduled with a fellow and/or attending whenever possible, along with other appropriate members of the health care team (key consultants, nurses, social workers).
  - f. All residents (PGY-I and PGY-II) will attend daily rounds, conferences and didactic sessions within work hour limitations, and bearing in mind patient emergencies. Please see educational content, below.
  - g. **Interpersonal and communications skills.** All residents are expected to act in a professional manner towards patients, families, the physician team, and hospital personnel. They will exhibit exemplary written skills, and effective verbal skills. Residents should demonstrate accountability, respect, compassion, and dedication to patient care. They should be committed to continuous professional development. They will be punctual and prepared for teaching sessions, and will display courtesy to their teachers, regardless of other responsibilities. They are expected to add to the educational content on rounds and in didactic session, with the provision of pertinent literature or expansion of differential diagnosis.
  - h. **Technical and Other Skills**
    - i. It is expected that residents will become familiar with common procedures performed in the critical care setting. These include: initiation, maintenance and weaning of invasive ventilatory support; non-invasive ventilation; arterial blood gas interpretation; central venous catheterization; arterial line placement; thoracentesis; lumbar puncture; bedside hemodynamic monitoring. Trainees will maintain a log documenting all procedures performed.
    - ii. Procedurally, both PGY-I and PGY-II residents will have the knowledge of procedural indications, contraindications, necessary equipment, specimen handling, patient after-care, and risk and discomfort minimization. Both PGY-I and PGY-II residents will participate in the informed consent process with the patient and/or decision-maker. Additionally,
      - The nurse taking care of a patient should be informed about planned procedures whenever possible. Non-emergent procedures should not occur during change of shift (between 0630-0730 and 1830-1930)
      - Sterile barrier precautions should be used for all central lines and for PA catheter placement. A "checklist" for these barriers may be found on the pre-printed procedure notes, and nursing can help ensure its completion.

- An attending should be called prior to any procedure, and should be in attendance for most procedures. This includes procedures performed overnight.
- All documentation related to procedures should be done on the pre-printed procedure form, with appropriate time-out prior to procedure, and follow up of any post-procedural testing noted and done in a timely fashion, preferably by the person performing the procedure. A timeout should be performed prior to any procedure (correct patient, correct procedure, correct location on patient)
- PGY-I residents will have a period of procedure observation followed by appropriate senior level supervision, until their competency to perform the procedure can be observed. Procedures in “high-risk” patients (i.e. severely coagulopathic patients, morbidly obese patients, emergent intubations) should not be performed by the least experienced hands, as these are usually not good “teaching” cases, and represent excessive risk for the patient.

## II. Educational Content

### a. Practice-based learning and improvement

- i. It is expected that residents will develop skill in the multidisciplinary assessment, diagnosis and management of critically ill patients. Residents will use information gained from literature and other sources including electronic databases. A CD-ROM of articles and other educational material related to common ICU topics will be provided to residents at the beginning of the rotation. This information is also available on the IMRP Residency Website (“Curriculum”→“Suggested Readings”).
- ii. PGY-I residents should have a sufficient fund of knowledge to manage urgent complaints associated with common conditions seen in the ICU with minimal resident supervision. They may use hospital and library resources to become familiar with the medical literature, and apply this evidence to patient care.
- iii. PGY-II residents will demonstrate a progression in knowledge and analytical thinking in order to develop well-formulated differential diagnoses, and manage more complex patients in the ICU. PGY-II residents will in addition consistently seek out and analyze data on practice experience, identify areas for improvement in knowledge or patient care performance and make appropriate adjustments. They will regularly demonstrate knowledge of the impact of study design on validity or applicability to individual practice. *They should always be available for PGY-I supervision; if issues arise, appropriate coverage of the PGY-I is necessary.* Ensuring appropriate supervision of the PGY-1 is imperative, especially when the PGY-II has the day off or is otherwise not physically present in the hospital. PGY-IIs should be able to critically appraise available literature in terms of study design, validity, and applicability to the patient they are caring for. They should impart this knowledge to the PGY-I residents, and may be called on for more formal presentations to the entire physician team.
- iv. Areas to be covered in didactic sessions include pulmonary diseases, cardiac diseases, gastrointestinal disorders, hematologic/oncologic disorders, neurological diseases and renal diseases. Furthermore, trainees will begin to develop competency in assessment and management of common presentations in the critical care setting, including: respiratory failure; shock; sepsis syndromes; multi-organ failure; acute lung injury/ARDS; respiratory infections; status asthmaticus; COPD exacerbation; gastrointestinal hemorrhage; hepatic failure; acute and chronic renal failure; renal replacement therapy; complications of immunosuppressed hosts; thromboembolic disease; coma; delirium; seizure disorders; acid-balance

disorders; electrolyte disturbances; toxic ingestions; hypertensive crises; interpretation of imaging studies; nutritional support; obtaining consent for procedures; advanced directives; end-of-life decision making. Literature regarding these areas can be found on either the CD-ROM or internet site for the rotation.

**b. Systems Based Practice:**

- i. PGY-I residents will be sensitive to health care costs while striving to provide quality care. They will begin to effectively coordinate care with other health care professionals as required for patient needs.
- ii. PGY-II residents, in addition to the above, will consistently understand and adopt available clinical practice guidelines and recognize the limitations of these guidelines. They will work with patient care managers, discharge coordinators and social workers to coordinate and improve patient care and outcomes.

**III. Formal Instruction**

**a. Professionalism:** All residents will demonstrate integrity, accountability, respect, compassion, patient advocacy, and dedication to patient care that supercedes self-interest. Residents will demonstrate a commitment to excellence and continuous professional development. They will be punctual and prepared for teaching sessions. Residents will demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, and informed consent. Residents are expected to show sensitivity and responsiveness to patients' culture, age, gender and disability

**b. Orientation**

- i. At the start of the rotation, residents will receive a copy of the curriculum and key articles (or direction as to how to access them). This will be reviewed by the fellow with the housestaff and supplemented by an orientation outlining ICU policies and procedures that typically occurs on the first Thursday of the month.

**c. Rounds/Didactic Sessions/Conferences**

- i. Bedside Rounds: Daily rounds (starting in room 2106, finishing at the bedside) are conducted from approximately 8:00-10:30 AM. During this period, all newly admitted patients and care plans are discussed in the presence of critical care faculty and fellow, housestaff, nursing, and pharmacy. Respiratory therapy, nutrition and social work, and palliative care may also be present depending on availability. *It is expected that housestaff responsible for a given patient will discuss the patient's overnight events with the patient's nurse and respiratory therapist prior to bedside rounds.* It is expected that the housestaff notes will be written prior to work rounds, and placed on the chart immediately at the end of work rounds. Many attendings and fellows may also use the beginning of this allotted time for didactic teaching. The post-call team, at the discretion and direction of the attending, may be dismissed prior to the full completion of these rounds to prevent work hour violations.
- ii. Afternoon ("Check-Out") Rounds: Conducted from Monday through Friday at a mutually agreeable time with housestaff and the fellow. Serves as an opportunity to discuss patient care plans independently with the fellow, who is responsible for organization of the rounds. All housestaff, including any "float" residents, are expected to be in attendance (with the exception of the post-call team and residents who are at a continuity clinic). *This is vitally important in that the on-call team will be covering patients from the opposite team that he/she may not know well.* Teaching of core topics may be

performed by the fellow and/or attending either before or after these rounds.

**d. Call Schedules/Duty Hours/Days Off**

- i. Call Schedule: Each residents/intern team will take in-house call on a shift system. There is one fellow on the service. Scheduling conflicts and/or unanticipated absences should be discussed with the chief medical resident and fellow at the earliest possibility.
- ii. Duty Hours: Residents are expected to adhere to the 80-hour work week requirements. No resident should spend more than 28 consecutive hours in the hospital. No intern should spend more than 14 consecutive hours in the hospital. Post-call residents should work closely with their buddy team (e.g. the other PGY I and PGY II supervised by the same attending) to help adhere to this 28 hour regulation. On work rounds, it is expected, and will help to mitigate work hour violations, if:
  1. The *buddy team writes orders for the post call team's patients* at the bedside while the patient is being discussed. This facilitates timely implementation of the patient's plan, and prevents the post-call team from receiving pages regarding these patients post call.
  2. The post call team "checks out" their patients *during walk rounds* to their buddy team, including all cross cover issues that need to be addressed (code status, whether or not to culture, anticipated problems, consultants that need to be called.) The buddy team will then "check out" both these patients, as well as the others they are following, to the on call team prior to leaving later in the day.
- iii. It is the responsibility of individual residents to log their duty hours and bring problems to the attention of the fellow and/or chief medical resident.
- iv. Days Off: Residents will have one day off a week. Allowed days off occur ideally between Thursday-Sunday; days off taken between Monday-Wed are likely to interfere with didactic opportunities that occur during the week. All residents are *expected to coordinate their days off with each other at the beginning of the month to avoid having more than one supervising resident off each day*, and to not have both residents and interns on one team off the same day. Taking more than one day off each week is strongly discouraged. Problems with days off and scheduling should be brought to the attention of the fellow.

**e. Reading Materials**

**Suggested reading can be found at:**

<http://www.ucdenver.edu/academics/colleges/medicalschoo/department/medicine/intmed/imrp/CURRICULUM/Pages/SuggestedReading.aspx>

- 1) The acute respiratory distress syndrome.
- 2) Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome.
- 3) Higher versus lower positive end-expiratory pressure in patients with the acute respiratory distress syndrome.
- 4) Comparison of two fluid-management strategies in acute lung injury (FACCT).
- 5) When to wean from a mechanical ventilator: an evidence-based strategy.
- 6) Clinical review: hemodynamic monitoring in the ICU.

- 7) Early goal-directed therapy in the treatment of severe sepsis and septic shock.
- 8) A comparison of albumin and saline for fluid resuscitation in the ICU: the SAFE trial.
- 9) New approaches to the treatment of sepsis.
- 10) Effect of treatment with low doses of hydrocortisone and fludrocortisone on mortality in patients with septic shock.
- 11) Corticosteroid insufficiency in acutely ill patients.
- 12) Efficacy and safety of recombinant human activated protein C for severe sepsis (PROWESS).
- 13) Intensive insulin therapy in critically ill patients.
- 14) Heparin plus alteplase compared with heparin alone in patients with submassive pulmonary embolism.
- 15) Handout: ICU pharmacotherapy.
- 16) Diagnosis and treatment of diabetic ketoacidosis and the hyperglycemic hyperosmolar state.
- 17) Fever in the ICU.
- 18) Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia.
- 19) A randomized trial of diagnostic techniques for ventilator-associated pneumonia.
- 20) Preventing complications of central venous catheterization.
- 21) Handout: Evaluation of acid-base disorders.
- 22) Acute upper gastrointestinal bleeding in critically ill patients: causes and treatment modalities.
- 23) Effect of intravenous albumin on renal impairment and mortality in patients with cirrhosis and spontaneous bacterial peritonitis.
- 24) A multicenter randomized, controlled clinical trial of transfusion requirements in critical care.
- 25) When heparins promote thrombosis: review of HIT.
- 26) Pulmonary complications in bone marrow transplantation: a practical approach to diagnosis and treatment.
- 27) Clinical review: the management of hypertensive crises.
- 28) Alcohol withdrawal severity is decreased by symptom-oriented adjusted bolus therapy in the ICU.
- 29) Cognitive impairment in the ICU.
- 30) Toxicology in the critically ill patient.
- 31) A consensus-based approach to providing palliative care to patients who lack decision-making capacity.
- 32) Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation.

#### **Other Resources**

UCHSC Intranet Critical Care Website: <http://hub.uch.edu/champions-committees/critical-care-committee/index.aspx>

This is a link to many ICU protocols/policies, and gives a synopsis of ongoing research in the ICU

Mechanical Ventilation and Respiratory Physiology:

[www.acbrown.com/lung/Instructions/RsRsrc.htm](http://www.acbrown.com/lung/Instructions/RsRsrc.htm)

*great respiratory physiology resource link*

[www.physiologyeducation.org/materials/simres.html](http://www.physiologyeducation.org/materials/simres.html)

*downloadable simulations in respiratory physiology (supported by the NSF)*

[oac.med.jhmi.edu/res\\_phys/index.html](http://oac.med.jhmi.edu/res_phys/index.html)

*interactive respiratory physiology tutorials (from Johns Hopkins)*

Critical Care Tutorials: [www.ccmtutorials.com/rs/index.htm](http://www.ccmtutorials.com/rs/index.htm)

Hemodynamic Monitoring: [www.pacep.org](http://www.pacep.org)

*Pulmonary Artery Catheter Education Project*

Drugs that Cause Lung Damage: [www.pneumotox.com](http://www.pneumotox.com)

Chest Radiology Tutorial: [www.med-ed.virginia.edu/courses/rad/](http://www.med-ed.virginia.edu/courses/rad/)

Radiographic manifestations of TB: [www.nationaltbcenter.edu/radiology](http://www.nationaltbcenter.edu/radiology)

#### **V. Learning Objectives** (cross-referenced to “Key Literature”)

- I. Respiratory failure
  - a. Introduction/overview
  - b. Mechanical ventilation
  - c. Liberation from mechanical ventilation
    - i. Tracheostomy
  - d. ARDS
    - i. VILI & LTV
    - ii. Outcomes of patients surviving ARDS
  - e. NIPPV
- II. Hemodynamic monitoring
  - a. Shock states
    - i. Assessment of tissue dysoxia
  - b. Resuscitation
    - i. Albumin versus saline
    - ii. EGDT
  - c. Venous oximetry
  - d. PA catheter
- III. Sepsis
  - a. Introduction/overview
  - b. Corticosteroids
  - c. APC
  - d. Glycemic control
- IV. Specific pulmonary disorders
  - a. COPD
  - b. Asthma
  - c. Pulmonary embolism
    - i. Lytics
    - ii. IVC filters
    - iii. LMWH
  - d. Aspiration pneumonitis/pneumonia
  - e. Pleural disease
- V. ICU pharmacotherapy
  - a. Pressors
  - b. Sedation/Analgesia/NMB
- VI. Endocrinology
  - a. DKA and HHS
  - b. Thyroid disorders (storm and myxedema coma)
- VII. Infectious disease
  - a. Approach to fever in the ICU
  - b. Pneumonia (CAP, HAP, VAP)
  - c. Catheter-related bloodstream infections
  - d. Treatment of severe acute pancreatitis
- VIII. Renal
  - a. Acid-base disorders
  - b. Natremias
  - c. Approach to ARF
    - i. Renal replacement therapy (CVVH)
  - d. Contrast nephropathy
    - i. Prevention (NAC and HCO<sub>3</sub>)
  - e. Hepatorenal syndrome
- IX. Gastroenterology
  - a. Upper & lower GI bleed
  - b. Stress ulcer prophylaxis
  - c. *C. difficile* infections
- X. Hepatology
  - a. Chronic liver disease and critical illness
  - b. Approach to abnormal LFTs in the ICU
  - c. Hepatic encephalopathy
  - d. Fulminant hepatic failure

- XI. Hematology
  - a. Anemia in the ICU
    - i. Erythropoietin
    - ii. Transfusion requirements
  - b. Platelet disorders
    - i. HIT
    - ii. DIC
    - iii. TTP
  - c. Neutropenic fever
- XII. Oncology
  - a. Oncologic emergencies
  - b. Bone marrow transplantation
- XIII. Cardiology
  - a. Hypertensive crises
  - b. Cardiogenic pulmonary edema
- XIV. Neurology
  - a. Alcohol withdrawal
  - b. Status epilepticus
  - c. Cognitive impairment/delirium in the ICU
  - d. Assessment of coma and brain death
  - e. ICU myoneuropathy
- XV. Toxicology
  - a. General approach
  - b. Specific toxicities
    - i. Acetaminophen overdose
    - ii. Salicylate overdose (acute & chronic)
    - iii. TCA overdose
    - iv. Serotonin syndrome
    - v. Neuroleptic malignant syndrome
  - c. Anaphylaxis
- XVI. Communication, ethics & palliative care
  - a. Decision-making
  - b. Dying patient