

**University of Michigan Health System
Internal Medicine Residency**

Critical Care Medicine: University Hospital and Ann Arbor VA

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Rotation Goals and Educational Purpose

Care of the critically ill patient requires timely assessment and intervention of manifold life threatening conditions. Critical care management requires not only detailed knowledge of pathophysiology and pharmacotherapeutics, but also advanced skills in communication and medical ethics. All internists must feel comfortable communicating with patients and their families or surrogates regarding life threatening conditions. The goals of this rotation are therefore to develop knowledge of the pathophysiology and scientific basis of critical care, to establish astute management skills necessary for common critical conditions, and to foster interpersonal skills essential for sensitive communication.

This rotation is required for all residents.

Rotation Competency Objectives

In supplement to the University of Michigan Longitudinal Learning Objectives, the following provide an overview of specific knowledge, skills, and behaviors promoted in this rotation.

- I. Medical Knowledge**
 - a. Disease-based knowledge
 - i. By completion of the rotation, HO1 residents should reflect understanding of the basic pathophysiology, differential diagnosis, diagnostic assessment, natural course, and triage treatment of:
 1. Hypotension (including common vasopressor supports)
 2. Sepsis syndrome
 3. Respiratory failure and ARDS
 4. Pneumonia
 5. Obstructive lung disease exacerbations (e.g. asthma & COPD)
 6. Thromboembolic disease
 7. Upper and lower GI bleeding
 8. Acute and chronic hepatic failure
 9. Pancreatitis

10. Renal failure
11. Meningitis
12. Neurovascular events
13. Myocardial infarction
14. Congestive heart failure
15. Diabetic ketoacidosis
16. Hypoglycemia
17. Electrolyte disturbance (Na, K, Ca, acidosis, alkalosis)
18. Ingestion/poisoning – acetaminophen, sedatives, narcotics
- ii. HO2-3 residents should additionally reflect similar knowledge of
 1. Pulmonary vascular disease (including massive PE)
 2. Pulmonary hemorrhage and massive hemoptysis
 3. Upper airway obstruction
 4. Aortic dissection
 5. Neuromuscular respiratory failure
 6. Coma
 7. Status epilepticus
 8. Coagulopathy
 9. Adrenal crisis
 10. Hyper/hypothyroidism
 11. Ingestion/poisoning – salicylates, carbon monoxide, cocaine, tricyclic antidepressants, stimulants, digoxin, warfarin
 12. Hyper/hypothermia
 13. Malnutrition
- iii. HO3 residents should additionally demonstrate knowledge of the scientific evidence base for management of common critical conditions.
- b. Socio-behavioral knowledge
 - i. HO1 residents will reflect understanding of the principles of end-of-life care, including indications for palliative care
 - ii. HO2-3 residents will additionally demonstrate knowledge of ethical principles of
 1. Informed consent, including provisions for emergent care
 2. Cross-cultural communication in critical care settings
 3. Patient advocacy in the setting of complex or poor prognostic settings
 4. Surrogate decision making, including identification and communication with patient surrogates

II. Patient Care

- a. Medical history - By completion of the rotation, HO1 residents should be able to make use of multiple sources of information to assemble an accurate critical care patient history.
- b. Physical diagnosis
 - i. By completion of the rotation, HO1 residents should be able to

1. Recognize abnormalities of respiratory pattern (Kussmaul, Cheyne-Stokes, abdominal-thoracic asynchrony, use of accessory muscles)
 2. Recognize common abnormalities of the thoracic cage, the pulmonary exam, and the cardiovascular exam.
 3. Recognize signs and symptoms of shock sufficient to form a differential diagnosis.
 4. Detect neurologic findings sufficient to diagnose and monitor delirium, encephalopathy, acute cerebrovascular event, meningitis, and coma.
- ii. HO2-3 residents should additionally be able to
1. Elicit and monitor exam findings relevant to the broad array of diagnoses listed under “medical knowledge” objectives.
- c. Laboratory and radiologic diagnosis
- i. By completion of the rotation, HO1 residents should be able to
1. Interpret serum and urine lab results for common fluid and electrolyte disorders, including anion and osmolarity gaps
 2. Interpret arterial blood gasses for acid-base disorders, p(A-a)O₂
 3. Interpret sputum, pleural fluid, cerebrospinal fluid, peritoneal fluid, and other bodily secretion studies
 4. Interpret chest X-ray sufficient to note frank congestive heart failure, pleural effusion, lobar pneumonia, pneumothorax, lobar collapse, atelectasis, pulmonary masses, and correct placement of feeding and central intravenous lines.
- ii. HO2-3 residents should additionally be able to
1. Interpret complex fluid and electrolyte findings, including the presence of multiple coexistent acid-base and electrolyte disorders
 2. Detect chest X-ray and CT findings consistent with interstitial disease, asbestosis, pulmonary embolus, pneumoconiosis, pulmonary hemorrhage, and abnormalities of the aorta and cardiac chambers.
- d. Management of critical conditions
- i. By completion of the rotation, HO1 residents should
1. Based on a synthesized and prioritized patient assessment: suspect, form an initial prioritized diagnostic plan, and initially manage with minimal supervision the disorders noted under HO1 medical knowledge objectives.
 2. Under HO2/3 and attending physician supervision, ensure provision of urgent care within a medically appropriate time frame for the broad spectrum of critical presenting conditions.
 3. Assess and manage patients using noninvasive ventilatory support, including CPAP and BiPAP.
 4. Understand risks and benefits of invasive ventilatory support, and participate under supervision as a provider of endotracheal intubation.

5. Under HO2/3, respiratory technician, and faculty guidance, monitor and adjust invasive ventilatory support
 6. Monitor chest tube function and indications
 7. Provide care consistent with national guidelines for prevention of ventilator-associated pneumonia, catheter-associated blood stream infection, and DVT.
- ii. HO2 residents should additionally, by completion of the rotation
 1. Based on a synthesized and prioritized patient assessment: perform initial prioritized diagnostic and therapeutic evaluations of all conditions noted under the medical knowledge objectives.
 2. Demonstrate proficiency with procedural skills necessary for the care of critically ill patients, including central venous catheter, arterial line, thoracentesis, paracentesis, and lumbar puncture.
 3. Demonstrate awareness of risks and benefits of endotracheal intubation, and demonstrate sufficient procedural proficiency to perform endotracheal intubation in urgent care settings.
 - iii. HO3 residents should additionally, by completion of the rotation
 1. Monitor and adjust invasive ventilatory support for common critical conditions, reflecting understanding of airway pressures, work of breathing, and compliance. Manage ventilation to avoid barotrauma and promote successful ventilatory weaning.

III. Interpersonal and Communication Skills

- a. By completion of the rotation, HO1 residents are expected to
 - i. Adapt history-taking skills to the presentation status of critically ill patients.
 - ii. Provide written documentation of care consistent with critical care unit standards, including monitoring of safety and care improvement measures.
 - iii. Under supervision and after having observed the attending or senior resident manage a similar interaction, successfully negotiate appropriate communication for distraught patients and their families.
- b. HO2 residents should additionally be able to
 - i. Effectively communicate with patients or their advocates regarding risks and benefits of critical care interventions, sufficient to engage in a process of informed consent.
 - ii. With decreasing reliance on faculty supervision, initiate communication with surrogate decision makers regarding end of life decision making
- c. HO3 residents should additionally be able to
 - i. With minimal faculty supervision, communicate with surrogate decision makers regarding end of life decision making.

IV. Professionalism: Objectives for HO1, 2, and 3 are as described in the U of M Longitudinal Learning Objectives document, with special emphasis placed on the principles of respect for patient dignity, compassionate care for dying patients, advocacy for patients lacking decision-making capacity, personal responsibility for recognizing

the limits of their own abilities, and professionally collaborative behaviors among colleagues and allied professionals.

V. Practice-Based Learning and Improvement

- a. HO1 residents must constructively respond to and internalize feedback from faculty, nursing, and allied healthcare providers. They must demonstrate willingness to change identified behaviors in order to continually improve their function in the critical care environment.
- b. HO2 residents must demonstrate continual identification of critical care learning opportunities, investigating the evidence base for critical patient care.
- c. HO3 residents must demonstrate independent learning skills through application of current evidence to management decisions and promotion of a learning environment for the critical care team.

VI. Systems-Based Practice

- a. By completion of the rotation, HO1 residents are expected to be able to
 - i. Effectively mobilize and interact with critical care team services, including respiratory therapy, pharmacy, and nursing services to assure timely management of potentially life-threatening conditions.
 - ii. Comply with infection control and patient safety protocols designed for the critical care environment.
 - iii. Utilize the knowledge and collaborative efforts of team allied health professionals for guidance and for adherence to established care systems.
- b. HO2 residents will additionally
 - i. Identify psychosocial support and/or hospice care options for patients with terminal diseases.
 - ii. Under attending supervision, function as a team leader for interdisciplinary complex care.
- c. HO3 residents will additionally
 - i. Model facilitative behavior for patient-safety and quality improvement initiatives in the critical care setting, incorporating team management skills to advance adherence with evidence based practices
 - ii. Reflect understanding of documentation and billing compliance requirements in critical care.

Teaching Methods

- I. Supervised Patient Care (including mix of diseases, patient characteristics, types of clinical encounters, procedures, pathologic material, services, the level of faculty supervision for all resident patient-care activities, and other services interacted with)
 - a. The emphasis of this rotation is on experiential learning through supervised management of patients. Residents perform admission and continuing care evaluations for critically ill hospitalized patients under the full supervision of a faculty critical care specialist. At the Ann Arbor VA, the on call ICU resident accepts transfer patients who are considered ICU-eligible by the floor medical team. Faculty discussions review each patient daily. Patients present from a broad range of age, geographic area, and socioeconomic background.

- b. At the Ann Arbor VA, residents care for outpatient pulmonary patients a minimum of ½ day per week.
 - c. Residents perform invasive procedures (e.g. central intravenous line, paracentesis, thoracentesis, arterial line, endotracheal intubation or lumbar puncture) under supervision until considered competent to perform procedures independently
 - d. Residents interact with respiratory therapists, pulmonary/critical care fellows, and a full spectrum of medical and non-medical specialties while providing patient care; residents should consider all such interactions as opportunities for education.
- II. Structured Didactics and Small Group Learning**
- a. At the Ann Arbor VA, critical care ethics rounds take place once monthly, focusing on end-of-life care and surrogate decision making.
 - b. Mandatory residency conferences (Internal Medicine Grand Rounds, Morning Report, Intern Report, noon conference) continue during this rotation.
 - c. At University Hospital, Critical Care Conference occurs weekly, Wednesdays at noon. Attendance is optional due to a conflict with residency noon conference.
 - d. Teaching Rounds are held at a time determined by rotating faculty. At the UH, the default schedule is Monday, Tuesday, Thursday and Friday at 1:30 pm, patient workflow permitting. At the VA, teaching rounds occur a minimum of twice weekly.
- III. Simulation**
- a. All residents must complete and maintain BLS and ACLS certification, including practical demonstration of airway management and cardiac resuscitation.
 - b. All interns must complete a comprehensive procedure simulation session, which includes aseptic technique, IV/phlebotomy, central venous catheter insertion with ultrasound guidance, procedure note documentation, and informed consent communication. This training occurs by the end of fall of the internship year.
- IV. Independent study – Residents are expected to actively read core content regarding both their patient-based experiences and the common conditions as noted under the rotation learning objectives. The following resources are suggested and are available on line:**
- a. Textbooks and Manuals
 - i. Principles of Critical Care. Editors, Hall JB, Schmidt GA, Wood LDH. New York: McGraw-Hill. Latest edition. Available electronically through Taubman Medical Library (with authentication required) at: <http://www.accesssurgery.com/resourceTOC.aspx?resourceID=76>
 - ii. A CD of historic ICU articles is available on request from Dr. Hyzy.
 - b. Clinical care guidelines, as posted on websites:
 - i. University of Michigan Critical Care Unit Policies, Standards, and Guidelines (including sedation protocol, infection control protocols, ethics links, and more) are posted at: <http://www.med.umich.edu/ccmu/policies.htm>
 - ii. Infectious Diseases Society of America <http://www.idsociety.org/Content.aspx?id=9088>

1. [New Fever in Critically Ill Patients](#)
 2. [Prevention of Catheter-related Infections](#)
 3. [Management of Catheter-related Infections](#)
 4. [Hand Hygiene in Health-care Settings](#)
- i. Society of Critical Care Medicine
 1. End of Life Care in the ICU:
<http://www.learnicu.org/SiteCollectionDocuments/EOL.pdf>
 2. Multiple guidelines for clinical, professional, and systems issues can be found at: <http://www.learnicu.org/Pages/default.aspx>
- c. Online multimedia learning
- i. “Central Venous Catheterization: Techniques to Reduce Complications” Davoren A. Chick, University of Michigan. Content includes procedure planning, procedure time-outs, aseptic technique, insertion technique, procedure documentation, and prevention and recognition of complications. All interns are required to complete this course through MLearning. MLearning is accessible through the residency curriculum website: <http://www.med.umich.edu/intmed/resident/info/curriculum.htm>. Access the assigned course through “My Learning Plan” within MLearning, or search for course code OCAX-20082 to enroll during your if you have not already completed it.
 - ii. <http://www.acid-base.com/> Acid-base tutorial. Alan W. Grogono, Tulane University Department of Anesthesiology. This site is highly recommended for all. Peer-reviewed, light-hearted, and interactive, it provides an alternative and in-depth approach.
 - iii. ECG Wave Maven, developed by Nathanson LA, McClennen S, Safran C, and Goldberger AL, Beth Israel Deaconess Medical Center: <http://ecg.bidmc.harvard.edu/maven/mavenmain.asp>
- d. Core Clinical Journals, with free access available through Taubman Medical Library e-journals:
- i. Critical Care Medicine
 - ii. American Journal of Respiratory and Critical Care Medicine
 - iii. Chest
 - iv. Intensive Care Medicine
 - v. Journal of Critical Care

Evaluation Methods

Each month, attendings complete online competency-based evaluations of each resident. The evaluation is shared with the resident, is available for on-line review by the resident at his/her convenience, and is sent to the residency office for internal review. The evaluation is part of the resident file and is incorporated into semiannual performance reviews for directed resident feedback.

Residents complete a service evaluation of the rotation faculty monthly.

Rotation Schedule

Call duty:

- At University Hospital: Long call is Q4 days. HO2/3 sign out to a Night Float following completion of call at 8PM. HO1 remain on overnight call duty with early departure the following day. Short call duties are scheduled until noon Q2 except on weekends.
- At the Ann Arbor VA: Long call is Q3 days to 8 PM, signing out to a senior night float resident. Each week, one senior resident has overnight call from Saturday 7AM through Sunday 8AM. Please note that appropriateness of transfer from a medical floor to the ICU is determined by the floor resident at the VA, not by the ICU resident on call. Following determination of eligibility for transfer by the floor resident, the on call ICU resident performs a full ICU admission care plan assessment.

Weekend duty: Residents will have an average of one day off in 7 over the course of a 4-week rotation block. The day off is determined based on the call schedule, and may or may not occur on a weekend. There is no short call on the weekend.

Continuity Clinic:

- At University Hospital: For interns, general medicine continuity clinic continues during this rotation, one half-day weekly, except post-call. For senior residents, continuity clinic continues only on short call days. Discuss your continuity clinic schedule with your attending and fellow.
- At the Ann Arbor VA: Continuity Clinic continues as usually scheduled, except on Tuesday mornings. Tuesday morning continuity clinic sessions are rescheduled to a make-up continuity clinic in order to allow attendance at the Tuesday morning VA pulmonary clinic.

(See weekly schedule grids next page)

UM

	Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
AM	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:30 Rounds
	8:30 Multidisciplinary Bedside Rounds	8:30 Multidisciplinary Bedside Rounds	8:30 Multidisciplinary Bedside Rounds	8:30 Multidisciplinary Bedside Rounds	8:30 Multidisciplinary Bedside Rounds	8:30 Bedside Rounds
	10:30 Morning Report	10:30 Morning Report	10:30 Morning Report	10:30 Morning Report	10:30 Morning Report	
PM	12:00 Noon Conference	12:30 Intern Report	12:00 Noon Conference (or optional Critical Care Conference)	12:00 Noon Conference	12:00 Grand Rounds	
	1:30 Faculty Teaching Rounds	1:30 Faculty Teaching Rounds	1:30 Faculty Teaching Rounds	1:30 Faculty Teaching Rounds	1:30 Faculty Teaching Rounds	
	5 pm Sign out	5 pm Sign out	5 pm Sign out	5 pm Sign out	5 pm Sign out	

VA

	Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
AM	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:00 Preround 7:30 Rounds	7:30 Rounds
		8:00 Pulmonary Clinic (short senior only)				
	10:30 Morning Report	10:30 Morning Report	10:30 Morning Report	10:30 Morning Report	10:30 Morning Report	
PM	12:00 Noon Conference	12:30 Intern Report	12:00 Noon Conference (or optional Critical Care Conference)	12:00 Noon Conference	12:00 Grand Rounds	
	Patient Care (or continuity clinic, short senior only)	Patient Care (or continuity clinic, short senior only)	1PM Pulmonary Clinic (short senior only)	1PM Pulmonary Clinic (short senior only)	Patient Care (or continuity clinic, short senior only)	
	Faculty Teaching Rounds	Faculty Teaching Rounds	Faculty Teaching Rounds	Faculty Teaching Rounds	Faculty Teaching Rounds	
	8 pm Sign out	8 pm Sign out	8 pm Sign out	8 pm Sign out	8 pm Sign out	