

**CARDIOLOGY INPATIENT SERVICE CURRICULUM
UNIVERSITY OF COLORADO HOSPITAL
INTERNAL MEDICINE RESIDENCY PROGRAM**

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I. Educational Purpose and Goals

Management of hospitalized patients remains essential for the practice of cardiovascular medicine. The general medicine rotation at DVAMC allows residents to refine history and physical exam skills, develop experience in selection of diagnostic tests and learn management of a wide variety of diseases. These experiences provide exposure to common medical problems of hospitalized patients and allow residents opportunities to develop discharge care plans. Additionally, residents are exposed to uncommon medical conditions and have the opportunity to interact with subspecialists while managing patients with complex conditions. This rotation provides internal medicine residents with direct experience in history and physical exam skills with attention to the cardiovascular system, the selection and interpretation of common diagnostic tests (ECG, echocardiogram, and cardiac catheterization), and management of a variety of diagnostic investigations and management of acute and chronic cardiovascular diseases in the setting of an intensive and coronary care unit, an intermediate or "step-down" unit, and a cardiac telemetry unit. The rotation is divided into two units: a general cardiology service with exposure to all aspects of acute cardiovascular disease (i.e. atrial fibrillation, acute coronary syndromes, syncope, endocarditis, decompensated valvular heart disease, pericardial disease, and adult congenital heart disease) and a heart failure and transplantation service involving care of patients with advanced heart failure before and after cardiac transplantation. These residents are under direct supervision by board certified cardiologists including added qualifications in interventional cardiology and electrophysiology as well as UNOS-certified transplant cardiologists. All residents will gain experience and exposure in evaluating and managing cardiac cases including interactions with other specialties involved in the management team. Interaction between residents and fellows is designed to enhance the educational experiences at various levels of training in medicine. Currently there are no medical students on this rotation. Residents are also taught the critical concept of team care in the in-patient environment with the central role of nursing, consultative services, social services, and a variety of other groups involved in the process of care. Finally, a major goal of the rotation is for residents to understand the principles of evidence-based medicine, the large repository of randomized clinical trials that guide cardiovascular care, and the use of guidelines, pre-printed orders for specific cardiovascular syndromes, and the metrics of quality of care in the hospital setting.

II. Principal Teaching Methods

Residents work directly with the cardiology fellow and attending cardiologist on the inpatient Cardiology Service to obtain a focused problem-based history and physical examination on acutely ill cardiac patients. There is a separate cardiology fellow and attending cardiologist for each component of the inpatient cardiology experience, one for the general service and one for the Heart Failure and Transplant Service. They formulate an appropriate management plan which includes various noninvasive and invasive diagnostic studies as well as a

treatment plan that included medical therapy as well as indications for percutaneous cardiac intervention and/or surgical therapy. This management approach includes a review of relevant testing requests and their frequency as well as medication therapy, documenting all findings in the medical record. The resident is expected to discuss significant findings with the sub-specialty fellow and attending physician. The resident will attend rounds on all cardiology patients with the sub-specialty fellows and attending physicians. They will prepare and present cases including appropriate literature references and all pertinent patient related data, and are expected to review and be prepared to discuss relevant literature references.

Specific Teaching Methodology:

- a. Bedside teaching/management rounds are conducted on a daily basis with both the general cardiology attending and the Heart Failure and Transplantation attending and fellows incorporating teaching through supervised direct patient care activities during these management rounds. Bedside teaching includes refinements in taking a cardiac history and demonstration of an array of abnormal cardiovascular physical findings including auscultatory abnormalities.
- b. Supervised Direct Patient Care teaching occurs throughout the workday during subspecialty fellow/internal medicine resident interactions. Sub-specialty fellows in Cardiology are held responsible for teaching rotating residents and insuring that these individuals are provided with a high quality rotation.
- c. Supervised Procedures – Residents are required to have direct supervision of all invasive procedures such as central line placement and cardioversion. This supervision is provided by either the cardiology fellow or attending cardiologist depending on the nature and risks of the procedure.
- d. Didactic Lectures and Small Group Discussions are included through
 - i. Teaching Rounds – a component of daily rounds, these rounds consist of either case-based discussions addressing the pathophysiology, diagnosis, and treatment of various cardiovascular disease processes with a focus and short-term and long-term outcomes of a given therapy. This involves the review and interpretations of standard ECG's on all patients. Furthermore cardiovascular blood tests such as cardiac markers, lipid profiles, and anticoagulation assessment are reviewed and discussed as to interpretation. In addition, didactic information is also provided utilizing either material from textbooks or from recent relevant medical literature. Residents are also provided reprints or photocopies of pertinent, clinically relevant articles. These are conducted by assigned cardiology faculty from both the general cardiology and Heart Failure and Transplantation service who act as the teaching attending for a 1-2 week period. The cardiology fellows also arrange additional didactic time to review pertinent diagnostic and therapeutic aspects of the management of cardiovascular diseases. An integral part of this learning experience involves the use of appropriate literature references and case review methods as noted above.
 - ii. Cardiology Grand Rounds and Cardiac Catheterization Conferences - Typically, these are either case reviews and/or

- topics of interest present by guest speakers.
- e. Assigned Readings are based on materials provided during teaching rounds supervised by the attending and the subspecialty fellows.
 - f. Required Presentations - All sub-specialty fellows and rotating residents participating in this rotation are expected to present during the above teaching rounds. Rotating residents usually present cases pertinent to either new admissions or issues related to patients on the services. Rotating residents are also required to present cases at the daily Morning Report, a conference which includes rotating residents on all the inpatient Internal Medicine rotations at University of Colorado Hospital. Cardiology fellows are expected to present pertinent information from the medical literature on cardiovascular disease management.
 - g. Image review sessions – Rotating residents as well as specialty fellows have attending directed reviews of patient’s cardiovascular imaging studies including echocardiography, angiography, cardiac CT, cardiac nuclear, and cardiac MR studies. Often these reviews are with specialists in these fields.

III. Educational Content

- a. Mix of diseases
 - i. Cardiac patients with a broad spectrum of ischemic and non-ischemic etiologies make up the composition of the rotation. During the month rotation it is common for residents to have patients with ST elevation and non-ST elevation acute myocardial infarction, out of hospital cardiac arrest, new onset atrial fibrillation with rapid ventricular response, complete heart block, endocarditis, aortic stenosis, hypertrophic cardiomyopathy with obstruction, pericardial tamponade, syncope of unknown etiology, and a variety of other disorders. Many of these patients have systemic hypertension, diabetes mellitus, a variety of lipid abnormalities, cigarette smoking, and genetic predispositions to cardiovascular disease. Management of these chronic disorders/predilections are combined with diagnosis and management of acute conditions requiring hospitalization. The addition of the Heart Failure and Transplantation service provide state-of-the-art training in the management of complex patients with severe heart failure as well as an approach to immunosuppressive therapy of cardiac transplant patients with the inherent complications and associated conditions.
- b. Patient characteristics
 - i. Patients admitted to the service all have primary cardiovascular symptoms and signs that required management and are housed in the ICU or CCU, the intermediate care unit, or the cardiac telemetry unit of University of Colorado Hospital. The typical patient admitted to the inpatient Cardiology Service is one requiring acute cardiac care that may require a variety of interventional techniques or complex medical management. Patients admitted to the Heart Failure and Transplantation Service component of the rotation are either those with severe complex heart failure being considered for cardiac transplantation, device intervention (IABP or LVAD), or prolonged intravenous inotropic therapy. Cardiac transplant patients are usually admitted for the

treatment of cardiac rejection, infection, or other complications of cardiac transplantation and its associated therapy.

ii. These patients will be of both gender types and of a wide spectrum of socioeconomic backgrounds. Patients are either admitted from the Emergency Department, from subspecialty clinics of the hospital, transferred from community hospitals from the Rocky Mountain region, or admitted following therapeutic procedures in cardiac catheterization laboratory and electrophysiology laboratory.

c. Learning venues: Type of clinical encounters, procedures and services

i. Attending physicians involved in staffing the inpatient cardiology and the Heart Failure and Transplantation services are ABIM certified in cardiovascular disease and in addition, the attending cardiologists on the Heart Failure and Transplantation service are UNOS certified. At any given time there are two sub-specialty cardiology fellows on the service, one for the general service and one for the Heart Failure and Transplantation service. There are four housestaff teams with one PGY-1 and PGY-2 internal medicine resident on each team. In addition, there is a PGY-3 “float resident” responsible for covering the clinical responsibilities of the team who was admitting the previous night to insure that this team does not exceed the hour-limit of in-hospital duty as mandated by the ACGME. This “float resident” participates in all clinical and teaching activity of the cardiology rotation.

ii. The Intensive Care Unit/CCU, the intermediate care unit, and the cardiology telemetry units at University of Colorado Hospital will be the principal training sites, providing modern equipment and skilled nursing and technical support available to patients with a variety of cardiovascular diseases. The degree of severity of illness will determine the location of the patients on the cardiology services. Sub-specialty fellow and rotating internal medicine have the resources available to provide the highest quality care to acutely ill cardiac cases. Patients will be admitted to the Cardiology Service by members of the team, referrals from other services or via Emergency Department contact.

iii. The rotation is 100% inpatient, with the exception of mandatory resident participation in their weekly internal medicine continuity clinic.

iv. ECG and chest Xray interpretation skills are taught, and invasive and noninvasive cardiac procedures are introduced including echocardiogram interpretation, cardiac catheterization, defibrillator implantation, pacemaker evaluation, and selection for intra-aortic balloon pump and ventricular assistance devices. In addition, pre-transplantation evaluation, heart failure evaluation and management, and arrhythmia management are emphasized.

v. A special effort is made to enhance the knowledge of cardiovascular pharmacology during both formal rounds and informal bedside teaching. A pharmacist from the School of Pharmacy attends the daily Teaching and Patient Management Rounds and participates in the teaching process.

vi. Ancillary Services and Consultative services: Residents learn the use of special consultative services from such groups as Interventional Cardiology, Cardiac Electrophysiology, Cardiac Surgery, Vascular Surgery, Infectious Disease, Nephrology, and Genetics. The use of special ancillary services are also incorporated into the rotation including cardiac rehabilitation, palliative care, social services, and chaplain services.

d. Structure of rotation

- i. Residents are on call every 4th night, with a maximum of 80 work hours per week averaged over four weeks. Residents will take in-house call. They have one 24-hour day in 7 free from duty, averaged over four weeks.
- ii. On post call days, after 24 hours maximum continuous on-site duty, the resident must not care for new patients. S/he may however remain onsite for up to 6 additional hours to continue care of prior known patients, participate in management rounds, and attend educational conferences. On post-call days, the rotating residents are expected to leave the hospital by 13:00 with any remaining clinical responsibilities covered by the “float resident”. The cardiology fellow also plays an important role in the clinical follow-up of newly admitted patients.
- iii. Post-call residents as well as all rotating residents are responsible for appropriate sign-out to either the “float resident” or the on-call team. This sign out is accomplished by computerized sign out with written documentation of clinically-relevant issues.
- iv. During a 24-hour call experience, the two residents are required to admit up to 10 patients to the cardiology service under the supervision of the sub-specialty fellow assigned to the service. PGY1 residents on call supervise PGY1 residents on the general cardiology and Heart Failure and Transplantation services and are responsible for total admissions to these services according to standard University of Colorado resident duty limits.
- v. Patients admitted to the general cardiology or Heart Failure and Transplant services after the resident caps are admitted by rotating residents on other inpatient services and are transferred in the morning to the new on-call cardiology team.
- vi. The PGY1 and PGY2 rotating residents are also responsible for admitting patients to the Observation Unit after 10:00 PM. These patients are admitted to “rule-out” a myocardial infarction. In the AM these patients are presented to the hospitalist and nurse practitioner covering this unit. The number of these patients are included in the total “cap” for each housestaff team per night.
- vii. On days when the residents are not post-call, they are also responsible for documenting/dictating daily progress notes as well as discharge summaries on all patients on their team.
- viii. There is a cardiology fellow on call for both the general cardiology and Heart Failure and Transplantation services at all times for supervision and support for the rotating housestaff team. Additionally consultative support is available for an on-call electrophysiology fellow.

ix. Residents will continue to attend their weekly medicine continuity clinic during this rotation, being excused one afternoon a week.

x. Typical weekly conference schedule:

Mon	Tues	Wed	Th	Fr	Sa/Su
8:00 - 9:30 AM Teaching and Patient Care Rounds	8:00 – 9:30 AM Teaching and Patient Care Rounds	8:00 – 9:30 AM Teaching and Patient Care Rounds	8:00 – 9:30 AM Teaching and Patient Care Rounds	8:00 – 9:30 AM Teaching and Patient Care Rounds	8:00 – 9:30 AM Teaching and Patient Care Rounds
9:30 – 10:30 AM Heart Failure Rds	9:30 – 10:30 AM Heart Failure Rds				
				12:00– 1:00 PM Cardiology Grand Rounds	

IV. Principal Ancillary Educational Materials

- a. Residents have access to standard cardiology texts and journals onsite at the medical housestaff library, and through 24-hour online Denison library access. All residents are encouraged to read primary literature extensively throughout the rotation and they are routinely given articles pertinent to patient case discussions or didactic lecture material.

V. Methods of Evaluation

- a. Resident Performance:

Faculty will complete web-based electronic resident evaluation forms provided by the Internal Medicine Residency office. The evaluation is competency-based, fully assessing core competency performance. The evaluation will be shared with the resident, is available for on-line review by the resident at their convenience, and is sent to the residency office for internal review. The evaluation will be part of the resident file and will be incorporated into the semiannual performance review for directed resident feedback.

- b. Program and Faculty Performance:

Upon completion of the rotation, the residents will be asked to complete a service evaluation form commenting on the faculty, facilities, and service experience. These evaluations are conducted by the Chief Medical Resident in a conference-type format. These evaluations will be sent to the residency office for review and the attending faculty physician will receive anonymous copies of completed evaluation forms within several weeks of the completion of the clinical rotation. The Housestaff Education Committee will review results annually.

VI. Institutional Resources: Strengths and Limitations

- a. Strengths - The faculty of the Cardiovascular Division are full-time members of the School of Medicine and include nationally recognized experts in a variety of areas within cardiovascular medicine. Many have received teaching awards and are the authors of textbooks, chapters, and lecture in regional, national, and international conferences. The residents will encounter a wide variety of presentations of the most common serious cardiovascular complaints and conditions as well as an introduction to extremely complex patients requiring advanced cardiac care such as special cardiac intervention procedures for coronary/pericardial/valvular/adult congenital heart disease, cardiac assist devices, advanced electrophysiologic therapy, and cardiac transplantation. They will be introduced to a variety of testing modalities and therapeutic interventions.
- b. Limitations - The residents are extremely busy with a long period of formal rounds each day from 8:00 until 10:30 AM, interacting with the attending cardiologists and fellows on both the general cardiology and Heart Failure and Transplantation services. In addition, the rotating residents have little autonomy in the management of complex cardiovascular disease patients. The current set-up of the diagnostic laboratories with limited ability to view x-rays, cardiac angiograms and echocardiograms in the conference room where rounds are conducted make this aspect of teaching more difficult and cumbersome within the allotted time period. Also the location of patients in several areas of the hospital makes bedside rounds time consuming and limits to some extent the opportunities for bedside teaching.

VII. Rotation Specific Competency Objectives:

By the conclusion of this rotation the resident will:

- a. Patient Care
 - i. Demonstrate the ability to provide a problem focused history and physical examination.
 - ii. Demonstrate reinforced skills in cardiopulmonary resuscitation, phlebotomy, central line placement, hemodynamic monitoring, temporary pacemaker placement and pericardocentesis.
 - iii. Demonstrate increased ability in the assessment and management of critically ill cardiac patients including formulation of a working diagnosis and plan.
 - iv. Review studies, data and procedural notes to more effectively manage patients.
 - v. Provide clear and concise documentation in the medical record.
- b. Medical Knowledge
 - i. Demonstrate knowledge of fundamental approaches to the evidence-based care of acute myocardial infarction, severe congestive heart failure, unstable arrhythmias, evaluation for cardiac transplantation, and other cardiovascular problems.
 - ii. Demonstrate knowledge of fundamental elements of cardiac anatomy, physiology and pharmacology, as well as the manifestations of common forms of cardiac pathophysiology through the cardiac physical exam.

- iii. Correctly interpret common electrocardiographic findings including:
 - 1. atrial and ventricular rates
 - 2. common regular and irregular rhythms
 - 3. p wave axis and morphology
 - 4. QRS axis and duration
 - 5. P-QRST morphology including patterns for hypertrophy, conduction delays, ischemia, pericarditis, electrolyte abnormalities, and common drug effects
- c. Interpersonal and Communication Skills
 - i. Provide supervision by the PGY2 resident for the PGY1 resident participating in this rotation under the supervision of sub-specialty fellows and attending physicians
 - ii. Follow assigned patients while under the direct supervision of sub-specialty fellows and attending physicians, interacting productively in a team care approach.
- d. Professionalism
 - i. Reflect compassion, commitment, integrity, and responsibility throughout his/her interactions.
 - ii. Reflect sensitivity to patients of all ages, genders, religious, ethnicities, and sensitivity to the dignity of critically ill and/or terminal patients.
- e. Practice Based Learning and Improvement
 - i. Demonstrate improving ability to access and critically appraise cardiac literature appropriate to the care of patients, discussing such information as appropriate during the course of cardiology attending rounds case discussions and at Morning Report.
 - ii. Assist in the achievement of performance improvement projects and goals identified by the cardiology services, including current projects targeting the care of patients with myocardial infarction and acute coronary syndromes (American Heart Association's Get with the Guidelines Program).
- f. Systems Based Practice
 - i. Work as an integral part of the health care team including appropriate transfer of care.
 - ii. Demonstrate patient advocacy and sensitivity to family interactions during any discussions of terminal care decisions for critically ill patients.
 - iii. Demonstrate ability to interact with nurses, physician assistants, catheterization lab technicians, and all other ancillary professionals for total care of cardiac patients.

This document is adapted from the MSU Internal Medicine Residency Program curriculum.