

Pediatric Cardiology

Description:

This rotation is designed to provide first year pediatric residents with experiences in clinical cardiology. They will participate in supervised clinical evaluations of patients in the outpatient clinic and the inpatient services including those who are critically ill in the specialized intensive care units.

Note:

The goals and objectives described in detail below are not meant to be completed in a single one-month block rotation but are meant to be cumulative, culminating in a thorough and complete Pediatric Cardiology experience at the end of residency

Primary Goals for this Rotation

GOAL: Prevention, Counseling and Screening. Understand the role of the pediatrician in preventing cardiovascular diseases, and in counseling and screening individuals at risk for these diseases.

Offer cardiovascular risk prevention counseling to all patients and parents and routinely screen for cardiovascular disease to identify individuals at increased risk.

1. Identify risk factors and provide information to patients and families regarding atherosclerotic heart disease and hypertension (family history or genetic predisposition to heart disease, lifestyle issues such as weight control, diet, exercise, and tobacco use).
2. Provide regular screening for prevention of heart disease and hypertension (regular monitoring and plotting of BMI, cholesterol and lipid screening as indicated, and periodic blood pressure measurement).

Provide cardiovascular preventive counseling to parents and patients with specific cardiac diseases about:

1. Indications, duration, and appropriate antibiotic regimens for bacterial endocarditis prophylaxis
2. Indications and appropriate antibiotic treatment for rheumatic fever prophylaxis
3. Routine influenza and pneumococcal immunization in children with cardiac disease

GOAL Normal Vs. Abnormal. Distinguish normal from abnormal cardiovascular signs and symptoms.

Describe normal perinatal circulation and changes at birth and during the first year of life.

Describe age-related changes in heart rate and blood pressure, including normal ranges from birth through adolescence.

Explain the mechanism for the production of heart sounds and murmurs and

differentiate between physiologic (normal, functional or innocent) and pathologic heart murmurs.
Explain the findings on history and physical examination that suggest congenital heart disease or cardiovascular disease needing further evaluation and treatment.
Interpret clinical and laboratory tests to identify cardiovascular disease, including: pulse and blood pressure monitoring, chest X-ray interpretation, pulse oximetry, hyperoxia test, electrocardiography, ECG monitoring reports and echocardiography reports.
Describe the principles of electrocardiography, including normal voltages and rhythms. Differentiate normal from abnormal rhythms and voltages that suggest cardiovascular disease.
GOAL: Undifferentiated Signs and Symptoms. Evaluate, treat, and/or refer patients with presenting signs and symptoms that suggest a cardiovascular disease process.
<p>Create a strategy to determine if the following presenting signs and symptoms are caused by a cardiovascular disease process and determine if the patient should be treated or needs referral to a subspecialist.</p> <ol style="list-style-type: none"> 1. Shortness of breath 2. Chest pain 3. Cyanosis 4. Syncope 5. Wheezing 6. Apparent life threatening event 7. Failure to thrive 8. Exercise intolerance 9. Unexplained tachypnea, dyspnea 10. Palpitations 11. Abnormal heart sounds
GOAL: Common Conditions Not Referred. Diagnose and manage patients with common cardiovascular conditions that generally do not require referral.
<p>Diagnose, explain and manage the following cardiovascular conditions:</p> <ol style="list-style-type: none"> 1. Tachycardia related to fever 2. Peripheral pulmonic stenosis 3. Functional (innocent) heart murmur 4. Small, hemodynamically insignificant and closing VSD 5. Small, hemodynamically insignificant and closing PDA within the neonatal period 6. Musculoskeletal chest pain 7. Mild hypertension 8. Premature atrial contractions 9. Benign premature ventricular contractions
GOAL: Conditions Generally Referred. Recognize, provide initial management of, and refer patients with cardiovascular conditions that generally require referral.
Identify, explain, provide initial management and refer the following cardiovascular conditions:

1. Hypertension, moderate and severe
2. Supraventricular tachycardia
3. Bradycardia
4. Congestive heart failure
5. Cardiovascular collapse
6. Cardiovascular syncope
7. Chest pain associated with exercise
8. Pathologic heart murmurs
9. Congenital heart disease for initial diagnosis and follow-up

Identify the role and general scope of practice of pediatric cardiologists; recognize situations where children benefit from the skills of specialists trained in the care of children; and work effectively with these professionals in the care of children with congenital heart disease and other cardiovascular disease processes.

GOAL: Congenital Heart Disease. Understand the general pediatrician's role in diagnosis and management of congenital heart disease in children.

Describe the presenting symptoms, signs/physical findings, pathophysiology, treatment and prognosis for the following congenital cardiovascular conditions:

1. Ventricular septal defect
2. Atrial septal defect
3. Tetralogy of Fallot
4. Patent ductus arteriosus
5. Coarctation of the aorta
6. Transposition of great vessels
7. Tricuspid atresia
8. Pulmonary atresia
9. Hypoplastic left heart
10. Aortic stenosis
11. Pulmonic stenosis
12. Total anomalous pulmonary venous return
13. Mitral valve prolapse
14. Truncus Arteriosus
15. Atrioventricular canal

Describe the association of congenital heart disease with the following genetic syndromes:

1. Down's syndrome
2. Marfan syndrome
3. VACTERL association
4. Trisomy 13
5. Trisomy 18
6. Williams syndrome
7. Turner syndrome
8. Chromosome 22 microdeletion (i.e., Velocardial facial, DiGeorge syndrome)

GOAL: Acquired Heart Disease. Understand the general pediatrician's role in diagnosis and management of acquired heart disease in children.

Describe the presenting signs and symptoms, physical findings, pathophysiology,

treatment and prognosis for the following acquired cardiovascular conditions:

1. Supraventricular tachycardia
2. Myocarditis/cardiomyopathy
3. Kawasaki disease
4. Acute rheumatic fever
5. Bacterial endocarditis
6. Essential hypertension
7. Dyslipidemia
8. Long QT Syndrome
9. Complete atrioventricular block
10. Ventricular tachycardia

GOAL: Hypertension. Understand the general pediatrician's role in diagnosis and management of hypertension in children.

Classify a patient with hypertension as to severity according to current national guidelines, e.g., elevated BP, stage I, and stage II.

Develop a diagnostic plan for a child with hypertension that accounts for severity of the condition, including recognition of hypertensive emergencies.

Manage a patient with hypertension using a step-wise approach that includes the role of diet, exercise, weight control, and medications.

Compare the commonly used antihypertensive drugs, considering indications and contraindications for use, mechanism of action and side effects.

Identify the indicators for a cardiology or nephrology referral in a child with hypertension.

GOAL: Cardiovascular Drugs. Understand key principles related to the use of cardiovascular drugs.

Identify the indications, contraindications, mechanism of action and side effects of the commonly used cardiovascular drugs (antiarrhythmic, chromotropes, inotropes, diuretics, vasodilator, vasopressors).

GOAL: Pediatric Competencies. Demonstrate high standards of professional competence while working with patients under the care of a subspecialist.

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

1. Use a logical and appropriate clinical approach to the care of patients presenting for cardiology care, applying principles of evidence-based decision-making and problem-solving.

2. Describe general indications for cardiology procedures and interpret results for families.

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

1. Acquire, interpret and apply the knowledge appropriate for the generalist regarding the core content of cardiology.

2. Critically evaluate current medical information and scientific evidence related to cardiology and modify your knowledge base accordingly.

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

1. Provide effective patient education, including reassurance, for a condition(s) common to cardiology,

2. Communicate effectively with primary care and other physicians, other health professionals, and health-related agencies to create and sustain information exchange and teamwork for patient care.

3. Maintain accurate, legible, timely and legally appropriate medical records, including referral forms and letters, for cardiology patients in the outpatient and inpatient setting.

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

1. Identify standardized guidelines for diagnosis and treatment of conditions common to cardiology and adapt them to the individual needs of specific patients.

2. Identify personal learning needs related to cardiology; systematically organize relevant information resources for future reference; and plan for continuing acquisition of knowledge and skills.

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

1. Demonstrate personal accountability to the well-being of patients (e.g., following up on lab results, writing comprehensive notes, and seeking answers to patient care questions).

2. Demonstrate a commitment to carrying out professional responsibilities.

3. Adhere to ethical and legal principles, and be sensitive to diversity.

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

1. Identify key aspects of health care systems as they apply to cardiology, including the referral process, and differentiate between consultation and referral.

2. Demonstrate sensitivity to the costs of clinical care in cardiology, and take steps to minimize costs without compromising quality

3. Recognize and advocate for families who need assistance to deal with systems complexities, such as the referral process, lack of insurance, multiple medication refills, multiple appointments with long transport times, or inconvenient hours of service.

4. Recognize one's limits and those of the system; take steps to avoid medical errors.

Rotation Specific Competencies

Patient Care:

1. Understands and weighs alternatives for diagnosis and treatment
2. Elicits subtle findings on physical examination
3. Gathers essential/accurate information via interviews and physical exams in a manner that is respectful of patients and families
4. Develops and carries out management plans
5. Competently understands/performs/interprets procedures:
 - _____ Radiology Interpretation: CXR
 - _____ Electrocardiogram (EKG): Performs/Interprets
 - _____ Echocardiogram: Interpretation
 - _____ Holter Monitor: Indications/Findings

Medical Knowledge:

1. Is aware of indications, contraindications, and risks of commonly used medications and procedures
2. Applies the basic science, clinical, epidemiologic, and social-behavioral knowledge to the care of the patient

Interpersonal Skills and Communication:

1. Creates and sustains therapeutic and ethically sound relationships with patients and families
2. Provides education and counseling to patients, families, and colleagues
3. Works effectively as a member of the health care team

Practice-based Learning and Improvement:

1. Undertakes self-evaluation with insight and initiative
2. Facilitates the learning of students and other health care professionals

Professionalism:

1. Displays initiative and leadership
2. Shows regard for opinions and skills of colleagues
3. Is responsive to needs of patients and society, which supersedes self-interest

Systems Based Practice:

1. Applies knowledge of how to partner with health care providers to assess, coordinate

- and improve patient care
2. Provides cost effective care

Suggested Reading (residents provided with digital copies of articles):

Cardiology Basics

- Chapter 3: History and Physical Examination. Moss and Adams' Heart Disease in Infants, Children, and Adolescents. 7th Edition, 2008
- Presentation of Congenital Heart Disease in the Neonate and Young Infant. Silberach, et al. Pediatrics in Review 2007;28;123

Syncope and Chest Pain

- Chest pain and syncope in children: a practical approach to the diagnosis of cardiac disease. Friedman, et al. J Pediatr. 2013 Sep;163(3):896-901.e1-3.
- Fainting freshmen and sinking sophomores: cardiovascular issues of the adolescent. DiVastaa, et al. Current Opinion in Pediatrics 2004, 16:350–356

SVT/arrhythmias

- Current Management of the Infant and Child with Supraventricular Tachycardia. Kertesz NJ, et al. Cardiol Rev. 1998 Jul;6(4):221-230
- The infant with supraventricular tachycardia: Diagnosis and management. Etheridge SP, et al. Progress in Pediatric Cardiology 35 (2013) 1–6

- PACES/HRS Expert Consensus Statement on the Management of the Asymptomatic Young Patient with a Wolff-Parkinson-White. (WPW, Ventricular Preexcitation) Electrocardiographic Pattern. [Heart Rhythm](#). [Volume 9, Issue 6](#), June 2012, Pages 1006-1024

Basic ECG

- The pediatric Electrocardiogram: Part II: Dysrhythmias. O'Connor M, McDaniel N, Brady WJ. Am J Emerg Med. 2008 Mar;26(3):348-58.

Acquired Heart Disease

- Hypertrophic Cardiomyopathy in Childhood. Colan SD, *Heart Fail Clin*. 2010 October ; 6(4): 433–444. doi:10.1016/j.hfc.2010.05.004
- Diagnosis, Treatment, and Long-term Management of Kawasaki Disease. McCrindle, et al. *Circulation*. 2017;135:00–00.

Cyanotic Congenital Heart Disease

- Transposition of the great arteries. (Adult Congenital). Warnes CA *Circulation*. 2006 Dec 12;114 (24):2699-709.
- Hypoplastic left heart syndrome – Review. Connor JA, Thiagarajan R. Orphanet Journal of Rare Diseases 2007, 2:23 doi:10.1186/1750-1172-2-23

Hypertension and Hyperlipidemia

- Flynn JT, Kaelber DC, Baker-Smith CM, et al. Clinical Practice Guideline for Screening

and Management of High Blood Pressure in Children and Adolescents. *Pediatrics*.2017;140(3):e20171904

-Hypertension in infancy: diagnosis, management and outcome. Dionne JM, Abitbol CL, Flynn JT. *Pediatr Nephrol* (2012) 27:17–32

-Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents: Summary Report. *Pediatrics*. Volume 128, Supplement 6, December 2011 (Read lipid section)

Pulmonary Hypertension

-Diagnostics, monitoring and outpatient care in children with suspected pulmonary hypertension/ paediatric pulmonary hypertensive vascular disease. Expert consensus statement on the diagnosis and treatment of paediatric pulmonary hypertension.

Lammers AE, et al. *Heart* 2016;102:ii1–ii13. doi:10.1136/heartjnl-2015-307792

-Persistent Pulmonary Hypertension of the Newborn. [NeoReviews](#). [December 2015, VOLUME 16 / ISSUE 12](#)

Miscellaneous reading

-ADHD Drugs and Serious Cardiovascular Events in Children and Young Adults. Cooper WO, et al. *New Engl. J. Med.*, 365 (2011), pp. 1896–1904

-Roman B. Nourishing little hearts: Nutritional implications for congenital heart defects. August 2011. *Practical gastroenterology* 35(8):11-3

-Cardiac: Syndromes Associated with Congenital Cardiac Defects. NCCU Clinical Practice Guidelines. <https://www.kemh.health.wa.gov.au/For-health-professionals/Clinical-guidelines/NEO>

Infective Endocarditis

-Infective Endocarditis in Childhood: 2015 Update - A Scientific Statement From the American Heart Association. *Circulation*. 2015;132:00-00

Athletic Participation

-Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Preamble, Principles, and General Considerations. Maron, et al. *J Am Coll Cardiol* 2015

*****Read the following chapters in Park's Pediatric Cardiology for Practitioners (a copy will be provided for your temporary use):

Chapter 3: ECG

Chapter 9: Pathophysiology of Left-to-Right Shunts

Chapter 11: Pathophysiology of Cyanotic Congenital Heart Defects

Chapter 18: Primary Myocardial Disease

Chapter 27: Congestive Heart Failure

-Park's pediatric cardiology for practitioners. Park, Myung K. Sixth edition. Philadelphia, PA : Elsevier/Saunders, [2014]

References:

1. American Board of Pediatrics, Content Specification, 2007 and 2017
2. Ambulatory Pediatric Association
3. Association of Pediatric Program Directors
4. Pediatric RRC, January 2006

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