

DMS-2650: PEDIATRIC CARDIAC SONOGRAPHY

Cuyahoga Community College

Viewing: DMS-2650 : Pediatric Cardiac Sonography

Board of Trustees:

March 2020

Academic Term:

Fall 2020

Subject Code

DMS - Diagnostic Medical Sonography

Course Number:

2650

Title:

Pediatric Cardiac Sonography

Catalog Description:

Study of normal and abnormal cardiac anatomy, fetal heart development and perinatal circulation specific to congenital cardiovascular defects. Focus on pediatric echo protocol, exam considerations for the patient population with congenital heart abnormalities (pediatric and adults). Discussion and case study review of simple to complex congenital heart abnormalities. Sonographer's role in the operating room and catheterization lab.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

DMS-1950 Field Experience II or departmental approval.

Outcomes

Course Outcome(s):

Apply knowledge of congenital cardiovascular defects, their etiologies, effects and sonographic appearance

Objective(s):

1. Explain the embryology, anatomy, and physiology of congenital heart defects.
2. Compare and contrast simple congenital heart defects to complex congenital heart defects.
3. List syndromes associated with congenital cardiovascular defects and sonographer exam considerations for this population.

Course Outcome(s):

Relate and describe components associated with and affecting the pediatric cardiovascular system.

Objective(s):

1. Recognize a diagnostic sonogram on patients with congenital cardiovascular defects.
 2. Describe various surgical and medical management of patients with congenital heart defects.
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Methods of Evaluation:

1. Article reviews
2. Class participation
3. Final examination
4. Homework assignments
5. Oral/Written quizzes

6. Research/Semester project
7. Technical Impressions
8. Written tests

Course Content Outline:

1. Concepts
 - a. Protocols
 - b. Congenital heart disease/types
 - c. Embryology
 - d. Pathology/physiology
 - e. Associated Conditions
 - f. Exam preparation technique
 - g. Critical thinking
 - h. Cardiac Auscultations
 - i. Natural history/complications of Congenital Heart Disease (CHD)
 - j. Medical/Surgical management
2. Skills
 - a. Preparing pediatric patient and room for exam
 - b. Assessing patient for Congenital Heart Disorders
 - c. Recognize Congenital Heart Disease by echocardiogram
 - d. Analyze findings using critical thinking
 - e. Differentiating between artifact and anatomical variants
3. Issues
 - a. Knowledge retention
 - b. Standards of practice
 - c. Exam preparation
 - d. Critical thinking
 - e. Medical ethics
 - f. Difficult examinations

COURSE OUTLINE

1. Anatomy
 - a. Basic embryology
 - b. Persistence of normal fetal communication
 - c. Situs and position
 - d. Systemic and pulmonary venous connections
 - e. Chambers / septa
 - f. Atrioventricular connection and valves
 - g. Ventriculoarterial connection and semilunar valves
 - h. Great vessels, branches and relationships
 - i. Other adjacent and related structures
2. Physiology
 - a. Phases of the cardiac cycle
 - i. Systolic events
 - ii. Diastolic event
 - b. Hemodynamics
 - i. Systemic - venous
 - ii. Pulmonary - venous
 - iii. Systemic - arterial
 - iv. Pulmonary - arterial
 - v. Atrioventricular events
 - vi. Shunts
 - c. Perinatal Circulation
 - i. Patent Ductus Arteriosus
 - ii. Patent Foramen Ovale
3. Functional qualitative and quantitative assessment
 - a. Systolic function
 - b. Diastolic function
 - c. Linear measurements

- d. Volumes
- e. Wall motion abnormalities
- f. Velocities and pressure gradients
- g. Maneuvers altering cardiac physiology (e.g., position)
- 4. Congenital pathology - Patient history, associated abnormalities/syndromes, medical/surgical management and complications and sonographic appearance
 - a. Abnormalities related to situs and position
 - i. Dextrocardia
 - ii. Asplenia/Polysplenia
 - b. Systemic and pulmonary venous connection
 - c. Defects in cardiac septation
 - i. Atrial septal defects
 - ii. Ventricular septal defects
 - d. Atrioventricular septal defects
 - e. Conotruncal defects
 - f. Abnormalities of atrioventricular and ventriculoarterial connection
 - g. Ventricular hypoplasia
 - h. Abnormalities of ventricular inflow (valve / obstruction / insufficiency)
 - i. Mitral stenosis/insufficiency
 - ii. Tricuspid stenosis/insufficiency
 - i. Abnormalities of ventricular outflow (valve / obstruction / insufficiency)
 - i. Aortic stenosis/insufficiency
 - ii. Pulmonary stenosis/insufficiency
 - j. Abnormal vascular connections and structures
 - i. Coarctation of Aorta
 - ii. Interrupted Aortic Arch
 - iii. Vascular Ring
 - iv. Coronary anomalies
 - k. Cyanotic Malformations
 - i. Complete Transposition of Great Arteries
 - ii. Double Outlet Right Ventricle
 - iii. Ebstein's Anomaly
 - iv. Pulmonary atresia
 - v. Tricuspid atresia
 - vi. Tetralogy of Fallot
 - vii. Truncus arteriosus
 - viii. Total anomalous venous return/ partial anomalous venous return
 - ix. Univentricular heart
 - I. Syndromes/chromosome abnormalities associated with CHD
- 5. Acquired pathology - Patient history, associated abnormalities, medical/surgical management and complications and sonographic appearance
 - a. Cardiomyopathies
 - b. Space-occupying lesions (mass / tumor / vegetation / thrombi)
 - i. Rhabdomyomas
 - ii. Fibromyomas
 - iii. Myxomas
 - c. Aneurysms
 - d. Fistulas
 - e. Kawasaki disease
 - f. Rheumatic heart disease
 - g. Effusions (pericardial and pleural)
 - h. Drug toxicity
- 6. Miscellaneous supportive procedures
 - a. Pericardiocentesis
 - b. Catheterization interventions / device occlusion procedures
 - c. Transesophageal echo
 - d. Balloon atrial septostomy (Rashkind)
 - e. Saline contrast
 - f. Exercise and pharmacologic stress testing: basic principles

7. Exam preparation considerations
 - a. Exam environment preparation
 - b. Special considerations for the pre-mature newborn and neonatal patient
 - c. Special considerations for the sedated patient
 - d. Performing the exam
 - e. Instrumentation
 - i. ECG
 - ii. M-mode imaging
 - iii. Two-dimensional imaging
 - iv. Doppler (PW, CW, color, tissue imaging)

Resources

Everett, Allen D. *Illustrated Field Guide to Congenital Heart Disease and Repair*. 3rd ed. Chicago: Scientific Software Solutions, Inc., 2011.

Heiden, Ken. *Congenital Heart Defects, Simplified*. 2nd ed. Glendale, WI: Midwest Echo Solutions, 2017.

Reynolds, Terry. *The Pediatric Echocardiographers Pocket Reference Guide*. 3rd. Phoenix: Arizona Heart Institute, 2002.

Siegel, Marilyn J. *Pediatric Sonography*. 5th ed. Philadelphia: Lippincott Williams & Wilkins, 2018.

Eidem, Benjamin W., O'Leary, Patrick W. Cetta, Frank. *Echocardiography in Pediatric and Adult Congenital Heart Disease*. 2nd ed. : Wolters Kluwer, 2014.

Lewin, Mark B., Stout, Karen K. *Echocardiography in Congenital Heart Disease*. 2nd ed. : Saunders, 2016.

Abuhamad, Alfred Z., Chaoui, Rabih. *A Practical Guide to Fetal Echocardiography: Normal and Abnormal Hearts*. 3rd ed. : LWW, 2015.

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