Pediatric Echocardiography Examination Content Outline

(Outline Summary)

#	Domain	Percentage
1	Normal Anatomy and Physiology	15%
2	Acquired Heart Disease	12%
3	Congenital Anomalies	25%
4	Postoperative (surgically corrected/palliated) Anatomy	19%
5	Performing the Exam	29%

(Detailed Outline)

1	Normal Anatomy and Physiology 15%
1.A.1	Identify anatomical structures and morphology of the great arteries
1.A.2	Identify physiological properties of the great arteries (e.g., spectral Doppler and flow patterns)
1.A.3	Identify anatomical structures and morphology of the systemic and pulmonary veins
1.A.4	Identify physiological properties of the systemic and pulmonary veins (e.g., spectral Doppler and flow patterns)
1.A.5	Identify anatomical structures and morphology of cardiac valves
1.A.6	Identify physiological properties of the cardiac valves (e.g., motion, flow patterns)
1.A.7	Identify anatomical structure and morphology of the left and right ventricles of the heart
1.A.8	Identify physiologic function of the left and right ventricles of the heart
1.A.9	Identify anatomical structures and morphology of the left and right atria (e.g., eustachian valve, Chiari network, appendage)
1.A.10	Identify characteristics of normal transitional circulation
1.A.11	Identify anatomy and origin of the coronary arteries
1.A.12	Identify characteristics of abdominal situs
2	**Acquired Heart Disease 12%**
2.A.1	Identify characteristics of cardiomyopathies
2.A.2	Identify characteristics of pulmonary hypertension
2.A.3	Identify characteristics of systemic hypertension
2.A.4	Assess pericardial and pleural abnormalities

2.A.5	Identify characteristics of acquired coronary artery abnormalities (e.g., Kawasaki disease)
2.A.6	Identify characteristics of infective endocarditis
2.A.7	Identify characteristics of cardiac thrombi
2.A.8	Identify characteristics of functional abnormalities associated with drug toxicity (e.g., chemotherapy)
2.A.9	Identify characteristics of lesions associated with connective tissue disorders (e.g., Marfan syndrome, Ehlers-Danlos syndrome, Loeys-Dietz syndrome)
2.A.10	Identify characteristics of rheumatic heart disease
3	**Congenital Anomalies 25%**
3.A.1	Identify characteristics of aortic arch anomalies
3.A.2	Identify characteristics of vascular rings and slings
3.A.3	Identify characteristics of conotruncal defects
3.A.4	Assess ventricular outflow tract anomalies
3.A.5	Identify characteristics of atrioventricular and ventriculoarterial connection anomalies
3.A.6	Identify characteristics of anomalies of the pulmonary veins
3.A.7	Assess anomalies of the pulmonary arteries
3.A.8	Assess anomalies of the aortic valve
3.A.9	Assess anomalies of the pulmonic valve
3.A.10	Assess anomalies of the mitral valve
3.A.11	Assess anomalies of the tricuspid valve
3.A.12	Identify characteristics of patent ductus arteriosus and aortopulmonary collaterals
3.A.13	Identify characteristics of atrioventricular canal defects
3.A.14	Identify characteristics of atrial and ventricular septal defects
3.A.15	Identify characteristics of abnormalities of the coronary artery (e.g., anomalous origin and course, sinusoids, fistulae)
3.A.16	Identify characteristics of anomalies of abdominal and cardiac situs/position
3.A.17	Identify characteristics of anomalies of the systemic venous system
3.A.18	Identify characteristics of cardiac tumors
3.A.19	Identify characteristics of cor triatriatum
3.A.20	Assess single ventricle anomalies and pathophysiology
3.A.21	Identify characteristics of cardiac pathologies associated with genetic disorders

4	Postoperative (surgically corrected/palliated) Anatomy 19 %
4.A.1	Identify characteristics of tetralogy of Fallot repair
4.A.2	Identify characteristics of valve repair/replacement
4.A.3	Identify characteristics of surgical repair for aortic arch anomalies
4.A.4	Identify characteristics of atrial and ventricular septal defect surgical repair
4.A.5	Identify characteristics of shunt closure devices
4.A.6	Identify characteristics of arterial switch operation
4.A.7	Identify characteristics of atrial switch operation (e.g., Mustard, Senning)
4.A.8	Identify characteristics of post-interventional valvular and vascular procedures (e.g., balloon, stent, transcatheter valve replacement)
4.A.9	Identify characteristics of modified Blalock-Thomas-Taussig shunt or central shunt
4.A.10	Identify characteristics of single ventricle staged palliation
4.A.11	Identify characteristics of the Ross procedure
4.A.12	Identify characteristics of repair of total/partial anomalous pulmonary venous connection
4.A.13	Identify characteristics of pulmonary artery banding
4.A.14	Identify characteristics of Rastelli repair
4.A.15	Identify implantable devices and lines (e.g., catheters, pacemaker/defibrillator leads)
4.A.16	Identify characteristics of cardiac transplantation and rejection
5	Performing the Exam 29%
5.A.1	Obtain a parasternal view
5.A.2	Obtain a suprasternal view
5.A.3	Obtain an apical view
5.A.4	Obtain a subcostal view
5.A.5	Adjust equipment settings to optimize image quality and Doppler information
5.A.6	Select appropriate transducer(s) based on patient size, window, and modality
5.A.7	Practice universal precautions and proper patient care
5.A.8	Interrogate the aortic arch using color and spectral Doppler
5.A.9	Interrogate the atrial and ventricular septum using color Doppler
5.A.10	Assess physiology of ventricular septal defects

5.A.11	Assess physiology of atrial septal defects
5.A.12	Calculate maximal pressure gradients using the modified Bernoulli equation
5.A.13	Interrogate pulmonary venous return using color and spectral Doppler
5.A.14	Interrogate the pulmonary artery and branches using color and spectral Doppler
5.A.15	Assess right heart pressure
5.A.16	Interrogate systemic venous return using color and spectral Doppler
5.A.17	Assess ventricular regional wall motion using two-dimensional imaging
5.A.18	Demonstrate echocardiographic findings at specific times during the electrocardiogram (cardiac) cycle
5.A.19	Measure chamber sizes and wall thickness using two-dimensional or M-mode imaging methods
5.A.20	Calculate fractional shortening using two-dimensional or M-mode imaging
5.A.21	Calculate ejection fraction (e.g., biplane Simpson, 5/6 area-length [bullet])
5.A.22	Perform linear measurements of cardiac structures using two-dimensional imaging methods
5.A.23	Calculate indices of diastolic function (e.g., E/A ratio, E/E' ratio, mitral valve inflow pattern, pulmonary venous flow pattern)
5.A.24	Correlate measurements to Z-score
5.A.25	Utilize advanced ultrasound techniques (e.g., myocardial strain, three-dimensional imaging, ultrasound enhancing agents, agitated saline studies)

Knowledge, Skills, and Abilities: *The following is a list of the foundational knowledge, skills, and abilities required to complete the tasks listed in the content outline.*
Understand hemodynamics and physiology of normal and abnormal hearts
Identification of variations of normal anatomy
Identification of transitional newborn physiology
Understand progression of disease states in congenital and acquired heart disease
Ability to recognize structural heart disease
Knowledge of pediatric specific anomalies
Knowledge of congenital heart lesions and interventions
Knowledge of genetic syndromes and associated cardiac findings
Knowledge of expected outcomes after interventions

Knowledge of additional pediatric/lesion specific imaging views/techniques
Knowledge of equipment and imaging settings
Troubleshooting common challenges in obtaining images
Knowledge of optimization of ergonomics and environment
Knowledge of universal precautions
Ability to make patients and guardians feel comfortable/calming techniques
Ability to have situational awareness while scanning a patient
Knowledge of critical findings and the appropriate response
Knowledge of the published guidelines for performance and quantification of a pediatric echocardiogram including Z-scores
Ability to follow standardized methods of assessment
Understand hemodynamics and physiology of normal and abnormal hearts