

Foundational Principles for Fetal, Maternal and Placental Health Imaging

The fetus is abnormal till proven otherwise

Approximately 3% of newborns have a recognizable major anomaly and at least 5% will ultimately be diagnosed with a congenital defect. Birth defects are the single most common cause of perinatal mortality in developed countries.

Because most anomalies occur in the absence of family history or known risk factors, every pregnancy must be considered at risk for significant birth defects.

Congenital heart disease (CHD) is the most common, the most serious, and the most frequently missed of all fetal malformations during detailed ultrasound fetal anatomic assessment. The profound majority of CHD occurs in the low-risk general population.

*Diagnostic Imaging of Fetal Anomalies. Nyberg. p.xii.

*Prenatal detection of congenital heart disease in south Nevada. The need for universal fetal cardiac evaluation. J. Ultrasound Med. 26:2007. p1715-1719. Acherman.

*Improving detection of fetal cardiac anomalies - A fetal echocardiogram for every fetus? J. Ultrasound Med. 26:2007. p1639- 1641. Bahtiyar and Copel.

Placental vascular dysfunction can lead to the great obstetrical syndromes - preeclampsia, small for gestational age, fetal death, abruption, preterm labor, preterm premature rupture of membranes

The most important adaptation for a successful pregnancy is the establishment and development of an adequate blood supply to the placenta and conceptus. The clinical consequences of suboptimal perfusion range from fetal growth restriction, SGA, preeclampsia, abruptio placenta, and fetal death.

*Expert review. Preeclampsia and eclampsia: The conceptual evolution of a syndrome. Erez. AJOG. Feb 2022.

Uterine artery Doppler and the universal screening for impaired placentation/placenta related adverse obstetrical outcomes

More than 15% of pregnancies are affected by placenta related adverse obstetrical outcomes necessitating uterine artery Doppler to screen for impaired placentation.

Preeclampsia and other hypertensive disorders of pregnancy occur in 5-8% of all pregnancies of women who have no known risk factors. <https://www.preeclampsia.org/faqs>
O36.512 - maternal care for known or suspected placental insufficiency.

Preeclampsia is a leading cause of maternal death worldwide. Preeclampsia is potentially life-threatening and affects 1 in 25 pregnancies in the United States.

*American Heart Association. April 2023.

More than 15% of pregnancies are affected by placenta related adverse obstetrical outcomes. Placental dysfunction - due to vascular and/or inflammatory pathophysiology - are considered to be the primary or significant contributor to The Great Obstetrical Syndromes, namely, preterm labor, preterm prelabor rupture of membranes, fetal demise, preeclampsia, and intrauterine growth restriction.

Placental disease confers increased risk for adult metabolic and cardiovascular disorders of both mother and child.

*Expert Review AJOG Nov 2021. Bar. The thrifty phenotype hypothesis: The association between ultrasound and Doppler studies and fetal growth restriction and the development of adult disease.

*Diabetes. March 2021. Keleher. Placental insulin/IGF-1 signaling, PGC-1 α , and inflammatory pathways are associated with metabolic outcomes at 4-6 years of age: The ECHO Healthy Start Cohort

*Obstetrics & Gynecology Clinics. March 2020. Nelson. The human placenta in health and disease.

Uterine artery Doppler is a validated non-invasive proxy for placenta ischemia due to impaired placentation and defective trophoblastic invasion - the pathogenesis of early onset preeclampsia and contributing factor to preterm preeclampsia. Uterine artery Doppler is a marker for defective remodeling of spiral arteries with consequent placental malperfusion and associated impaired fetal growth.

*Scazzocchio. Ultrasound Obstet Gynecol 2017; 49:435 - 441.

*Mifsud. Placental pathology in early onset and late onset fetal growth restriction. Fetal Diagn Ther 2014;36:117-128

In each trimester of pregnancy, uterine artery Doppler is an essential component within the evidence based multifactorial Fetal Medicine Foundation algorithm optimizing personalized quantitative preeclampsia risk assessment in each trimester of pregnancy

*The competing risk approach for prediction of preeclampsia. Wright. Am J Obstet Gynecol. July 2020

*From first trimester screening to risk stratification of evolving preeclampsia and second and third trimesters of pregnancy: comprehensive approach. Ultrasound Obstet Gynecol. Poon. 2020;55:5-12.

<https://fetalmedicine.org/research/assess/preeclampsia/Second>

<https://fetalmedicine.org/research/assess/preeclampsia/background>

<https://fetalmedicine.org/research/utpi>

