

Whether or not a mother is high-risk or not, there are certain tests that doctors make sure mothers get to ensure their babies are developing properly. The kind of tests they administer can vary depending on numerous factors (such as the mother's medical history, pre-existing health conditions, among others), These tests (commonly called *prenatal tests*) are used to identify babies who are at risk of having a brain injury like hypoxic-ischemic encephalopathy and to take steps to reduce their risk of *adverse health outcomes* (a general term for health conditions that negatively impact a baby's development). Mothers who are high-risk and/or have the following conditions are monitored and/or tested particularly frequently to decrease risk:



- Mothers with high blood pressure and preeclampsia
- Diabetes or gestational diabetes
- Other medical conditions that impact pregnancy
- The baby is small for their gestational age due to fetal growth restriction
- The baby has a decrease in movement
- The mother has had an external cephalic version to turn the baby into the correct position for birth
- The baby has received a 3rd trimester amniocentesis to check lung maturity or infection status
- The mother previously lost a baby during the second ½ of pregnancy
- The baby has been diagnosed with abnormalities or birth defects



One of the best ways to prevent HIE is to closely monitor pregnancies, especially those with one or more [risk factors](#) for HIE. Proper prenatal care and monitoring is crucial for managing and identifying conditions that may affect the baby's health and development.

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### What Do Prenatal Tests Screen For?

Different prenatal tests look for different things. Because the list of tests that a mother goes through during her prenatal care is extensive, this page focuses on the tests that directly relate to hypoxic-ischemic encephalopathy (HIE). Other tests (such as those that test for [UTIs/BV or Group B Strep](#)) are equally as important from a birth injury standpoint but will be discussed separately.

There are several factors that prenatal testing surrounding the oxygenation of the baby can focus on. These include:

- Fetal heart rate
- Blood flow
- Fetal movement
- Amniotic fluid levels

If a baby is being oxygen deprived (hypoxic), their heart rate will slow down, they will move less to conserve energy. These are warning signs of a condition called *fetal distress*, where the baby is beginning to suffer damage from oxygen deprivation. Additionally, if amniotic



fluid levels decrease or are low, there is a risk that the umbilical cord can be compressed and cause fetal distress. During pregnancy, birth and delivery, medical professionals must monitor the baby's health in order to address such signs as soon as they occur, because prolonged inaction can cause permanent damage.

What Are Some of the Common Prenatal Tests Doctors Administer to Their Patients?

### Prenatal Testing: Non-Stress Tests

One of the tests administered during pregnancy is called a *non-stress test (NST)*. It is commonly provided between weeks 38-42 (or much earlier depending on risk factors), and is provided to mothers are high-risk or have a post-term pregnancy (a pregnancy that lasts longer than 40 weeks).

Just as in adults (whose heart rates increase during exercise), a baby's heart rate should increase when they move around or kick. An NST tests how well their heart rate responds to movement, If the baby isn't getting enough oxygen, their heart rates don't increase when they move around, producing a *non-reactive test*. If a baby is getting enough oxygen, their heart rate increases, pointing to a *reactive test*. This reaction (acceleration) shows up as an increase of at least 15 beats per minute for at least 15 seconds. This is an extremely important measure because these accelerations can indicate how well a baby will go through labor.

### Prenatal Testing: Contraction Stress Tests (CSTs)

After 34 weeks' gestation, this test determines whether a baby will stay healthy during labor and delivery. During labor and delivery, the uterus contracts, reducing oxygen availability for the duration of the contraction. In between contractions, oxygen levels increase back to normal. Most babies are able to tolerate this well, but some are not. CSTs determine if a baby can safely go through the labor process. During this test, a mother lies on her left side while a fetal heart rate monitor and a device that records contractions are placed in specific positions on her abdomen. A machine prints out the results of these monitoring tests, allowing a



physician to interpret the results and provide feedback to the mother about her baby's ability to tolerate labor. If a mother doesn't have contractions for the first 15 minutes of the tests, staff may give Pitocin to stimulate them.

CSTs are rarer now, as they are riskier and more expensive than NSTs. Much of the risk stems from the use of Pitocin, as it is very hard to predict how a mother's uterus will react to Pitocin. There are also some conditions where Pitocin shouldn't be used (such as if a mother has a low-lying placenta) because it can cause hemorrhaging and other adverse health outcomes.

#### Prenatal Testing: Amniotic Fluid Volume (AFV) Tests

Amniotic fluid (the fluid inside the uterus that cushions and protects the baby) must be at a precise level to effectively protect the baby and ensure that it develops properly. Too much amniotic fluid or too little amniotic fluid can cause issues with the flow of nutrients and oxygen to the baby through the umbilical cord, as well as other health conditions like preterm birth, premature rupture of the membranes, placental abruption and hypoxic-ischemic encephalopathy.

To test how much amniotic fluid there is, medical professionals use ultrasound to get a measurement called an *amniotic fluid index (AFI)* by measuring amniotic fluid depth in 4 different sections of the amniotic sac. Results are generally expected as follows:

- AFI 9-18 cm: Normal
- AFI 5-8: borderline
- AFI 5 or less: abnormal
- Sudden decrease in AFI at any range abnormal

A healthy AFI at 20-35 weeks gestation is ~14cm. At weeks 34-36, amniotic fluid volume begins dropping in anticipation of birth. Generally, amniotic fluid volume increases to about 1L total by 34-36 weeks, and then decrease as much as 25% a week, up to 150mL/week



between weeks 38-43.

AFI tests can indicate the presence of *oligohydramnios* (too little amniotic fluid) or *polyhydramnios* (too much amniotic fluid). Polyhydramnios is defined as having more than 2L of amniotic fluid, more than 8cm maximum pool, or an AFI of more than 25cm. In either case, the baby may need to be delivered early, though that is dependent on a host of factors, including lung maturity, the presence of fetal distress, and other causes that medical professionals evaluate.

A different amniotic fluid volume test is called the *maximum pool*, where medical professionals measure the single deepest vertical pocket of amniotic fluid using ultrasound. This is done as part of the biophysical profile (BPP).

#### Prenatal Testing: Biophysical Profiles (BPP)

This approximately 30-minute test uses ultrasound to evaluate the baby. The test takes into account the results of the non-stress test (NST), amniotic fluid volume (AFV) tests, as well as the presence or absence of fetal breathing movements, gross body movements, and the presence or absence of reflex and extension movements. The test uses a point system to evaluate if a baby has been having acute or chronic hypoxia. The BPP can also be modified to measure acute oxygenation and longer-term oxygenation.

This test can predict whether a baby is at risk for fetal asphyxia (severe oxygen deprivation) and risk of fetal death during the short period of time directly after birth (the antenatal period). If a medical professional identifies a baby with oxygen deprivation, they have to take immediate steps to prevent the baby from having brain damage or death due to acidosis. One of these steps is an emergency C-section.

#### Prenatal Testing: Doppler Velocimetry

This test measures how well blood is flowing through the uteroplacental structure and how



the baby responds to physiological changes. If the placenta's blood vessels aren't properly developing, this test will show progressive changes in areas like fetal blood flow, blood pressure and heart rate which show up as circulation changes. This test can show if there is major dysfunction in crucial arteries and veins like the umbilical cord. This is important because major dysfunction can indicate a likelihood for hypoxic-ischemic encephalopathy. This test is highly detailed and specific, and can pinpoint the flow of blood in different blood vessels. Abnormal Doppler findings must be closely monitored and a plan must be quickly made to determine when the baby should be delivered.