Frequency of prenatal visits [1]

- Visit frequency should be tailored to maternal needs and pregnancy risk factors. [1][5]
- Typical timing of routine prenatal visits for an uncomplicated pregnancy:
  - Initial visit: usually in the first trimester [5]
  - Follow-up visits [1]
    - **Every 4 weeks**: from initial visit to 28 weeks' gestation
    - **Every 2 weeks**: from 28 to 36 weeks' gestation
    - **Weekly**: from 36 weeks' gestation until delivery (see also "Postterm pregnancy")

High-risk pregnancies generally warrant more than the usual number of follow-up visits for maternal and/or fetal surveillance. [1]

Gestational age and estimated date of delivery [1][8]

- Determination of gestational age and estimated date of delivery is important for:
  - Guiding the timing of prenatal screening and fetal monitoring
  - Managing postterm pregnancy
- Methods of pregnancy dating include one or both of the following:
  - Naegele rule
    - Expected date of delivery (due date) is estimated as the first day of the LMP + 280 days [8][9]
    - May be unreliable in patients with uncertain LMP or irregular menstrual cycles
  - Ultrasound: should be performed to estimate gestational age if LMP is unreliable [1][10]
    - First-trimester US: estimation is based on crown-rump length
    - Second-trimester US: estimation is based on fetal biometric parameters
- For a gestational age discrepancy between ultrasound and LMP, use EDD determined by ultrasound if: [8]
  - > 5 days gestational age discrepancy in gestations < 9 weeks
  - > 7 days gestational age discrepancy in gestations 9–13 weeks

Symphysis-fundal height measurement [6]

- Measured from the top of the pubic symphysis to the top of the uterus.
- Fundal height can be used to monitor fetal growth or to roughly estimate gestational age in an emergency. [11]

- Screen all patients > 24 weeks' gestation for fetal growth abnormalities using symphysis fundal height. [6]
- From 20 weeks, fundal height in centimeters should roughly approximate the week of gestation. [12]
- If comparison of fundal height and gestational age suggests growth abnormality , perform an ultrasound. [10]

Fundal height and gestational age [11][13]

Week of pregnancy	Fundal height during pregnancy
12th	Just above the symphysis
16th	Between the symphysis and navel
20– 24th	Navel
32nd	Between the navel and xiphoid
36th	Peak: at the costal arch
40th	Two finger widths below the costal arch

Initial prenatal visit [1][22]

- Assess patient's feelings about the pregnancy.
  - Discuss possible options if pregnancy is undesired, including:
    - Continuation of pregnancy (with plan to raise the child themselves or place the child for adoption)
    - Termination of pregnancy
  - Refer as indicated to appropriate providers, agencies, and/or support groups.
- Review prior preconception counseling, if any was given.
- Perform a comprehensive clinical assessment, including history and physical examination.
- Take a medication history; if possible, stop or change medications contraindicated in pregnancy.
- Screen for comorbid physical and mental health conditions.
- Inquire about risk factors for lead exposure and send a lead level if any are present. [1][23]
- Assess for risk factors for adverse pregnancy outcomes; manage as high-risk pregnancy if present.
- Determine estimated date of delivery (EDD) and perform first-trimester ultrasound, if indicated (see "Gestational age and estimated date of delivery").
- Offer prenatal aneuploidy and genetic carrier screening (see "Prenatal genetic testing").
- Assess vaccination status and administer vaccines recommended in pregnancy, including: [24]

- Inactivated seasonal influenza vaccine
- COVID-19 vaccine

- Provide prenatal patient education.
- Arrange follow-up visits and referrals as needed.

Live attenuated influenza, varicella, and MMR vaccine are contraindicated during pregnancy; delay administration until after delivery. [24]

History and physical examination [1][5]

- Personal medical history, including obstetric history (e.g., miscarriage, preterm delivery, preeclampsia)
- Family history: maternal and paternal [25]
  - Medical conditions (e.g., early-onset heart disease, cancer)
  - Genetic or congenital abnormalities
  - Poor obstetrical outcomes (e.g., preeclampsia, preterm delivery)
- Complete physical examination including: [1][22]
  - Height and weight [1][26]
  - Blood pressure to screen for hypertensive pregnancy disorders [27]
  - Breast examination [22]
  - Pelvic examination
  - Auscultation of fetal heart tones at > 10 weeks' gestation [22]
  - Oral health assessment

Recommended initial prenatal screening tests [1][5]		
Tests		**Management of abnormal results**
Complete blood count to screen for anemia and thrombocytopenia [28]		• Anemia: Thresholds for anemia vary depending on trimester, see "Diagnostic Hb levels for anemia during pregnancy." ◦ Obtain diagnostic tests for anemia ◦ Consider common causes of anemia, e.g.: ▪ Iron deficiency anemia in pregnancy in patients with microcytic anemia ▪ Vitamin B12 or folate deficiency [1][28] • Thrombocytopenia [29] ◦ Rule out differential diagnosis of platelet disorders, medication effects, and viral infections. ◦ Consider gestational thrombocytopenia in asymptomatic patients without other identifiable causes. [29] • Repeat CBC at 24–28 weeks' gestation
Blood typing (ABO and rhesus) and RBC antibody screening to prevent hemolytic disease of the newborn [30][31][32]		• Management of rhesus-negative individuals without anti-D antibodies [30][31] ◦ Give anti-D immunoglobulins if any potentially sensitizing events occur. [30] ◦ Repeat Rh antibody testing at 24–28 weeks. [30] ◦ Administer prophylactic anti-D immunoglobulins at 28 weeks' gestation to prevent alloimmunization. [1] • Rhesus-negative individuals with anti-D antibodies: Determine the source of antibodies. ◦ Previous prophylaxis: Give Anti-D immunoglobulins as indicated. ◦ Previous sensitizing event: Anti-D immunoglobulins will not be effective, manage as a RhD-alloimmunized pregnancy. [31] • See also "Prevention" in "Hemolytic disease of the newborn."
Urine dipstick to screen for proteinuria [1]		• For patients with proteinuria on urine dipstick: Obtain spot urine protein-creatinine ratio or 24-hour urine collection for confirmation. [33] ◦ Proteinuria before 20 weeks' gestation: Consider nephrology consultation to evaluate for preexisting kidney disease. ◦ Proteinuria after 20 weeks' gestation: see "Hypertensive pregnancy disorders."
Urine culture to screen for asymptomatic bacteriuria [34]		• Positive screen: See "Treatment of asymptomatic bacteriuria in pregnancy.
Screening for STIs and bloodborne pathogens	HIV testing [1]	• Confirmed HIV infection: See "HIV in pregnancy."
	HBV serology	• Positive HbsAg: See "Hepatitis B in pregnancy." [35]
	Anti-HCV antibody [36][37][38]	• Positive anti-HCV antibody ◦ Order HCV RNA testing to assess for active infection (see "Hepatitis C diagnostics"). ◦ Refer to specialists (e.g., infectious disease, hepatology) for consideration of treatment after pregnancy. ◦ Inform the newborn's pediatrician of the diagnosis.
	Prenatal syphilis screening [39]	• Positive initial test: Follow syphilis testing algorithm. • If infection is confirmed, see "Treatment of syphilis in pregnancy" and "Congenital syphilis."

HIV screening in pregnancy is opt-out; inform individuals an HIV test will be sent as part of the routine prenatal studies unless they decline testing. [1]

Prenatal screening studies for patients with select indications

	Indications	Management of abnormal results
Rubella antibody	• All patients without evidence of immunity [1]	• Nonimmune patients [1] ◦ Offer MMR vaccine after delivery, prior to discharge. ◦ Repeat testing if rubella infection is suspected during pregnancy. [40] ◦ For management of patients who test positive during pregnancy, see "Congenital rubella infection."
Varicella antibody	• All patients without evidence of varicella immunity [41]	• Nonimmune patients: See "Prevention of varicella in pregnancy."
TSH	• Patients with increased risk of thyroid disease in pregnancy, e.g., those with: [42] ◦ Residence in a known iodine-deficient area ◦ History of pregnancy loss, preterm delivery, infertility, or multiple prior pregnancies ◦ Type 1 diabetes or other autoimmune disorder ◦ Use of medications that can cause thyroid dysfunction (e.g., amiodarone, lithium) ◦ Age > 30 years or BMI ≥ 40 ◦ History of head or neck radiation or thyroid surgery ◦ Family history of thyroid disease	• Interpret results in accordance with trimester-specific TSH reference ranges for pregnant individuals. [42][43] ◦ If elevated: Measure total or free T4. ◦ If decreased: Measure total or free T4 and total T3. • See also: ◦ "Management of pregnant women with preexisting hypothyroidism" ◦ "Hyperthyroidism in pregnancy" ◦ "Congenital hypothyroidism"
Prenatal chlamydia screening (using NAAT) [44][45]	• Obtain in patients with risk factors for STIs; consider in all other patients. [40][45]	• See "Management of genitourinary chlamydia." • Ensure appropriate follow-up of pregnant patients with chlamydia. [44]
Prenatal gonorrhea screening (using NAAT) [44][45]		• See "Treatment of gonorrhea." • Repeat gonorrhea testing 3 months after treatment. [44]
Pap smear and/or HPV DNA testing	• Patients due for cervical cancer screening [44]	• Consult OB/GYN specialist. [1] • See also: ◦ "Cervical cancer screening during pregnancy" ◦ "Management of invasive cervical cancer during pregnancy"
Screening tests for latent TB [1] [5]	• Patients with risk factors for tuberculosis	• See "Management of TB in pregnant individuals."
Hyperglycemia testing [1] [46] [47]	• Risk factors for T2DM [1]	• Screen negative: Repeat at 24–28 weeks' gestation. [1] • Screen positive: See "Gestational and pregestational diabetes mellitus."

Fist trimestrer ultrasound

Indications [10][14]

- Confirmation of pregnancy and its location (i.e., exclusion of ectopic pregnancy and gestational trophoblastic disease)
- Determination of EDD
- Evaluation for multiple gestation
- Assessment of fetal cardiac activity
- Evaluation of maternal symptoms (e.g., pelvic pain, vaginal bleeding) or abnormalities on examination (e.g., masses, structural uterine abnormalities)
- Evaluation of for fetal anomalies (e.g., anencephaly)
- Measurement of nuchal translucency as part of aneuploidy screening
- Provision of imaging guidance during procedures (e.g., chorionic villus sampling)

Estimating gestational age via ultrasonography is most accurate when performed in the first trimester. [14]

Modalities [10][14]

- Transvaginal ultrasound
- Transabdominal ultrasound

Components [10][14]

- Visualization of location and contents of gestational sac(s).
- Determination of number of fetuses.
- Evaluation of the embryo or fetus, including:
  - Cardiac activity
  - Crown-rump length for estimating gestational age [8]
  - Anatomy as appropriate for gestational size
  - Nuchal translucency in patients desiring aneuploidy screening
- Evaluation of maternal pelvic anatomy (e.g., uterus, adnexa, rectouterine pouch)

Genetics testing

- For patients interested in testing for chromosomal abnormalities, discuss options for both screening and diagnostic testing:

- Noninvasive aneuploidy screening (e.g., through measurement of maternal serum biomarkers and ultrasound markers, or **cell-free fetal DNA testing**)
- Invasive genetic testing (amniocentesis or chorionic villus sampling)

Risk factors associated with fetal genetic abnormalities [64]

- Fetal structural abnormality on ultrasound
- Increased maternal age [64]
- Increased paternal age
- Parental genetic abnormalities
- Previous child with aneuploidy [64]

Overview of one-step screening tests for fetal chromosomal abnormalities [65]

Test	Timing [65]	Components	Interpretation [65]
Cell-free fetal DNA testing (cffDNA)	• From 9–10 weeks' gestation onwards [65]	• Fetal DNA fragments isolated from a maternal blood specimen for genetic testing	• Identification of chromosomal abnormalities: Most sensitive and specific screening test for common fetal chromosomal aneuploidies (i.e., trisomy 21, trisomy 18, trisomy 13). [65] • Identification of the sex of the fetus
Sonographic nuchal translucency (NT screen) [65][69]	• 10–14 weeks' gestation	• Transabdominal ultrasound to measure the area of fluid between the fetal skin and soft tissue in the posterior neck. • May be used to evaluate individual fetuses in multiple gestations	• Positive screen is defined as either: ◦ NT ≥ 3 mm ◦ NT > 99th percentile for a specified crown-rump length measurement • Increased NT is associated with aneuploidy and fetal cardiac abnormalities.
First-trimester combined screening	• 10–14 weeks' gestation	• NT screen • Maternal serum measurement of: ◦ β-HCG (human chorionic gonadotropin) ◦ PAPP-A (pregnancy-associated protein A) ◦ AFP (optional) [65]	• Risk of aneuploidy is evaluated based on maternal age, lab results, and NT screen. • See also "Overview of first trimester combined screening test results."
Triple screen test and quad screen test [65]	• 15–22 weeks' gestation	• β-HCG • Alpha-fetoprotein (AFP) • Unconjugated estriol • Quad test only: Inhibin A [65]	• The risk of aneuploidy is evaluated based on maternal age, and lab results. • Can also be used to evaluate the risk of neural tube defects. • See also "Overview of quad and triple screening test results."

Overview of multi-step screening tests for fetal chromosomal abnormalities [65]

Test	Timing [65]	Components	Interpretation [65]
Integrated screen [1]	• First specimen: 10–13 weeks' gestation	• NT screen • PAPP-A	• The risk of aneuploidy is based on results of testing at both timepoints. • Results are only provided after second-trimester testing is completed.
	• Second specimen: 15–22 weeks' gestation	• Quad screen test	
Sequential integrated screening [65]	• First specimen: 10–13 weeks' gestation	• NT screen • PAPP-A • β-HCG • AFP (optional)	• The risk of aneuploidy is calculated based on first-trimester testing results • Follow-up testing recommendations are made based on first-trimester testing.
	• Second specimen: 15–22 weeks' gestation	• Quad screen test	

Invasive prenatal diagnostic testing [64]

- Invasive prenatal diagnostic testing is typically performed through chorionic villus sampling (CVS) or amniocentesis.
  - CVS is performed in the first trimester, while amniocentesis can be performed in the second or third trimester.
  - Cordocentesis to obtain a sample of fetal blood may be performed in select cases.
- Chromosomal testing of specimens collected through diagnostic procedures may include: [64]
  - DNA microarray
  - Karyotyping
  - Fluorescence in situ hybridization
  - Direct detection of specific DNA mutations

Maximize tableTable Quiz

Overview of invasive prenatal diagnostic tests [64]

	Chorionic villus sampling (CVS)	Amniocentesis	Cordocentesis [74][75]
Timing	• 10–13 weeks' gestation	• From 15 weeks' gestation onwards (most commonly performed at 15-20 weeks' gestation)	• After 18 weeks' gestation
Procedure	• Transcervical or transabdominal needle aspiration of a minimal amount of placental tissue under ultrasound guidance	• Transabdominal needle aspiration of amniotic fluid under ultrasound guidance [76]	• Transabdominal needle insertion into the umbilical cord to sample fetal blood from the umbilical vein
Indications	• Evaluation for fetal genetic abnormalities, e.g.: ◦ Follow-up of: ▪ Abnormal noninvasive genetic screening results ▪ Fetal structural abnormalities seen on US ◦ Initial evaluation in patients who prefer diagnostic evaluation instead of screening • For amniocentesis, other indications include: [77] ◦ Fetal blood typing in the evaluation of Rh alloimmunization [31] ◦ Diagnosis of certain suspected infections (e.g., toxoplasmosis) [41] ◦ Therapeutic amnioreduction in polyhydramnios [78]		• Fetal hemoglobin testing to assess the severity of fetal anemia [75] • Rarely used to evaluate for fetal genetic abnormalities [64]
Complications [64][74]	• Miscarriage (approximate risk: 0.2 %) [1] • Limb defects [64] • Vaginal bleeding [64]	• Miscarriage (risk 0.1-0.3%) [1] • Vaginal bleeding or leaking of amniotic fluid • Premature rupture of membranes • Infection	• Miscarriage (risk 1–2%) [75] • Umbilical cord bleeding • Fetal heart rate abnormalities

Second trimester screening

Routine prenatal clinical assessment [1][22]

- Ask all patients about:
  - Signs of pregnancy complications (e.g., vaginal bleeding or contractions, symptoms of preeclampsia, leakage of fluid) [5]
  - Awareness of fetal movement (quickening)
- Perform physical examination, including:
  - Weight
  - Blood pressure to screen for hypertensive pregnancy disorders [27]
  - Fundal height measurement : to monitor fetal growth after 24 weeks' gestation [5][22]
  - Auscultation of fetal heart rate: to confirm fetal heartbeat [1][22]
- Consider urine dipstick analysis. [1][22]

Pregnant individuals often begin to feel fetal movement (i.e., quickening) between 18 and 19 weeks' gestation in the first pregnancy and between 16 and 18 weeks in subsequent pregnancies. [22]

Recommended laboratory screening studies at 24–28 weeks' gestation

Test	Indication	Purpose	Management of abnormal results
CBC [28]	• All patients	• Anemia screening	• Low Hb ◦ Determine if true anemia or dilutional anemia (see "Diagnostic Hb levels for anemia during pregnancy"). ◦ Assess for iron deficiency anemia in pregnancy and other causes of anemia (e.g., vitamin B12 or folate deficiency), as indicated. [28]
Oral glucose tests [46][47]	• All patients	• Gestational diabetes screening	• 2-step oral glucose challenge ◦ Give 50-g oral glucose challenge test and assess blood sugar after 1 hour. ◦ If ≥ 130-140 mg/dL, perform 100-g, three-hour oral glucose tolerance test (OGTT) to confirm diagnosis. [1][46] • 1-step oral glucose tolerance test ◦ Measure fasting blood sugar and give 75-g oral glucose. ◦ Measure blood glucose at 1 and 2 hours. ◦ Diagnosis of gestational diabetes is confirmed with any of the following glucose values: [46] ▪ Fasting: ≥ 92 mg/dL ▪ 1 hour: ≥ 180 mg/dL ▪ 2 hour: ≥ 153 mg/dL • See also "Gestational diabetes mellitus."

Fetal anatomy scan

General principles

- A scan offered at 18–22 weeks' gestation to all patients to assess for:
    - Fetal anomalies, e.g., abnormal growth or anatomic abnormalities [10]
    - Estimation of gestational age (if not already performed) [10][77]
- If possible, the anatomy scan should be offered well in advance of the legal limit for pregnancy termination. [81]

Modalities [10][14]

- Transabdominal ultrasound: usually initial modality
- Transvaginal or transperineal ultrasound: if the transabdominal approach is suboptimal for evaluation

Components

- Evaluation of fetus, including:
    - Number of fetuses
    - Fetal presentation
    - Cardiac activity
    - Anatomy survey, including assessment for structural abnormalities and sex
    - Fetal biometric parameters [14]
        - Biparietal diameter
        - Fetal femoral length
        - Abdominal circumference
        - Head circumference
- Evaluation of amniotic fluid volume and placenta (e.g., location, appearance, cord insertion)
- Evaluation of maternal pelvic anatomy, including cervix [14][82]

Third trimester

Components

- Monitoring of fetal growth with symphysis-fundal height and ultrasounds as indicated
- Assess for risk factors for adverse pregnancy outcomes; manage as high-risk pregnancy if present.
- Screening for hypertensive pregnancy disorders [27]
- Measures to prevent neonatal infection
    - Perform third-trimester STI screening, if indicated.

    - Offer seasonal influenza vaccination and/or COVID booster, if due.
    - 27–36 weeks' gestation: Provide Tdap. [83]
    - 32–36 weeks' gestation: Give respiratory syncytial virus vaccine. [84]
    - 36–37+6 weeks' gestation: Perform Group B streptococcus prenatal screening.
- Screening for rhesus antibody in Rh-negative nonsensitized individuals [30]
    - Perform at 28 weeks' gestation.
    - Administer Anti-D immunoglobulin as needed.
    - See "Management of rhesus-negative individuals without anti-D antibodies" for further information.
- Screening for anemia and gestational diabetes, if not already performed (see "Second-trimester laboratory studies").
- Preparation for delivery
    - Provide counseling related to peripartum care.
    - Assess for indications for antepartum fetal surveillance and perform, if indicated.
    - From 36 weeks' gestation, use Leopold maneuvers for assessment of fetal presentation. [22]
    - Use ultrasound as needed to confirm fetal lie and placental position (see "Prenatal ultrasound").

In the third trimester, prenatal visits usually increase in frequency to every 2 weeks between 28–36 weeks and weekly thereafter. [1]

Indications for third-trimester STI screening [1][44]

STI	Indications for screening	Timing
Prenatal chlamydia screening Prenatal gonorrhea screening	• Risk factors for STIs	• 27–40 weeks' gestation
HIV screening	• Risk factors for HIV infection	• 27–40 weeks' gestation • If testing not performed during pregnancy, perform rapid HIV testing at time of labor.
Prenatal syphilis screening [85]	• All patients [44][85] • Delivery of stillborn fetus	• 28 weeks' gestation • At time of labor
Hepatitis B screening	• No previous prenatal screening • Risk factors for hepatitis B infection • Sexual partner who is HBsAg-positive	• At time of labor

Leopold maneuvers [22][86]

- The Leopold maneuvers consist of four abdominal palpation maneuvers used to determine fetal lie, fetal presentation, and fetal position in utero.
    1. Use both hands to palpate the uterine fundus, fetal head, and buttocks to assess:
        - Fetal lie (longitudinal/oblique/transverse)
        - Fundal height
    2. Place each hand on either side of the maternal abdomen to determine the location of the fetal back.
    3. Grasp the lower maternal abdomen above the symphysis to determine the fetal presenting part and if it is engaged.
        - In cephalic presentation, the fetal head is felt as hard, round, and ballottable.
        - In breech presentation, the buttocks are felt as a soft, less movable structure.
    4. Facing the mother's feet, use both hands to determine:
        - The cephalic prominence
        - Fetal attitude (based on the degree of flexion of the fetus's head)
- If fetal malpresentation is suspected or fetal position cannot be accurately determined, proceed to ultrasound. [87][88]

Antepartum fetal surveillance testing

is typically performed in the third trimester (at ≥ 32 weeks' gestation) to assess fetal well-being and reduce the risk of adverse fetal outcomes. [7]

Indications for antepartum fetal surveillance [19]

- High-risk pregnancy (e.g., maternal medical conditions or fetal conditions associated with increased risk of fetal hypoxic injury or death)
- Perceived reduction in fetal movement by mother

Modalities [7]

- Options include:
    - Kick counts
    - Nonstress test (NST)
    - Contraction stress test (CST)

    - Biophysical profile (BPP)
    - Modified biophysical profile
    - Doppler velocimetry of the umbilical artery (for suspected intrauterine growth restriction)
- A combination of modalities may be utilized. [7]

Kick counts [7]

- Maternal counting of the number of fetal movements within a particular time period (e.g., 1 or 2 hours).
- Number of kicks reduced compared to prior assessments: Perform additional antepartum surveillance testing.
- Limitations [7]
    - No consensus on the optimal duration of monitoring or abnormal number of counts
    - Limited evidence monitoring kick counts affects perinatal adverse outcomes.

Nonstress test (NST) [1][7]

NST is a noninvasive test that measures how fetal heart rate (FHR) responds to fetal movements;

Overview of management of antepartum fetal test results [7]

Result of test		Next steps
Normal	Resolved indication for testing	• No further testing indicated
	Ongoing indication for testing	• Repeat testing; usually weekly.
Abnormal	Kick count	• Perform any of the following: ◦ NST ◦ Modified BPP ◦ BPP ◦ CST
	NST or modified biophysical profile	• Perform CST or BPP
	CST or BPP	• Consider repeat testing or delivery.

a rise in fetal heart rate is expected with fetal movement.

Method [7]

- Perform electronic fetal heart rate monitoring over a minimum of 20 minutes.
- Review the FHR tracing for FHR accelerations and decelerations. [7]
- If no FHR accelerations are observed within the first 20 minutes:

    - Perform vibroacoustic stimulation.
    - Continue with the NST for another 20–40 minutes.

Interpretation [1]

- **Reactive nonstress test**: a normal NST that shows **≥ 2 FHR accelerations** over the course of 20 minutes
    - If the indication for testing has resolved, offer reassurance; further testing is not required.
    - If the indication persists, repeat the test (usually at weekly intervals).
- **Nonreactive nonstress test**: an abnormal NST that shows **< 2 FHR accelerations** over the course of 20 minutes (after at least 40 minutes of monitoring) [7]
    - Causes of a nonreactive NST include:
        - Fetal sleep (most common)
        - Hypoxemia or acidemia
        - Neurologic or cardiac abnormalities
        - Fetal immaturity [7]
        - Maternal drug use
    - Next steps: Perform a BPP or CST. [1]
- **Concerning decelerations** : Consider further monitoring or delivery.

Reactive fetal nonstress test (NST)

Contraction stress test (CST) [1][7]

- CST is a test that measures how FHR responds to uterine contractions.
- Can be safely performed, provided there are no contraindications to labor or vaginal delivery. [1][89]

Method

- Perform cardiotocography to assess both FHR and uterine contractions.
- If < 3 contractions lasting at least 40 seconds are observed over 10 minutes, induce contractions using either:
    - Nipple stimulation [90]
    - IV oxytocin

CST may induce early labor; consider alternative methods of assessing fetal well-being in patients with contraindications to labor or vaginal delivery. [1]

Interpretation [1][7]

- Negative: absence of late decelerations or significant variable decelerations
- Positive
    - Late decelerations after ≥ 50 % of contractions
    - Consider repeat testing or delivery.
- Equivocal
    - Defined as any of the following:
        - Intermittent variable decelerations or late decelerations
        - Decelerations occurring with uterine tachysystole
    - Repeat in 24 hours.
- Unsatisfactory
    - Tracing uninterpretable or insufficient number of contractions (< 3 in 10 minutes).
    - Repeat with an alternative form of contraction stimulation. [91]

Biophysical profile (BPP) [7]

The BPP is a noninvasive test consisting of fetal ultrasound of four specified parameters and NST.

Method [7]

- An ultrasound examination is performed over 30 minutes to assess the following four parameters:
    - Fetal movement
    - Fetal tone
    - Fetal breathing
    - Amniotic fluid volume
- An NST is then performed if any ultrasound parameter is abnormal but may be omitted if all are normal.
- Each parameter of the ultrasound examination and the NST is given a score of either 0 (abnormal) or 2 (normal)

Biophysical profile scoring criteria [1]	
Parameter	Normal results (= 2 points)
Fetal movement	• ≥ 3 body or limb movements in 30 minutes
Fetal tone	• ≥ 1 episodes within 30 minutes of either: ◦ Fetal extremity extension with return to flexion ◦ Opening or closing of a hand
Fetal breathing	• ≥ 1 rhythmic breathing episode(s) lasting ≥ 30 seconds in 30 minutes
Amniotic fluid volume	• A single deepest vertical pocket > 2 cm with a horizontal dimension ≥ 1 cm [10]
Nonstress test	• Reactive nonstress test

Modified biophysical profile [1][7]

- **Description**: NST plus amniotic fluid measurement by ultrasound [92]
- **Method**: Use one of two methods of assessing amniotic fluid volume.
  - Measurement of the deepest vertical pocket of amniotic fluid
  - Amniotic fluid index
- **Interpretation**
  - A normal result is a reactive NST plus either: [1]
    - Deepest vertical pocket of amniotic fluid > 2 cm
    - Amniotic fluid index of ≥ 5 cm
  - An abnormal result includes any of the following:
    - Nonreactive NST
    - Deepest vertical pocket of amniotic fluid ≤ 2 cm
    - Amniotic fluid index of < 5 cm
- **Next steps**: For abnormal results, obtain a BPP or CST. [7]

Amniotic fluid index (1/2) Amniotic fluid index (2/2)

Doppler velocimetry of the umbilical artery [7]

- Used to monitor fetuses with intrauterine growth restriction (IUGR)
- Assesses diastolic flow velocity of the umbilical artery
- For more information, see:
  - "Overview of maternal and fetal vessel doppler ultrasound"
  - "Intrauterine growth restriction"