Preconception Care, Antepartum Care & Maternal-Fetal Physiology

Compiled by Megan Gleason Hutchcraft, MD
10th Edition APGO Objectives and Teaching Cases
Preconception Care

• **The Goal:**
  • Optimization of a woman’s health and knowledge *before* planning and conceiving a pregnancy in order to eliminate, or at least reduce, the risk associated with pregnancy for the woman and her future baby.
  • If pregnancy is not desired, then current contraceptive use and options can be discussed to assist the patient in identifying the most appropriate method for her and to reduce the potential for an unplanned pregnancy.

• **Performed by:** A provider who is skilled in the care of obstetric patients. However, the assistance of a maternal-fetal medicine specialist or genetic specialist may be necessary in certain circumstances.
Preconception Care

- **Major Topics to be discussed with any woman prior to conception:**
  - Identify undiagnosed, untreated or poorly controlled medical conditions
  - Review immunization history and recommend appropriate immunizations
  - Risks of medication and radiation exposure in early pregnancy
  - Nutritional issues
  - Family history and genetic history including racial/ethnic background and specific genetic risks
  - Tobacco, alcohol, and substance abuse and other high-risk behaviors (such as sexual activity and risk for STIs)
  - Occupational and environmental exposures
  - Social issues
  - Mental health issues
  - Screening for intimate partner violence issues
**CASE:** You have been Mary’s doctor for the past 3 years. She is a 39-year-old Caucasian woman with a BMI of 32.9 who sees you primarily for her idiopathic chronic hypertension, which is well controlled on an ACE inhibitor. She has smoked 1 pack of cigarettes per day for the past 20 years. She is in today for her annual exam and mentions that she is getting married in a few months and would like to start a family. She has never been pregnant before.

On physical exam, her BP=138/84, Ht=5’ 2”, Wt=180 lbs. Otherwise, her exam is unremarkable.

For the patient in this case, what specific topics need to be addressed?
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Preconception Care

- **Weight loss and exercise**: Mary’s BMI is 32.9 (obese)
  - She may see improvement in her blood pressure and decrease the need for antihypertensive therapy
  - Obesity in pregnancy is associated with increased risks including higher rates of gestational diabetes, preeclampsia, cesarean delivery, anesthesia complications, and post-operative complications

- **The effect of chronic medical disease (idiopathic hypertension) on pregnancy**
  - Increased risk of preeclampsia, fetal growth restriction, abruption and recommendations for heightened maternal and fetal surveillance in pregnancy

- **Need to modify antihypertensive therapy**
  - ACE inhibitors are contraindicated in pregnancy due to risks for fetal renal dysgenesis and dysfunction

- **Effect of smoking on pregnancy**
  - Increased risk of fetal growth restriction
Preconception Care

- **Offer Cystic Fibrosis (CF) carrier testing**
  - Carrier prevalence increased in Caucasians

- **Discuss any family history of birth defects or genetic disorders:** referral for genetic counseling may be warranted if issues are identified

- **Discussion of increased risk of Down’s Syndrome and other trisomies based on current age of 39 and probable older age when she conceives**
  - Screening options:
    - Cell free fetal DNA
    - Nuchal translucency and first trimester screening (11w1d - 13w6d)
    - Quadruple screen and integrated/sequential techniques (15-20 wks)
    - Amniocentesis: > 15 weeks. Quoted loss rate ~ 1:300
    - CVS: > 10 weeks. Quoted loss rate ~ 1/175
## Preconception Care: Genetic Disorders

<table>
<thead>
<tr>
<th>Disease</th>
<th>Background</th>
<th>Carrier Rate</th>
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<tbody>
<tr>
<td>Sickle Cell Anemia</td>
<td>African American Mediterranean Middle Eastern Caribbean</td>
<td>1/12</td>
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<tr>
<td>β-Thalassemia</td>
<td>Greek Italian Southeast Asian Pakistani African</td>
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<tr>
<td>α-Thalassemia</td>
<td>Southeast Asian Chinese African</td>
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<tr>
<td>Tay-Sachs</td>
<td>Ashkenazi Jewish French Canadian Cajun</td>
<td>1/30</td>
</tr>
<tr>
<td>Cystic Fibrosis</td>
<td>Northern European</td>
<td>1/23</td>
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Preconception Care

• Begin **prenatal multivitamins** or at least **folic acid supplementation** (0.4 mg per day) for the prevention of fetal neural tube defects and 4 mg/day if they have had a prior child/pregnancy with a neural tube defect

• **Accurate recording of LMP and cycle length** in order to assist in dating her pregnancy and allow her to present early for prenatal care when she does conceive.
Preconception Care

- Review **immunization history**; employment, medical or behavioral risk factors for infections against which effective vaccines are available
- Test for evidence of immunity against **rubella**
  - Immunization should be given if nonimmune
  - Pregnancy should be avoided for at least 3 mo. after treatment
- All women should be brought up-to-date on all recommended immunizations prior to conception.
- **Syphilis**: check serology and treat prn prior to conception
- **Gonorrhea, chlamydia**: screen if high-risk and treat prn
- **HIV**: offer confidential screening to all women prior to conception.
  - Counseling regarding long-term prognosis and neonatal transmission should be offered if HIV-positive.
- **Tuberculosis**: offer testing if at risk
- **Hepatitis B**: offer testing and vaccination if at risk (not contraindicated in pregnancy)
- **Assess for risk of exposure and counsel**
  - **Cytomegalovirus**: day-care, neonatal nursery workers
  - **Toxoplasmosis**: cat owners, meat handlers
Antepartum Care

**CASE:** A 24-year-old woman presents to the office for her routine prenatal visit. She appears anxious. She denies fever, chills, abdominal pain or cramping. She says that she has been urinating more frequently than usual, without pain, and notes fatigue that she attributes to stress at her work. Her last menstrual period was 7 weeks ago, and she typically has 28-day cycles. She has never been pregnant. She tells you that she and her boyfriend plan to marry in the next year. Her medical history is only significant for a hyperthyroid disorder, which she has had for over 10 years. Her last check up was about 6 months ago. She takes methimazole. Otherwise, she has had routine gynecologic follow up, with normal pap smears and she has never been diagnosed with a sexually transmitted infection.

The patient is 170 pounds and is 5’5” tall. On physical exam, her vital signs include a pulse of 85, blood pressure of 115/70. Speculum exam reveals normal appearing vaginal epithelium and cervix. The cervical os is closed. Bimanual exam reveals a slightly enlarged and globular uterus consistent with a 7 week sized pregnancy; the adnexae are without masses and tenderness.
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Antepartum Care

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- If not confirmed, **urine or serum HCG to determine if pregnant**

- **Evaluate the early gestation with ultrasound** (transabdominal or transvaginal) to **determine location of pregnancy**, confirm due date, and number of embryos. Fetal cardiac activity visualized on ultrasound usually confirms early viability

- **Gestational age** can be determined from her last menstrual period, and compared to her early ultrasound. Consideration to changing her gestational age on ultrasound criteria would be:
  - If less than 12 weeks, would use the ultrasound date if off by more than 5 days
  - If between 12 and 16 weeks, would use the ultrasound date if off by more than 7 days

- Address her **visible anxiety**
  - Related to viability?
  - Related to her medical issues with thyroid disease and medications?

- Help schedule her for follow up with **Maternal Fetal Medicine** service, as well as an **Endocrinologist**
Antepartum Care

• With a known pregnancy, the next steps are to determine if it is *intrauterine or ectopic, viable or non-viable*.
• Serum quantitative hCG should double approximately every 48 hours in first 30 days of normal pregnancy.
  • If rises slowly, plateaus or declines pregnancy is probably destined to abort.
  • Also if rises very quickly not always good sign

• Types of spontaneous abortion:
  
  • **Threatened Abortion**: Pregnancy with “bleeding” prior to 20 weeks.
  • **Inevitable Abortion**: Cramping, bleeding, cervix partially dilated.
  • **Incomplete Abortion**: Cramping, bleeding, cervix partially dilated with partial passage of products of conception.
  • **Missed Abortion**: Non viable pregnancy that is retained in the uterus.
Antepartum Care

• With routine prenatal care, what factors need to be discussed with this patient?
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• **Nutrition and weight gain counseling:** recommended weight gain based on pre-pregnancy BMI
  - < 18.5: 28-40 lbs
  - 18.5-24.9: 25-35 lbs
  - 25-29.9: 15-25 lbs
  - > 30: 11 – 20 lbs

• Approximate breakdown of a weight gain of 29 pounds
  - **Blood:** 3 pounds
  - **Breasts:** 2 pounds
  - **Uterus:** 2 pounds
  - **Baby:** 7.5 pounds
  - **Placenta:** 1.5 pounds
  - **Amniotic fluid:** 2 pounds
  - **Fat & other nutrients:** 7 pounds
  - **Retained water:** 4 pounds
Antepartum Care

• With routine prenatal care, what factors need to be discussed with this patient?

• **Sexual activity**: is not restricted during pregnancy, unless conditions such as preterm labor, placenta previa or preterm premature rupture of membranes is present

• **Exercise**: up to 30 minutes of moderate exercise per day is encouraged, as permitted by personal tolerance

• **Travel**: without complication, air travel is generally safe up to 36 weeks. However, prolonged periods of inactivity (sitting) should be avoided

• **Environmental and work hazards**
• **Tobacco and alcohol use**
• **Substance abuse**
• **Medication use**
• **Intimate partner violence**
Antepartum Care

• What are the routine laboratory studies collected at the first prenatal visit?

• What additional screening tests does she require with her thyroid disease?
Antepartum Care

• What are the routine laboratory studies collected at the first prenatal visit?
  • Blood and Rh typing
  • Hepatitis and rubella titers
  • Antibody screening
  • HIV screening
  • Screening for chlamydia and gonorrhea
  • Consideration can be given to screening for hemoglobinopathies (with hemoglobin electrophoresis) and cystic fibrosis

• What additional screening tests does she require with her thyroid disease?
  • Evaluation of the thyroid should include TSH and Free T4 levels
Antepartum Care

• What additional concerns should be discussed with the patient regarding management of her pregnancy?

• What concerns are there for medication use for hyperthyroidism in pregnancy?
Antepartum Care

• What additional concerns should be discussed with the patient regarding management of her pregnancy?
  • With poorly controlled thyroid disease, there may be increased need for **medically indicated preterm delivery**
  • Slight increased risks in **intrauterine growth restriction** and **fetal loss**, requiring antenatal testing in the third trimester, or sooner with more severe disease
  • Increased risks of **fetal heart rate abnormalities**
  • Increased risks of **preeclampsia**

• What concerns are there for medication use for hyperthyroidism in pregnancy?
  • **Propylthiouracil generally safe in pregnancy**, small amounts cross into **breast milk**
  • **Methimazole** thought to have increased risk of **fetal aplasia cutis** (recently refuted), also higher secretion into **breast milk**, but generally considered **safe**
Antepartum Care

• How can this patient be followed for fetal well being in the third trimester?
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• Initial development can be evaluated with **anatomic survey** (scheduled in 16-20 weeks)
• Fetal growth can be measured **monthly** with **ultrasound**
• Well being can be assessed with either **non-stress tests** (twice a week) or **biophysical profiles** (once a week)

• **Biophysical profile** includes:
  • **Fetal movement**: three or more discrete body/limb movements in 30 minutes
  • **Fetal tone**: one or more episodes of extremity extension/flexion, or open/close of hand
  • **Fetal breathing movements**: episode of rhythmic fetal breathing for 30 seconds
  • **Amniotic fluid volume**: pocket of fluid that measures at least 2 cm in 2 perpendicular planes
**CASE:** You are seeing a new prenatal patient today. She is a 32 year-old G1 who is a nurse in the dialysis unit. She is in excellent health, a former college athlete. She has sent her own labs. Her vital signs are normal and she has gained 4 lbs. Your physical exam is normal and confirms her menstrual dates of 8 weeks. She has brought you a list of her questions:

- I’m urinating all the time so after lunch yesterday I dipped my urine. It showed no bacteria but +2 glucose. Why would this be? Do I have diabetes?
- My T4 is high, what meds do you want to start me on?
- I’m nauseous all day, but only vomit in the evening and when I do, even hours after dinner it looks undigested. Why would that be? Is it true if I’m feeling sick I’m less likely to miscarry?
Maternal Fetal Physiology

- I’m urinating all the time so after lunch yesterday I dipped my urine. It showed no bacteria but +2 glucose. Why would this be? Do I have diabetes?
  - Increased circulating maternal blood volume and renal blood flow result in increased urine output beginning in early pregnancy.
  - Compression of the bladder by the growing uterus leads to smaller bladder volume.
  - Increased filtration leads to a lower threshold for spilling glucose into the urine, though diabetes should still be screened.
  - Human placental lactogen dulls the insulin response so that a more constant supply of glucose is available to the fetus.
Maternal Fetal Physiology

• My T4 is high, what meds do you want to start me on?
  • Hyperthyroidism is unlikely with normal vital signs, weight gain and physical exam.
  • Increased steroid binding globulin leads to increased total T4. If sent, free T4 is likely to be normal.
  • TSH, more commonly used as a screening test, should be unchanged in pregnancy

• I’m nauseous all day, but only vomit in the evening and when I do, even hours after dinner it looks undigested. Why would that be? Is it true if I’m feeling sick I’m less likely to miscarry?
  • High progesterone levels in early pregnancy lead to a lower esophageal sphincter tone and delayed gastric emptying.
  • As high HCG levels correlate with nausea symptoms, it’s true that the risk of miscarriage is lower than average
Maternal Fetal Physiology

Your patient is now 32 weeks with a normal pregnancy to date, including her glucose tolerance test. She has stopped sending her own labs but still has a lot of questions:

• My mom says I sound breathless all the time. I still walk up 5 flights to my unit but I am more tired and my back is starting to bother me at night. I have noticed my O2 sat is normal but my pulse is 90 at rest, and it used to be 50. What do these symptoms mean? Am I anemic?
• My cousin told me I should be eating iodized salt to protect my baby’s thyroid function. Is this true?
• I’ve noticed I’m constipated more often than not. I have never had this problem before. Why am I having this?
Maternal Fetal Physiology

- My mom says I sound breathless all the time. I still walk up 5 flights to my unit but I am more tired and my back is starting to bother me at night. I have noticed my O2 sat is normal but my pulse is 90 at rest, and it used to be 50. What do these symptoms mean? Am I anemic?
  - Increased plasma volume and fetal utilization of iron both lead to a dilutional anemia in pregnancy, generally requiring (at least) vitamin supplementation even in healthy women.
  - An increased heart rate is normal (Average 90-100 bpm). O2 saturation should remain normal in pregnancy. Cardiac output increases by 30-50%.
  - A feeling of breathlessness is common though respiratory rate (and vital capacity) should be normal in pregnancy.
  - Total lung capacity is decreased by the 3rd trimester uterus, as are functional residual capacity and residual volume.
  - Back pain in pregnancy is common due to the progesterone mediated loosening of joints and ligaments and the lordosis of the 3rd trimester.
Maternal Fetal Physiology

• My cousin told me I should be eating iodized salt to protect my baby’s thyroid function. Is this true?
  • The fetal thyroid gland begins to fully function by 10 weeks gestation. No additional supplementation is needed.

• I’ve noticed I’m constipated more often than not. I have never had this problem before. Why am I having this?
  • This is due to the elevated levels of progesterone that occur during pregnancy. Other effects of progesterone include:
    • Heartburn
    • Runny and irritable nose (nose bleeds)
    • Eyesight problems (blurring or headaches)
    • Increased kidney infection risk
    • Causes the cervix to produce a mucous plug to help form a barrier between the pregnancy and the outside world