Prenatal Care Guideline Team

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Prenatal Care

Patient population: Women of childbearing age, pregnant women, and their fetuses.

Objectives: (1) Promote maternal and infant health.
(2) Reduce maternal mortality and morbidity and fetal loss.
(3) Reduce preterm birth, intrauterine growth restriction, congenital anomalies, and failure to thrive.

Key Points:

Prenatal care summary. Main aspects of prenatal care (history & examination, testing & treatment, and education & planning) are summarized from preconception through delivery in Table 1.

Fetal surveillance. Common indications for antepartum fetal surveillance and gestational age at which to initiate testing as well as frequency of testing are presented in Table 2.

Referral. Indications for referral are summarized in Table 3.

Important care aspects:

Assess risk factors. For all women, perform a history and physical that includes a risk assessment with a goal of identifying risk factors for adverse pregnancy outcome *[I-D]*.

Visit timing and frequency. For average risk women, the first prenatal visit should be an intake at 6-8 weeks, with provider review and a follow-up office visit at 10-12 weeks. Subsequent visits may occur on a schedule of every 4-6 weeks until 34 weeks, then every 2 weeks until 37 weeks, and weekly thereafter *[I-C]*.

Progesterone therapy. Progesterone should be offered to patients who have a history of prior spontaneous preterm birth or who are found to have a shortened cervix on ultrasound *[I-A]*.

STI testing. Test all women for sexually transmissible infections including HIV. Patients at risk for STIs during pregnancy should be retested in the third trimester *[I-A]*.

Estimated delivery date (EDD). Establish a patient's EDD prior to 20 weeks, with consideration given to menstrual history, mode of conception, and sonographic findings using standardized criteria (Page 13). *[I-C]*

Diabetes risk. At the first prenatal visit evaluate risk factors for diabetes and test high-risk patients *[I-C]*. Screen all women without a diagnosis of diabetes for gestational diabetes at 24-28 weeks using a 50 gram glucose challenge with a cutoff of ≥135 mg/dl at 1 hour *[1-A]*.

Tdap vaccination. Offer Tdap vaccination to all women. Immunization at 27-36 weeks facilitates passive immunization of newborns for pertussis [I-D]. Administration around 32 weeks may optimize maternal antibody formation peaking at normal time of delivery.

No non-medically-indicated delivery < 39 weeks. Non-medically-indicated planned delivery before 39 weeks' gestation is contraindicated *[III-B]*.

*** Strength of recommendation:**
I = generally should be performed; II = may be reasonable to perform; III = generally should not be performed.
Level of evidence supporting a diagnostic method or an intervention:
A = randomized controlled trials; B = controlled trials, no randomization; C = observational trials; D = opinion of expert panel

Clinical Background

Management Issues

Women who receive prenatal care during the first trimester have better pregnancy outcomes than women who have little or no prenatal care. Expert panels on the content of prenatal care have identified the following three basic components:

(1) Early and continuing risk assessment
(2) Health promotion
(3) Medical and psychosocial interventions and follow-up

Each of these three components is reflected in this guideline.

(Continued on page 5)

Table 1. Guidelines for Prenatal Care*

Gestational Age	History and Examination	Testing and Treatment	Education and Planning
Preconception - 12 weeks	Medical history including menstrual, sexual, immunization, varicella, HSV, and contraceptive history Obstetrical history Family and genetic history Psychosocial history including tobacco, alcohol, drugs, depression, domestic violence, employment, and nutrition Evaluate for environmental and infectious exposures (e.g. CMV, toxoplasmosis, and household lead) Current pregnancy update including movement and signs of labor † Complete physical exam including height, weight, BMI, blood pressure, and pelvic examination	Blood type and Antibody Screen Hemoglobin / Hematocrit / Platelet count Rubella titer (Vaccinate preconceptionally †) Hepatitis B Surface Antigen HIV STI screening (GC, Chlamydia, Syphilis) Urine culture at first prenatal visit Pap smear † Genetic screening † Diabetes testing † Varicella titer (Vaccinate preconceptionally) † Hepatitis C testing † Tuberculosis testing † First trimester screen † Influenza vaccination †	Counsel on significant positive findings elicited by history, physical, or test results Review test results if available Review dating criteria † Screening for aneuploidy Nutrition in pregnancy, including folate, calcium, fish, and listeria Weight gain in pregnancy Breastfeeding Obesity counseling † VBAC/TOLAC † Refer for genetic counseling † Refer to high risk †
12-16 weeks	Current pregnancy update including movement and signs of labor Interim medical, psychosocial, and nutritional evaluation Weight and blood pressure Fetal heart rate	First trimester screen † Diabetes screening at 12 weeks † Influenza vaccination †	Review test results Physical changes Safe sex/sexuality during pregnancy Exercise/fitness during pregnancy Managing work during pregnancy Seatbelt use in pregnancy
16-22 weeks	Current pregnancy update including movement and signs of labor Interim medical, psychosocial, and nutritional evaluation Weight and blood pressure Fetal assessment including fetal heart rate and growth	Ultrasound Quad screen † Progesterone for prevention of recurrent preterm birth † Influenza vaccination †	Review test results Review dating criteria Signs of complications including preterm labor and preeclampsia Directions to the Birth Center Childbirth classes Common discomforts in pregnancy Emotional changes in pregnancy Trauma protocol in pregnancy
22-28 weeks	Current pregnancy update including movement and signs of labor Interim medical, psychosocial, and nutritional evaluation Weight and blood pressure Fetal assessment including fetal heart rate and growth	Diabetes screening at 24-28 weeks Hemoglobin / Hematocrit / Platelet count at 24-28 weeks † Antibody Screen at 24-28 weeks in Rhesus (-) women † Influenza vaccination †	Review test results Signs of complications including preterm labor and preeclampsia Parenting, infant classes Breastfeeding class Contraception/family planning Family adjustment Work plans Review diet VBAC/TOLAC †
28-34 weeks	Current pregnancy update including movement and signs of labor Interim medical, psychosocial, and nutritional evaluation Screen for domestic violence Weight and blood pressure Fetal assessment including fetal heart rate and growth Screen for depression and domestic violence	Tdap vaccination at 27-36 weeks RhoD Immune Globulin (Rhogam) given at 28-29 weeks in Rhesus (-) women † Influenza vaccination † Nonstress testing after 32 weeks †	Review test results Fetal movement Anticipatory guidance regarding labor and delivery Identify a newborn care provider Car seat information

Table 1. Guidelines for Prenatal Care* (Continued)

Gestational Age	History and Examination	Testing and Treatment	Planning and Education
34-38 weeks	Current pregnancy update including movement and signs of labor Interim medical, psychosocial, and nutritional evaluation Weight and blood pressure Fetal assessment including fetal heart rate, growth, and lie	Group B strep culture at 35-37 weeks (unless +GBS in urine during current pregnancy or prior affected infant) Nonstress testing † HIV and STI (GC, Chlamydia, Syphilis) screening repeated at 36 weeks in high risk patients † Acyclovir for women with HSV † Influenza vaccination †	Review test results Review signs of labor Infant safety after birth Caring for self and infant after delivery
38 weeks - delivery	Current pregnancy update including movement and signs of labor Interim medical, psychosocial, and nutritional evaluation Weight and blood pressure Fetal assessment including fetal heart rate, growth, and lie	Offer membrane sweeping Delivery by 41-42 weeks (elective delivery prior to 39 weeks is contraindicated) Nonstress testing † Influenza vaccination †	Review test results Review dating criteria Review signs of labor

* The items listed comprise a broad list of general topics to be covered, and may be based on evidence of varying quality, including expert opinion. Some topics may not be relevant for some individuals while some clinical scenarios may prompt additional evaluation or education that is not listed here. Emphasize items that are most relevant for your patient.
† These items should be performed when indicated by the clinical scenario.

Table 2. Common Indications for Antepartum Fetal Surveillance

Diagnosis	Gestational Age to Initiate Testing	Frequency of Testing
Advanced maternal age (age 36 at delivery)	36 weeks	1 x week
Amniotic fluid volume / amniotic fluid index (AFI)		
Mildly Decreased (AFI < 8 cm)	Time of Diagnosis	1 x week
Oligohydramnios (AFI ≤ 5 cm)	Time of Diagnosis	Per high risk provider
Cholestasis of Pregnancy	32 weeks	2 x week (AFI 1 x week)
Diabetes		
Gestational, diet controlled	40 weeks	1 x week
Gestational, requiring medication	32 weeks	2 x week (AFI 1 x week)
Pregestational	32 weeks	2 x week (AFI 1 x week)
Fetal Growth Restriction		
Fetal Weight 6^{th} to 10^{th} percentile, normal Doppler studies	Time of Diagnosis	1 x week
Fetal Weight ≤ 5^{th} percentile or abnormal Doppler studies	Time of Diagnosis	Per high risk provider
Hypertension		
Chronic, not requiring medication	32 weeks	1 x week
Chronic, requiring medication	32 weeks	2 x week (AFI 1 x week)
Gestational	Time of Diagnosis	2 x week (AFI 1 x week)
Preeclampsia	Time of Diagnosis	2 x week (AFI 1 x week)
Obesity, BMI ≥ 40	36 weeks	1 x week
Post-dates pregnancy	41 weeks	2 x week
	42 weeks	Every other day
Previous Intrauterine Fetal Demise (IUFD)	Two weeks prior to earliest IUFD	2 x week (AFI 1 x week)

Note: These guidelines may be based on data of variable quality, and in some cases represent expert opinion. This list is not intended to be comprehensive, as numerous other indications for testing are accepted in complicated pregnancies.

Table 3. Selected Indications for Referral for Consultation and/or High-Risk Pregnancy Care

Medical Complications
Carcinoma
Gestational diabetes mellitus requiring medication or any pregestational diabetes
Severe chronic medical disease
Thrombocytopenia, moderate or severe
Past OB/Gyn History
Previous fetal or neonatal demise with continuing cause
Previous major operations to the uterus and cervix, including cerclage, resection of uterine septum and myomectomy (not including LTCS)
Prior preterm birth <34 weeks
Recurrent spontaneous abortion (3 or more)
Current Pregnancy Complications
Documented serious fetal anomaly (e.g. diaphragmatic hernia)
Hyperemesis unresponsive to outpatient therapy
Isoimmunization
Multiple gestation
Second or third trimester fetal demise
Severe preeclampsia or eclampsia
Shortened cervix ≤20 mm identified on ultrasound
Third trimester bleeding due to placenta previa or placenta abruption
Vasa previa

Rationale for Recommendations

When to Deliver Care

Evidence is limited as to what represents an adequate number of prenatal care visits. Studies have shown that some prenatal care is better than no prenatal care, and that a visit during the first trimester is especially important. Based upon scientific evidence, recommendations of the U.S. Public Health Service, clinical judgment regarding effectiveness of identifying and modifying risk, and the success of medical and psychosocial interventions, a chronological sequence of prenatal care visits is presented.

The sequence of prenatal care, including History, Examination, Testing, Treatment, Planning, and Education is summarized in Table 1.

Detailed recommendations and the rationale for care are organized into four major time frames:

- Preconception care
- Prenatal visits
- Delivery planning
- Postpartum assessment

These divisions are followed by additional sections on topics that may be relevant at any time:

- Indications for referral to a high-risk provider
- Cultural sensitivity

Preconception Care

Preconception Visit

A preconception visit is recommended for all women planning to become pregnant in order to minimize risk before pregnancy. Elements of care are indicated in Table 1 and summarized below. When a woman expresses her desire for pregnancy, consider the following:

- History: Perform and document maternal medical history and risk assessment.
- Physical exam: Perform and document a complete physical examination.
- Laboratory tests:
  - Assess infectious disease risk/immunization status for rubella, HIV, hepatitis B, varicella, herpes, hepatitis C, toxoplasmosis, and cytomegalovirus. Vaccinate as indicated (e.g., if rubella titer is negative, then provide preconception vaccination and advise that pregnancy should be avoided for 4 weeks).
  - Perform the tests recommended in Table 1. In most cases, if a test is obtained within the six months prior to conception, it need not be repeated during pregnancy.
- Genetic counseling: Provide genetic counseling based on family history and race/ethnicity probabilities (e.g., cystic fibrosis, sickle cell, Tay Sachs).

- Health promotion:
  - Encourage healthy behaviors (eg. folate supplementation, calcium intake, exercise)
  - Discuss risk factor reduction: smoking, alcohol, substance abuse, and environmental exposures (e.g., avoid cat litter if patient has cats that go outside).
  - Review fetal health risks (e.g., optimal blood sugar control in patient with diabetes).

Overlap of Preconception and Prenatal Care

Given that half of all pregnancies are unplanned, in most cases a preconception visit will not have taken place, and all of the content of the preconception visit must be addressed at the first prenatal visit. This limits the opportunity for primary prevention (e.g., some vaccinations will no longer be feasible). The elements of preconception visits are discussed in more detail below in the section on prenatal visits.

Prenatal Visits

General consideration of the initial prenatal visit and frequency of visits is followed by information on each category of care to be provided during prenatal visits: history, physical examination, laboratory and other tests, and health promotion and education. Within each category, specific aspects of care are listed in the general chronologic sequence in which they are performed, with the timing for specific care activities noted in italics.

Initial Prenatal Visit and Visit Frequency

Initial prenatal visit. We recommend that the initial encounter of the pregnancy should consist of an intake visit at *6-8 weeks*, with review of the record by an obstetric care provider and a subsequent follow-up visit at *10-12 weeks*.

These visits will be shorter and more effective if a preconception visit has occurred. Still, when the first visit takes place at 10-12 weeks of gestation, the activities of prenatal care will be substantially more effective than when the first visit is delayed to the second or third trimester.

Frequency of visits For average risk women visits should occur:

- Every 4-6 weeks through 34 weeks' gestation
- Every 2 weeks through 37 weeks' gestation
- Every week after 38 weeks' gestation

For patients requiring additional surveillance, visit frequency can be tailored individually.

Prenatal care visits should be allotted adequate time in order to facilitate maternal and fetal health assessment as well as offer education and anticipatory guidance; we suggest at least 15 minutes. Group model of prenatal care is also an acceptable alternative to individual appointments.

History

Taking and documenting a thorough history is recommended at the first pregnancy visit if a preconception visit has not taken place. Key elements of the history are identified in Table 1, including:

Tobacco use/avoidance. Screening for tobacco use is recommended at the *initial visit*. Tobacco use during pregnancy has well known risks including miscarriage, placental abruption, fetal growth restriction, preterm delivery, birth defects such as cleft lip and palate, and sudden infant death syndrome. Cessation of tobacco use is highly recommended. The UMHS clinical guideline "Tobacco Treatment" provides information on assisting patients to quit tobacco use. Non-pharmacological measures are addressed. Nicotine gum and patches can be considered; while use of these during pregnancy has been associated with low birth weight, the risk of tobacco use itself is still greater.

Alcohol and substance use/abuse. Alcohol is a known teratogen and use of alcohol in pregnancy incurs a risk for fetal alcohol syndrome. Similarly, use of narcotics and other controlled or illicit substances can adversely affect fetal well-being. Screen all patients for alcohol and substance use at the *initial visit* by asking the following questions:

"Do you drink alcohol?"

"How many times in the past year have you used an illegal drug or used a prescription medication for nonmedical reasons?"

Any patient who answers "yes" to the first question, or indicates 1 or more episodes of substance use in response to the second question, should be further evaluated using a standardized methodology. The CAGE-AID questions (Table 4) may be the simplest to employ and are potentially effective in detecting problems with substance or alcohol use. The questions are the well-recognized and established CAGE questions Adapted to Include Drugs. Other questionnaires that have higher sensitivity are also available and may be used.

Table 4. Alcohol and Drug Use Screening Questions

CAGE-AID: "Yes" on ≥ 1 indicates potential risk*

1. Cut down: In the last year, have you felt you should cut down or stop drinking or using drugs?
2. Annoyed: In the last year, has anyone annoyed you or gotten on your nerves by telling you to cut down or stop drinking or using drugs?
3. Guilty: In the last year, have you felt guilty or bad about how much you drink or use drugs?
4. Eye opener: In the last year, have you been waking up wanting to have an alcoholic drink or use drugs?

* Although the usual cutoff for the CAGE-AID is two positive answers, we recommend lowering the threshold to one positive answer in order to better identify patients who may have alcohol or substance abuse disorders

Patients who screen positive using a standardized methodology should be further evaluated by a social worker. Consider referral to a trained alcohol or substance abuse counselor or program as well as consultation with a high-risk provider.

Depression. Depression is common in women of childbearing age and during pregnancy. Identifying and treating depression can benefit the mother in terms of social function during pregnancy and the fetus by decreasing risk for preterm birth and low birth weight.

Women should be screened for depression at the *preconception visit, initial prenatal visit, at 28 weeks, and in the postpartum period* using a validated depression scale. Among several available screening scales, the Patient Health Questionnaire-2 (PHQ-2) is a very easily administered and sensitive way to screen for depression. It consists of 2 questions:

- In the past 2 weeks, have you felt down, depressed, or hopeless?
- In the past 2 weeks, have you had little interest or pleasure in doing things?

If the answer to either is positive, following up with a validated depression scale such as the PHQ-9, Edinburgh Postnatal Depression Score, or the Beck Depression Inventory.

Treatment of depression in pregnancy can include both counseling/behavioral techniques and pharmacologic management. Multidisciplinary care is recommended when available. As with any condition during pregnancy, a careful assessment of the risks of medication versus the potential benefits based on the individual situation is required prior to considering pharmacologic treatment.

Domestic violence. Domestic violence occurs with a high prevalence during pregnancy; up to 20% has been reported in some studies. Therefore, screening for domestic violence is recommended at the *preconception visit, initial prenatal visit, at 28 weeks, and in the post-partum period.* Screening at multiple visits can result in a higher rate of detection than does screening only at the initial visit.

Screen using the following three questions:

- Within the last year, have you been hit, slapped, kicked, or otherwise physically hurt by someone?
- Since you've been pregnant, have you been hit, slapped, kicked, or otherwise physically hurt by someone?
- Within the last year, has anyone forced you to engage in sexual activities?

If any of these questions are positive, it is essential to evaluate the safety of patient and family members. Consider a referral to either adult or child protective services and a referral to social work.

Recurrent preterm birth. Patients with a prior history of spontaneous preterm birth between 20-37 weeks resulting from spontaneous preterm labor or premature rupture of membranes are at risk for recurrent preterm birth. They should be offered progesterone supplementation to reduce this risk.

Treatment should begin at *16-20 weeks* with 17 alpha-hydroxyprogesterone caproate (17P) 250 mg IM weekly (recommended therapy) or progesterone 100 mg daily vaginally (alternative therapy). Treatment should be continued until 36 weeks' gestation

Patients with history of prior spontaneous preterm birth prior to 34 weeks should be referred to a physician trained in the care of high-risk obstetrical patients.

Herpes simplex virus. In pregnant women who are known to have genital HSV, the use of prophylactic antiviral medication beginning at *36 weeks' gestation* has been shown to reduce the rate of cesarean delivery, although it has no benefit in terms of neonatal outcome. Recommended therapy is acyclovir 400 mg three times daily. Valacyclovir 500 mg twice daily offers more convenient dosing, but at a greater cost.

Serologic screening for HSV infection in asymptomatic women is not recommended. In symptomatic women, clinical history may be adequate to make a presumptive diagnosis, although confirmation with HSV culture may be considered.

If active lesions are present at time of labor admission, cesarean delivery is preferred as the mode of delivery due to uncertainty of the risk from primary versus secondary HSV infection. The risk for neonatal HSV infection, however, is low even if lesions are noted incidentally after a vaginal delivery.

Physical Examination

Mother. The mother's examination should include:

- Height measured at the *initial visit*.
- Weight recorded at *each visit*. Evaluating weight gain is a simple and appropriate measure to potentially reduce risk for complications. If a patient experiences excessive or poor weight gain, then additional nutritional guidance may be necessary. A nutrition consult can be considered.
- BMI calculated at the *initial prenatal visit*.
- Blood pressure measured at *each visit*.
- A complete physical exam, including a breast exam, at the *initial visit*. If a breast examination has been recently performed the provider may consider omitting this portion of the exam.
- A pelvic exam at the *initial visit*. This exam includes testing for chlamydia and gonorrhea and a pap smear if indicated. This exam may identify cervical abnormalities and should document the size of the uterus in conjunction with estimated gestational age. If a pelvic exam has recently been performed and a pap smear is not indicated, the provider may consider omitting the exam and testing a urine sample for chlamydia and gonorrhea.

Fetus. The examination of the fetus should include:

- Fetal heart rate assessed at each visit *12 weeks and after* with a fetal Doppler. If no heart rate is detected, an ultrasound should be performed to assess fetal age and viability.
- Fundal height or assessment of fetal growth recorded *each visit* from 20-36 weeks. If fundal height differs by 4 cm or more from the corresponding gestational age, then an ultrasound should be ordered to assess fetal growth and amniotic fluid volume. If an ultrasound has recently been done to assess fetal growth, measurement of fundal height provides no additional benefit. If measuring fundal height is not possible, or in cases where BMI $\geq$ 40, an ultrasound at 26 weeks and 32 weeks for growth assessment is suggested.
- Fetal presentation assess after *34 weeks* by Leopold's and/or ultrasound. If a fetus remains breech at 37 weeks an external cephalic version should be offered to appropriate candidates. If the ECV is unsuccessful, a scheduled term ($\geq$ 39 weeks) cesarean delivery is recommended.

Obesity. Obese pregnant women (BMI $\geq$ 30 kg/m2) require additional considerations in providing care.

- Counsel at *the initial visit* regarding:
  - Weight gain, nutrition, and regular exercise.
  - Associations with fetal malformation, hypertensive disorders, gestational diabetes, fetal macrosomia, increased cesarean delivery rate, and intrapartum and operative complications.
- Test for diabetes at the *initial visit*.
- For BMI:
  - $\geq$ 35 kg/m^2 with comorbidities such as hypertension or diabetes, consider a screening echocardiogram.
  - $\geq$ 40 kg/m^2: also sonographic evaluation of fetal growth is suggested at 26 and 32 weeks.
  - $\geq$ 50 kg/m^2: also evaluation by anesthesiology should occur in the third trimester.
  - At any BMI, if the body fat distribution limits clinical assessment of fetal growth, serial sonographic evaluation of fetal growth is suggested.

Hypertensive disorders of pregnancy. Hypertension in pregnancy is defined as a systolic pressure greater than 140 mm Hg and/or a diastolic pressure greater than 90 mm Hg recorded on at least two separate occasions at least four hours apart. Hypertensive disorders noted during pregnancy are divided into 4 categories: preeclampsia-eclampsia, chronic hypertension, chronic hypertension with superimposed preeclampsia, and gestational hypertension.

- Preeclampsia is hypertension identified after 20 weeks' gestation in the presence of new onset proteinuria (protein/creatinine ratio on a random specimen with a cut-off of 0.3 or excretion of 300 mg/24 hours on a timed urine), thrombocytopenia (<100,000/µl), impaired liver function (elevation of transaminases to twice the normal concentration), new-onset renal insufficiency (creatinine > 1.1 mg/dl or doubling of serum creatinine in the absence of other renal disease), pulmonary edema, or new onset cerebral or visual disturbances.
- Chronic hypertension is hypertension that predates pregnancy. In patients without documentation of blood pressure prior to conception the diagnosis is suspected in the presence of two elevated pressures prior to the 20th week of gestation in the absence of multiple gestation or gestational trophoblastic disease.
- Chronic hypertension with superimposed preeclampsia is chronic hypertension in association with preeclampsia
- Gestational hypertension is hypertension identified after 20 weeks' gestation in the absence of proteinuria or other systemic findings suggestive of preeclampsia.

If a patient's blood pressure is elevated, evaluation for proteinuria is recommended. A quantitative test, such as a protein/creatinine ratio on a random specimen or a timed urine collection, is preferred. Significant proteinuria may also be documented at a level of $\geq$ 1+ protein on dipstick, but, due to variability in this test confirmation is suggested using one of the previously mentioned techniques. If the protein/creatinine ratio is negative and clinical suspicion is high, consideration may be given to repeating the test or performing a timed urine collection.

Additional lab work that may aid in the evaluation of suspected preeclampsia includes a complete blood count with platelets, AST, ALT, and serum creatinine. Serum uric

acid has a low positive predictive value and is generally not helpful.

The complete management of hypertension in pregnancy is beyond the scope of this guideline. For detailed recommendations regarding the care of these patients the use of another resource is recommended. The following principles may aid in the care of these patients.

Patients at high risk for development of preeclampsia include patients with a history of prior preeclampsia, diabetes, chronic hypertension, renal disease, autoimmune disorder, or multiple gestation. Treatment with low-dose aspirin (81 mg/d) beginning at 12 weeks gestation is recommended to reduce the risk for development of preeclampsia in these patients. Routine aspirin prophylaxis has not been shown to be beneficial in low risk patients.

Gestational hypertension and preeclampsia without severe features are indications for sonographic evaluation of fetal growth and antepartum surveillance (Table 2). Patients should be followed with serial blood pressure assessment. Patients with gestational hypertension should undergo weekly evaluation of urine protein and patients with preeclampsia should undergo weekly laboratory assessment.

Gestational hypertension at ≥ 37 weeks with diastolic blood pressure ≥ 95 mm Hg is an indication for delivery, as is preeclampsia at this gestational age. When clinically appropriate, induction of labor reduces the likelihood of progression to severe hypertension (NNT = 8) and does not increase the risk for cesarean delivery.

Severe preeclampsia is preeclampsia characterized by systolic blood pressure ≥ 160 mm Hg, diastolic blood pressure ≥ 110 mm Hg, thrombocytopenia, severe persistent right upper quadrant or epigastric pain, impaired liver function, new-onset renal insufficiency, pulmonary edema, or new onset cerebral or visual disturbances. If this develops at any gestational age then admit patient to hospital for further evaluation and management. Bed rest does not alter the course of preeclampsia.

Laboratory and Other Tests

Most initial prenatal laboratory tests are ideally performed at the preconception visit. With the exception of the antibody screen in Rhesus negative patients, if performed within the 6 months prior to conception, the majority of these tests need not be repeated unless risk factors have changed or values were abnormal. Two further exceptions to this are HIV and Hepatitis B, for which the State of Michigan requires testing during pregnancy, although patients may choose to decline repeat evaluation.

Blood type and antibody status. Maternal ABO and Rh blood type and blood antibody status should be documented at the *initial visit*. In Rh negative women, if the antibody screen has been performed preconceptionally, it should be repeated at the *first prenatal visit*.

Women who are Rh negative and unsensitized should have a repeat antibody screen performed then receive RhoD Immune Globulin (Rhogam) (300ug) *at 28 to 29 weeks* prenatally, and postpartum if the newborn is Rh positive.

In unsensitized patients who are Rh negative and experiencing vaginal bleeding during pregnancy, RhoD Immune Globulin (Rhogam) should be administered at the time of bleeding due to concern for feto-maternal hemorrhage. If RhoD Immune Globulin (Rhogam) is given during the prenatal period for this indication, it need not be routinely readministered until the patient is beyond 28 weeks and 12 weeks have passed since administration. If concern exists for ongoing hemorrhage (e.g. persistent bleeding), check maternal indirect Coombs every 3 to 4 weeks. If it is positive, RhoD Immune Globulin (Rhogam) is still present and redosing is not necessary. If it is negative, repeat dosing of RhoD Immune Globulin (Rhogam) is reasonable.

Hemoglobin / hematocrit. Hemoglobin/hematocrit should be performed at the *initial visit*. If the initial hematocrit is in the normal range, testing need not be routinely repeated during the third trimester. However it should be *repeated once after 24 weeks on high-risk women*, those presenting with initial Hb <11 or Hct < 33, or those on restrictive diets.

If the hematocrit is less than 33.0 in the first or third trimester or less than 32.0 in the second trimester, supplemental iron should be recommended. If the Hct is:

- 30–32.9%, FeSO4, 325 mg once daily
- < 30%, check ferritin to confirm iron deficiency and supplement with FeS04, 325 mg twice daily.

Patients receiving supplementation should be counseled that Vitamin C supplementation and consumption of citrus improve iron absorption, whereas dairy, soy, spinach, coffee, and tea consumption impair absorption.

Platelet count. Platelet count should be performed at the *initial visit*. Thrombocytopenia is classified as mild (100,000-149,000/µL), moderate (50,000-99,000/µL) or severe (<50,000/µL). Patients with new-onset mild thrombocytopenia at initial evaluation may have ITP and should have *repeat evaluation at 28 weeks*. If platelet counts at any time are in the moderate to severe range, consider consultation with MFM and/or hematology.

Gestational thrombocytopenia is the most common cause of thrombocytopenia in pregnancy, usually presenting in the third trimester. Platelet levels do not typically fall below 70,000/µL. Gestational thrombocytopenia is likely in patients who develop mild thrombocytopenia in the third trimester, are asymptomatic, and have no history of bleeding or thrombocytopenia prior to pregnancy other than during a previous pregnancy or during the first 12 weeks

postpartum. These patients require no special evaluation or treatment.

Rubella titer. The titer should be performed for all women at the *initial visit*. Non-immune women should be vaccinated at least *28 days prior to conception* or should avoid exposure and be vaccinated in the immediate post-partum period.

Hepatitis B surface antigen (HBsAg). Testing for HBsAg should be performed at the *initial visit* on all women regardless of history of Hepatitis B immunization and carrier status should be documented in the delivery record. Early treatment of newborns with HB vaccine and HB immunoglobulin can prevent 85% to 95% of perinatal HBV infection.

HIV. As the incidence of HIV infection has increased among women of childbearing age, increasing numbers of children have become infected through perinatal transmission. Anti-retroviral therapy reduces perinatal transmission. HIV testing is recommended for all women at the *initial visit*. Offer testing again in *third trimester* and at *onset of labor* if initial testing declined.

HIV testing should be *repeated at 36 weeks in women who are high-risk* for infection. This includes patients with history of intravenous drug use, more than one sex partner in the last six months, recent blood transfusion, or an HIV-infected partner.

Screening for sexually transmitted infection (STI). STI screening (i.e. chlamydia, gonorrhea, syphilis) should be performed on all women at the *initial visit*. If testing was performed prior to conception, patients at increased risk for STI (e.g., new or more than one sex partner in the last 6 months, recent or current injection drug use, STI positive partner) should be retested during the *initial prenatal visit*. If testing is positive at any time, treatment, counseling, and referral of partner(s) for testing and treatment are recommended.

Repeat screening for sexually transmitted infections should be considered at *36 weeks in high risk patients*.

Neisseria gonorrhoeae and Chlamydia trachomatis. All patients should be screened for gonorrhea and chlamydia. Women with a positive test should be treated and followed with a test of cure due to risk for complications resulting from persistent or recurrent infections. Infected pregnant women should abstain from intercourse pending test of cure.

Syphilis. Syphilis screening using a serologic test (i.e. rapid plasma reagin [RPR]) should be performed on all patients. Positive (reactive) tests should be confirmed by a treponemal test (i.e. fluorescent treponemal antibody [FTA]) before treatment. Women with confirmed positive serology should be treated with penicillin. Follow-up serologic tests should be obtained after treatment to document decline in titers.

Urine culture. Screen women for asymptomatic bacteriuria with urine culture at the *first prenatal visit*. Evidence is insufficient to recommend for or against repeat screening throughout the remainder of the pregnancy.

Asymptomatic pregnant women with urinary bacterial colony counts < 100,000 CFU/mL should not be treated with antibiotics as no benefit is seen in prevention of adverse maternal or fetal outcomes. This recommendation applies to all bacterial isolates, including Group B Streptococcus, although the presence of GBS at any level in the urine should be documented, as this will necessitate intrapartum antibiotics.

If bacterial colony counts are > 100,000 CFU/mL, treatment at the time of diagnosis is recommended. Evidence is insufficient to recommend a test of cure after completion of antibiotic therapy, except in the case of GBS bacteriuria, for which a test of cure is recommended.

Pap smear. Women current with routine screening for cervical cancer do not need to undergo additional testing. If the woman will come due for routine screening before the post-partum visit, a screening test should be performed at the *first prenatal visit*. Rates of false positive cervical cytology increase in pregnancy; however, pregnancy presents an opportunity to detect disease in women not previously screened.

When a diagnosis of trichomonas is made on Pap smear, treatment is recommended if the patient is symptomatic. If the patient has no symptoms, no treatment is recommended.

Genetic screening. The family history, including ethnic background, of all patients should be determined at the *initial visit*. Patients at risk for carrying a genetic disorder should be offered testing for that disorder. Abnormal results suggesting that the patient is a carrier should prompt partner evaluation. If both partners are carriers, consider referral for genetic counseling.

Cystic fibrosis (CF). All couples should be provided with information about CF and offered carrier screening. Informed consent should be obtained prior to testing and should include the limitations of such testing as well as the inclusion of CF in the newborn screen.

Hemoglobinopathies. The risk for various types of hemoglobinopathy varies with geographic ancestry.

- African, Mediterranean, Middle Eastern, East Indian, South American, and Caribbean descent: risk for sickle cell anemia, ß-thalassemia, or other hemoglobinopathies. These patient should be screened with both MCV and hemoglobin electrophoresis.

- Southeast Asian descent: risk for alpha-thalassemia. These patients should be screened by evaluation of the MCV. If the MCV is <80fL, hemoglobin electrophoresis and ferritin should be offered. The combination of depressed MCV with normal electrophoresis and ferritin is consistent with alpha thalassemia.
- Northern European, Japanese, Native American, Inuit (Eskimo), and Korean ancestry: generally low risk for hemoglobinopathy.

Ashkenazi Jewish descent. Individuals of Ashkenazi Jewish descent (or with partners of such descent) are at risk for several heritable disorders. These individuals should be offered carrier screening for cystic fibrosis as well as Tay-Sachs disease, Canavan disease, and familial dysautonomia. If patients request screening, we also recommend testing for mucolipidosis IV, Niemann-Pick disease type A, Fanconi anemia group C, Bloom syndrome, and Gaucher disease, as inclusion of these disorders in a single panel is more cost-effective than screening for a more limited panel that does not include these latter disorders.

Diabetes testing. Testing for diabetes is recommended at the *initial prenatal visit* in women with signs or symptoms suggestive of undiagnosed diabetes and those with a history of gestational diabetes (GDM), a first degree relative with diabetes, or other risk factors (e.g., age ≥ 35, BMI ≥ 30, inactive lifestyle, prior macrosomic infant, prediabetes, or PCOS). A reasonable approach is to evaluate Fasting Plasma Glucose (FPG) and A1c. The results are interpreted as:

- FPG ≥ 126 mg/dl or A1c ≥ 6.5 is diagnostic of overt diabetes.
- FPG ≥ 95 mg/dl, but < 126 is diagnostic of GDM.

Patients with normal FPG (<95 mg/dl) and A1c of 5.7-6.4 should be counseled on dietary and lifestyle modification and should undergo an oral glucose challenge test (GCT) at *12 weeks' gestation*, using the procedures described in the section on "Screening for gestational diabetes" below. If GDM is not diagnosed, a second GCT should be *repeated at 24-28 weeks* or any time a patient has signs or symptoms suggestive of hyperglycemia.

In patients for whom testing of both the FPG and A1c is not logistically plausible, an A1c alone may be performed, although sensitivity of the protocol may be diminished.

Preconception evaluation: When evaluating patients *preconceptionally*, the same protocol may be performed using the following interpretation:

- Pre-diabetes is diagnosed if FPG is 100-125 mg/dl or A1c is 5.7-6.4%
- Diabetes is diagnosed if FPG ≥126 or A1c ≥6.5%

Varicella. Prenatal assessment of varicella immunity is recommended at the *initial visit*. The following are considered evidence of immunity.

- Documentation of 2 doses of varicella vaccine
- Laboratory evidence of immunity or confirmation of disease
- Diagnosis or verification of a history of varicella disease or herpes zoster by a health-care provider

Recent immigrants from tropical areas are less likely to have contracted varicella in childhood and are more likely to be non-immune if unvaccinated.

Non-immune women should be vaccinated, receiving the last dose at least 1 month *prior to conception* or should avoid exposure and receive the first dose of vaccine in the *immediate post-partum period.*

Hepatitis C. Women at high risk for hepatitis C infection should be tested for hepatitis C antibodies at the *initial visit*. Women at high risk include those with a history of intravenous drug use, more than one sex partners in the last 6 months, recent blood transfusion, or a hepatitis C-infected partner.

Tuberculosis. All women from one or more high-risk groups should be screened for tuberculosis using a Mantoux test with purified protein derivative (PPD) or an interferon-gamma release assay (IGRA) such as the Quantiferon-Gold test at the *initial visit*. High risk groups for tuberculosis include individuals who:

- Live in close contact with individuals known or suspected to have tuberculosis
- Have medical risk factors known to increase risk of disease if infected (e.g. immunocompromised state, HIV)
- Are born in a country with high tuberculosis prevalence
- Are alcoholics
- Are intravenous drug users
- Are residents of long term care facilities, including correctional facilities
- Are healthcare professionals working in high-risk healthcare facilities, if not recently screened.

Screening for aneuploidy and neural tube defects. All pregnant women presenting for care, regardless of age, should have aneuploidy screening options made available to them. All women considered high risk due to maternal age (age 35 or over at delivery) or personal or family history should be offered consultation with a genetic counselor. Prior to performing a screening test, a discussion of possible results and subsequent evaluation should occur with the patient. Screening options that should be offered to include:

- No testing

- First Trimester Screen (FTS): A screening test that can identify about 85% of pregnancies with Down syndrome and 97% with trisomy 18, with a false positive rate of 5%. This test measures blood levels of free beta-hCG and PAPP-A (pregnant associated plasma protein A) at 9-14 weeks. In addition, an ultrasound is performed at 11-14 weeks to assess the nuchal translucency.
- Quad Screen: A screening test that can identify about 80% of fetuses with Down syndrome, 80% of those with open neural tube defects, and 60% with trisomy 18, with a false positive rate of 5%. This test measures blood levels of alpha-fetoprotein, beta-hCG, estriol, and inhibin A. It is performed between the 15th and 21st weeks and can also identify pregnancies at risk for open spina bifida and trisomy 18.

If a screening test is positive, then genetic counseling and ultrasound should be offered.

Patients who are at increased risk on the basis of maternal age, history, or the result of one of the above screening tests should be offered genetic counseling. Tests that may be made available at the time of genetic counseling include non-invasive prenatal testing (NIPT), chorionic villus sampling (CVS), and amniocentesis.

- NIPT evaluates cell-free fetal DNA in maternal plasma after 10 weeks' gestation as a screen for Down syndrome, Trisomy 13, Trisomy 18, and sex chromosomal abnormalities. As a screen for Down syndrome the sensitivity exceeds 99%. The following four criteria must be met in order to be eligible for NIPT:
  - Patient will be age 35 or over at anticipated delivery
  - Ultrasound finding concerning for aneuploidy
  - First trimester or quad screen indicates increased risk for aneuploidy
  - Positive family history
- CVS and amniocentesis are invasive procedures that provide diagnostic information but carry risk for pregnancy loss. CVS is performed at 10-13 weeks and amniocentesis is performed after 15 weeks.

Patients without risk factors who request NIPT, CVS, or amniocentesis should receive counseling by a genetic counselor to review the risks in detail.

Women who undertake FTS, CVS, or NIPT should be offered screening for neural tube defects either by ultrasound examination or measurement of maternal serum alpha-fetoprotein in the second trimester.

Fetal Ultrasound. The routine use of screening fetal ultrasound in low risk women has not been demonstrated to improve long-term outcome. Nonetheless, offering ultrasound imaging is reasonable given potential benefits in terms of dating and identification of anomalies. Performing ultrasound imaging can confirm pregnancy viability in cases where fetal heart tones are not readily found through use of a Doppler. Ultrasound imaging can lower the rate of induction for presumed post-term pregnancy in women with uncertain menstrual dates. In women at increased risk for fetal abnormality where an intervention might improve the outcome, an ultrasound should be recommended. ACOG supports a simple screening ultrasound at *18-20 weeks' gestation* after counseling about limitations versus benefits.

Indications for ultrasonography during pregnancy include:
- Evaluate known or suspected pregnancy complications
- Pregnancy dating
- As a component of screening for fetal aneuploidy
- Evaluation of fetal growth and well being
- As adjunct for procedures

Cervical ultrasound. Asymptomatic low-risk women who are found to have a shortened cervix in the second trimester are at increased risk for preterm birth. Treatment with vaginal progesterone has been shown to improve pregnancy outcome. We recommend that the cervical length be evaluated at the time of the screening ultrasound (*18-20 weeks*). Patients found to have a shortened cervix ≤ 20 mm should be offered progesterone therapy. This may be given as micronized progesterone 200 mg intravaginally at bedtime or as progesterone 8% gel (90 mg) intravaginally every morning, continuing treatment *until 36 weeks*. These patients should further be referred to a physician trained in the care of high-risk obstetrical patients.

Screening and care for gestational diabetes. Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance that begins or is first recognized during pregnancy.

Screening for gestational diabetes. All pregnant women not known to have diabetes should undergo a 50 g oral glucose challenge test (GCT) at *24-28 weeks*, with testing of the plasma glucose at 1 hour. A test result of ≥ 135 mg/dl is considered abnormal and should be followed by a 100 g, 3-hour oral glucose tolerance test (OGTT). If the OGTT finds an elevated fasting plasma glucose (≥ 95 mg/dl) or 2 or more abnormal values after glucose loading (1hr ≥ 180 mg/dl, 2hr ≥ 155 mg/dl, 3hr ≥ 140 mg/dl), then the patient has GDM. Patients with a result on the 50 g glucose challenge ≥ 200 mg/dl are also considered to have GDM and need not perform the 3-hour OGTT.

Care for patients with GDM. GDM has two phases of risk and treatment:

- Prenatal: GDM is associated with maternal, fetal, and neonatal risks, including polyhydramnios, preeclampsia, cesarean delivery, macrosomia, shoulder dystocia, birth injury, hyperbilirubinemia, hypoglycemia, respiratory distress syndrome, and childhood obesity. Review these risks and refer for dietary counseling and instruction in home blood glucose monitoring. If a goal fasting blood sugar < 95 mg/dl or 2hr postprandial < 120 mg/dl cannot be

maintained, then pharmacologic therapy should be considered.

- Postpartum. Patients with history of GDM are at high risk for overt diabetes. Perform a 2-hour (75 g) glucose tolerance test at *6-weeks postpartum*. Counsel all patients regarding long-term risks and recommend a minimum of 150 minutes exercise per week, spread over 3-5 days.

Antepartum fetal surveillance. Antepartum surveillance should be initiated for pregnancies at increased risk for compromise to fetal well-being. See Table 2 for surveillance recommendations.

Group B streptococcus (GBS) culture. Universal screening of all pregnant women should be performed, with the exception of those who have had isolation of GBS in the urine during the current pregnancy and those with a previous infant affected by invasive GBS disease. Obtain ano-genital GBS cultures with antibiotic sensitivity testing at *35-37 weeks' gestation*. A positive culture indicates the need for intrapartum antibiotic treatment. If the patient has not delivered within 5 weeks of the initial sample, obtain a repeat sample.

The following patients should always be treated with intrapartum antibiotics:

- Prior newborn child with invasive neonatal GBS disease
- Preterm labor less than 37 weeks in the absence of a negative GBS screen unless delivered via cesarean delivery with intact membranes and no labor
- Ruptured membranes > 18 hours at any gestational age when GBS screening culture status is unknown or unavailable.
- Fever in labor > 38 degrees Celsius (100.4 degrees Fahrenheit)
- GBS bacteriuria during this pregnancy.

Tests not recommended. Routine screening for the following is not recommended:

- Vitamin D
- Thyroid stimulating hormone (TSH)
- Routine POC urinalysis at prenatal visits
- Spinal muscular atrophy (SMA)

Health Promotion and Education

Vaccinations. Recommendations for preconception, antepartum, or postpartum include the following.

- Rubella. Non-immune women should be vaccinated at least 28 days prior to conception or should avoid exposure and be vaccinated in the immediate post-partum period.
- Varicella. Non-immune women should be vaccinated, receiving the last dose at least 1 month prior to conception, or they should avoid exposure and be vaccinated in the immediate post-partum period. Non-immune postpartum women should receive the first dose of vaccine before discharge from the health-care facility. The second dose should be administered 4-8 weeks later.
- Influenza. Influenza vaccination is recommended for all women who will be pregnant during influenza season, and may be administered at any gestational age.
- Pertussis. Administer a dose of Tdap during each pregnancy irrespective of the patient's prior history of immunization. To maximize the maternal antibody response and passive antibody transfer to the infant, the CDC recommends immunization between 27 and 36 weeks, although it may be administered at any gestational age. For maternal antibody formation to peak around normal time of delivery, optimal administration may be later in the 27-36 week window. One strategy is to administer around 32 weeks.

Nutrition counseling. In addition to general good nutritional counseling, the following are important:

- Folic acid. Periconceptional folate supplementation has been shown to reduce the risk for neural tube defects and is recommended for all patients. While national guidelines suggest a dose of 0.4 mg daily, evidence suggests that higher doses may confer additional benefit. Folate supplementation at a dose of 1 mg daily is recommended beginning at least three months prior to conception and continuing through the first trimester. Women with a prior pregnancy complicated by a neural tube defect should supplement their diets with 4 mg of folate beginning at least one month prior to conception through the first trimester.
- Calcium supplementation. Calcium supplementation is recommended for women with a low intake of calcium rich foods. Recommended supplementation: 2 g of elemental calcium daily.
- Multivitamin. The routine use of prenatal multivitamins is not recommended as they have not been shown to improve pregnancy outcome, although they offer a convenient source of folic acid, with most formulations containing 0.8 – 1.0 mg of folate.
- Food with specific risks. Fish provides an excellent source of Omega-3 oils, but should be consumed in moderation with avoidance of fish high in mercury, See www.michigan.gov/eatsafefish for current list.
- Raw milk products and cold lunch meats carry risk for listeriosis and should be avoided.

Weight gain in pregnancy. Excessive weight gain during pregnancy increases the risk for complications of delivery from fetal macrosomia such as dystocia and need for operative delivery. It also increases risk for maternal gestational diabetes, and post-partum obesity. Inadequate weight gain is associated with preterm delivery, intrauterine growth restriction, and low birth weight.

Established parameters for weight gain are based on pre-pregnancy body mass index (BMI). ACOG, IOM, and AAP recommend the following.

Pre-pregnancy BMI	Weight Gain
<19.8 kg/m2	28-40 lbs
19.8-26	25-35 lbs
26-29	15-25 lbs
>29	11-20 lbs.

Women with BMI ≥ 40 may benefit from weight loss during pregnancy. Behavioral counseling and dietary education have been shown to be beneficial for women with BMI < 20 and ≥30.

Breastfeeding. Offer breastfeeding education to all pregnant women during the *initial visit* with the provider. Continuing education throughout pregnancy should be offered to pregnant women who express a desire to breastfeed and for those who are still undecided on feeding method. Breastfeeding provides substantial health benefits for children (decreased ear, respiratory and gastrointestinal infections) and their mothers (decreased ovarian and breast cancer). Feeding infants artificial milk (formula) is associated with increased likelihood of chronic disease in children (obesity, asthma and diabetes).

Exercise. Exercise in pregnancy is safe and beneficial to both mother and fetus. There is no evidence of risk to fetal well-being or that prolonged activity incurs a higher risk for either pre-term labor or pre-term delivery. Regular (3 or more time weekly) mild to moderate exercise is recommended for all healthy pregnant women. The choice and amount of exercise can be tailored to the patient based on their pre-pregnancy activities, but common sense leads to the recommendation to avoid activities that confer inherent risk for abdominal trauma. Avoidance of activities at high altitudes (>10,000 feet) due to lower pO2 is suggested for patients not acclimated to this environment.

Fetal movement counts. Fetal movement is a marker for fetal well-being. As such, counseling women to assess fetal movement can be potentially beneficial. No specific "number" of movements should occur within a set time frame. Movement is noted by the pregnant woman for 98% of fetuses between 24-27 weeks' gestation and 100% of fetus' between 30-39 weeks. Thus, any absence of maternal perception of movement after a 90 minute time period should prompt further evaluation for fetal well-being. This method, however, is insensitive as women may only recognize 35% of actual fetal movements.

Contraceptive counseling. Discuss post-partum contraceptive options during prenatal care at *22-28 weeks*. Provider-initiated discussion is recommended, as patients may not themselves raise the topic during antepartum visits. Reviewing options during pregnancy allows time for the patient to learn more about her options and make an informed decision. In addition, in the State of Michigan, patients with Medicaid desiring permanent sterilization (e.g. tubal ligation) are required to have a signed consent at least 30 days in advance of the procedure.

Choosing a Newborn Health Care Provider. To facilitate appropriate follow-up of infants, the identification of a newborn care provider should be made *prior to 36 weeks' gestation.*

For newborns discharged less than 48 hours after delivery, an appointment should be made for the infant to be examined by a licensed health care professional to assess infant well-being and the presence or absence of jaundice, preferably within 48 hours of discharge based on risk factors, but no more than 72 hours in most cases.

Delivery Planning

Gestational Age Determination

The gestational age-based estimated delivery date (EDD) should be established *prior to 20 weeks'* gestational age and reviewed prior to planning any intervention.

- In vitro fertilization is expected to be accurate to ±1 day
- Ovulation induction, artificial insemination, a single intercourse record, ovulation predictor assay, or basal body temperature measurement are typically accurate to ±3 days.
- Last menstrual period (LMP) dating is dependent on accurate recollection of a definite normal LMP and regular 28 day cycles when not taking hormonal contraceptives.
- Ultrasound performed by a trained sonographer is considered to be consistent with LMP dating if there is agreement to within the timeframe described in the following table. If dates are not consistent, refer to results of the initial ultrasound examination.

Gestational Age (weeks)	Expected Variation in Sonographic Measurement
6-10	± 3 days by crown-rump length
10-14	± 5 days by crown-rump length
14-21	± 7 days by the average of multiple biometric parameters
21-24	± 14 days by the average of multiple biometric parameters
>24 weeks	± 21 days by the average of multiple biometric parameters

For patients with sonographic dating established at or beyond 24 weeks, a second examination is suggested after 3-6 weeks to evaluate for appropriate growth.

Mode of Delivery

Cesarean delivery on maternal request. Both ACOG and the NIH consensus conference guidelines recommend

against primary cesarean delivery performed solely on maternal request due to increased risk for adverse maternal and neonatal outcomes.

Repeat cesarean delivery and vaginal birth after cesarean delivery (VBAC). A trial of labor after cesarean delivery (TOLAC) should be offered to women who have both:

- A documented low transverse incision from an operative note, or in cases where this documentation is not available, the history of a clinical scenario not consistent with risk for a classical cesarean delivery.
- 2 or fewer prior cesarean deliveries.

Potential for successful vaginal delivery can be assessed prenatally using the validated NIH VBAC calculator at: https://mfmu.bsc.gwu.edu

Compared to scheduled repeat cesarean delivery, benefits of a successful TOLAC include:

- Faster recovery after birth
- Shorter hospital stay
- Decreased risk for infection after delivery
- Decreased risk for blood transfusion
- Decreased risk for surgical complications
- Decreased risk for neonatal respiratory complications
- Quicker return to normal activities
- Greater chance of having vaginal birth in later pregnancies
- Decreased risk for abnormal placentation in future pregnancies

The risks of TOLAC increase if unsuccessful, and include

- Uterine rupture, which has a rate of 0.5-1%.
- Blood loss requiring transfusion
- Damage to the uterus requiring hysterectomy
- Bladder injury
- Infection
- Increased risk for hypoxic ischemic encephalopathy in the newborn

Counsel eligible patients on risks and benefits of TOLAC at the *initial visit, at 28 weeks' gestation, and once again near term.* If a patient chooses to pursue a trial of labor, a signed informed consent document that delineates the risks and benefits is recommended.

Membrane Sweeping

Membrane sweeping may be offered to women *every visit beginning at 38 weeks' gestation*. Membrane sweeping decreases need for post dates induction of labor (NNT=8). However, patients should be counseled on the potential for pain, cramping and spotting.

Timing of Delivery

Planned delivery of uncomplicated pregnancies (either by induction of labor or cesarean delivery) should be avoided before 39 weeks' gestation. For women with uncomplicated pregnancies, induction of labor should be offered at *41 weeks' gestation*. Induction of labor should be strongly recommended to women by *42 weeks' gestation*. Comparing induction of labor at 41 versus 42 weeks, 41 week induction results in:

- Less Meconium Stained Amniotic Fluid (RR 0.50)
- No difference in neonatal intensive care admissions
- No change in cesarean rates (slightly lower in 41 week inductions)
- No difference in operative vaginal delivery
- Less fetal demise, but absolute risk is small (NNT=410)

Postpartum Assessment

Recommended postpartum follow up is a phone call at *10-14 days after delivery* and an office visit *4 weeks postpartum*. Timing of assessment has traditionally been between 6-8 weeks but patients may benefit from earlier surveillance for postpartum depression, breastfeeding issues and/or contraception initiation.

The following should be included in the postpartum visit:

- Pelvic and breast examinations as needed
- Cervical cytology should be completed at six to eight weeks postpartum if indicated by cervical cancer screening guidelines.
- Screening for postpartum depression
- Screening for domestic violence
- Patients with pregnancies complicated by gestational diabetes should be tested for diabetes using a two-hour 75g oral glucose tolerance test at *6 weeks postpartum*

The visit should also include education about contraception, infant feeding, sexual activity, weight, and exercise.

Indications for Referral to High Risk

In general, prenatal care can be provided by appropriately trained and knowledgeable medical professionals. However, certain high risk situations require consultation and management by a high-risk obstetrician. Any aspect of prenatal care which is outside the scope of the medical professional's usual practice is indication for referral. Common conditions that warrant consideration of specialty consultation are listed in Table 3.

Cultural Sensitivity

Understanding the cultural context of particular patient's health-related behavior can improve patient communication

and care. Health care providers can minimize situations that strain provider-patient relationships by increasing their understanding and awareness of the cultures they serve or by being open minded and educating themselves regarding those that they do not know.

Adult patients have the right to refuse medical care.

Provide patient-centered care and honor cultural differences as long this does not result in discrimination against staff and providers.

Related National Guidelines

This guideline generally conforms to:
VA/DoD practice Guideline for Pregnancy Management (2009)
Guidelines for perinatal care. AAP/ACOG (2012)

Performance Measures

National programs that have clinical performance measures of diabetes include the following.

Centers for Medicare & Medicaid Services:

- Clinical Quality Measures for financial incentives for Meaningful Use of certified Electronic Health Record technology (MU)
- Quality measures for Accountable Care Organizations (ACO)

These programs have clinical performance measures for prenatal care and general preventive care addressed in this guideline. While specific measurement details vary (e.g., method of data collection, population inclusions and exclusions), the general measures are summarized below.

Prenatal screening for HIV. Percent of patients who gave birth during a 12-month period who were screened for HIV infection during the first or second prenatal care visit. (MU) [Note: Testing within 6 months prior to pregnancy is clinically acceptable, but will not be recognized by this performance measure.]

Prenatal Anti-D immune globulin. Percent of D-negative, unsensitized patients who gave birth during a 12-month period who received anti-D immune globulin at 26-30 weeks' gestation. (MU)

Pregnancy hepatitis B screen. Percent of patients tested for Hepatitis B (HBsAG) during pregnancy within 280 days prior to delivery. (MU) [Note: Testing within 6 months prior to pregnancy is clinically acceptable, but will not be recognized by this performance measure.]

BMI documented. Percentage of patients aged 18 years and older with a body mass index (BMI) in the past 6 months or during the current visit documented in the medical record. (ACO, MU)

BMI follow-up plan. If the most recent BMI is outside parameters, a follow-up plan is documented. Parameters; Age 18-64 BMI greater than or equal to 25 OR < 18.5; Age 65 and older BMI greater than or equal to 30 OR < 22. (ACO, MU)

Influenza immunization. Percent of patients (≥ 6 months old) seen for a visit between October 1 and March 31 of the one-year measurement period who received an influenza immunization OR who reported previous receipt of an influenza immunization. (ACO)

Tobacco use. Percent of patients ≥ 18 years old who were screened for tobacco use one or more times within 24 months AND who received cessation counseling intervention if identified as a tobacco user. (ACO, MU)

Depression screening. Percent of patients ≥ 12 years old screened for clinical depression using an age appropriate standardized tool AND follow-up plan documented. (ACO)

Chlamydia screening. The percent of female sexually active patients 16-24 years with 1 or more chlamydia tests during current year. (MU)

High blood pressure screen. Percent of patients ≥ 18 years old who are screened for high blood pressure. ACO)

Literature Search

For this update the initial evidence base was the literature search performed to develop the 2006 version of this guideline The team accepted the literature search performed to produce the Veterans Administration / Department of Defense and Veterans Administration to produce the VA/DoD Practice Guideline for Pregnancy Management (2009, see references). That search included literature through December 2007. A Medline search for literature published since that time was performed. The search was conducted prospectively using the major key words of pregnancy (prenatal care); guidelines, controlled trials, cohort studies; published from1/1/08 through 1/31/012, women (adolescent, adult), English language. Specific searches were performed for: Genetic screening & counseling (hemoglobinopathies, cystic fibrosis, Ashkenazi Jews), Nutrition counseling (folic acid, calcium supplementation, diet/foods), other counseling (weight gain in pregnancy, exercise, contraception counseling), Laboratory studies (rubella titer, hemoglobin/hematocrit, Hepatitis B surface antigen, HIV, Rh factor blood type, urine culture or urinalysis, screening for sexually transmitted disease, Pap smear, hypothyroidism, TB testing), comorbid conditions (obesity, depression, domestic violence, recurrent preterm birth, herpes simples management), prenatal visits (frequency, urine dipstick, fetal growth assessment, fetal imaging/ultrasound, gestational age determination, screening for aneuploidy, screening for neural tube defects, screening for diabetes/ gestational diabetes, anemia, preeclampsia, gestational

hypertension, fetal movement counts, group B streptococcus, breech, membrane sweeping, identification of a pediatrician), delivery (timing, repeat cesarean delivery and vaginal birth after cesarean delivery, elective primary cesarean delivery), breast feeding, indications for referral to high risk care, cultural sensitivity.

The searches were supplemented with recent clinical trials known to expert members of the panel. The search was single cycle. Conclusions were based on prospective randomized clinical trials if available, to the exclusion of other data. If RTC were not available, observational studies were admitted to consideration. If no such data were available, expert opinion was used to estimate effect size.

Disclosures

No member of the Prenatal Care Guideline Team has relationships with commercial companies whose products are discussed in this guideline. (The members of the team are listed on the front page of this guideline.)

Review and Endorsement

Drafts of this guideline were reviewed in clinical conferences and by distribution for comment within departments and divisions of the University of Michigan Medical School to which the content is most relevant: Family Medicine, Obstetrics/Gynecology, and Pediatrics. The guideline was approved by the Perinatal Joint Practice Committee and the Executive Committee of the UM C. S. Mott Children's Hospital and Von Voightlander Women's Hospital. The final version was endorsed by the Clinical Practice Committee of the UM Faculty Group Practice and the Executive Committee for Clinical Affairs of the University of Michigan Hospitals and Health Centers.

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1999: Robert Hayashi, MD, Obstetrics/Gynecology, Stephen Park, MD, Pediatrics, Robert Schumacher, MD, Pediatrics, Renee Stiles, PhD, Clinical Affairs.

2006: Lauren B. Zoschnick, MD, Obstetrics/Gynecology, Erin L. Brackbill, MD, Pediatrics, Lee A. Green, MD, Family Medicine, R. Van Harrison, PhD, Medical Education, Robert E. Schumacher, MD, Pediatrics.

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