Question: The greatest risk of maternal mortality is associated with ?

1. Ventricular septal defects
2. Mitral stenosis
3. Marfan’s Syndrome with a normal aorta
4. Pulmonary hypertension
5. Corrected Tetralogy of Fallot
Maternal Mortality Associated with Pregnancy

**Group I**

- Mortality < 1%
  - Mitral Stenosis, NYHA Class I and II
  - ASD
  - VSD
  - PDA
  - Pulmonary / tricuspid disease
  - Tetralogy of Fallot, corrected
  - Bioprosthetic valve

**Maternal Mortality Associated with Pregnancy**

**Group II**

- Mortality 5-15%
  - Mitral stenosis, NYHA Class III and IV
  - Aortic stenosis
  - Coarctation of the aorta, without valvular involvement
  - Tetralogy of Fallot, uncorrected
  - Previous myocardial infarction
  - Marfan Syndrome with normal aorta
  - Artificial Valve
  - Anticoagulation
Maternal Mortality Associated with Pregnancy

**Group III**

- Mortality 15-50%
  - Pulmonary Hypertension
  - Coarctation of Aorta, with valvular involvement
  - Marfan Syndrome with aortic involvement

Severity of Maternal Heart Disease

- New York Heart Classifications (NYHA)
  - Class I - Asymptomatic
  - Class II - Symptoms with greater than normal activity
  - Class III - Symptoms with normal activity
  - Class IV - Symptoms at bed rest

- Class I and II
  - 44% develop pulmonary edema in the third trimester of pregnancy
  - Why?
Hemodynamics: Intrapartum and Postpartum

• 300-500 ml autotransfusion during each contraction
• Cardiac output increases by 15-20%
• Mean arterial pressure increases by 10%
• Reflex bradycardia may occur
• Cardiac output increases by 60% immediately postpartum
• Consider these changes when treating lesions with fixed cardiac output
**Mitral Stenosis and Pregnancy**

- Particularly dangerous diagnosis in pregnancy
  - Relatively fixed cardiac output = less ventricular filling
  - Pregnancy does NOT change natural history
- Goal: maintain cardiac output & avoid pulmonary edema
  - Diuretics
  - Beta-blockade
  - Antibiotic prophylaxis
  - Rx atrial fibrillation
  - Labor and Delivery can be problematic (pain, fluids)
  - Consider PAC if valve area < 1 cm²
  - Limit patient pushing in labor
  - Postpartum caution auto-transfusion
  - Experienced staff and high risk unit needed

---

**Fetal Outcome with Maternal Cardiac Disease**

- Risk of fetal cardiac disease (4 to 23%)
- Higher risk with obstructive lesions
- If maternal hypoxia (PAO₂ < 6mm Hg) is present with and elevated hematocrit
- >65% there is an increased risk of
  - Intrauterine growth restriction (Not retardation!)
  - Fetal demise
  - Miscarriage
Question: Physiologic changes in pregnancy include all of the following except?

1. Increase in cardiac output
2. Increase in plasma volume and blood flow
3. Increase in systemic vascular resistance
4. Decrease in serum creatinine
5. Increase in heart rate

3 Key Cardiac Features

• Increased cardiac output
  – Begins early
    – 5 weeks up 10%
    – 34 weeks up 30-50%
    – Twins add 20%
    – Most to uterus, placenta, breasts

• Increased heart rate
  – Begins at 5 weeks, up to 32 wks, 15-20 bpm

• Reduced vascular resistance
  – Smooth muscle relaxation
  – Decreases until mid-pregnancy then gradual rise
  – At term 20% less than pre-pregnancy
  – \(BP = CO \times SVR\)
Maternal Hemodynamics

• Total Body Sodium increases by 500-900 mEq

• Total Body Water increases by 6-8 liters
  – Mostly extracellular

• Blood Volume increases by 40%

• RBC mass increases by 20-40%
Cardiac Physical Exam

- Peripheral edema in 50-80%
- Point of maximal impulse shifted to left
- 1st heart sound is increased and can be widely split
- 2nd heart sound can be loud in late pregnancy and split
- 3rd heart sound present by the 20th week in 84%
- Systolic flow murmur heard in 96% (left sternal border)
- Diastolic flow murmur heard in 18%

Cardiac Changes Can Mimic Heart Disease

- Physiologic normal symptoms:
  - Dyspnea, mild, doesn't progress
  - Fatigue, syncope
  - Decreased exercise tolerance
  - Louder heart and split sounds
  - Systolic ejection murmurs
  - Edema, tachycardia
  - Late jugular venous distension
  - Lateral displacement of apex
Supine Hypotensive Syndrome

- Signs and symptoms
- Faintness
- Dyspnea
- Dizziness
- Restlessness
- Nausea
- Cold clammy skin
- Hypotension

Heart Disease Symptoms In Pregnancy

- Dyspnea worsens with advancing gestation
- Progressive orthopnea
- Chest pain with exertion
- Syncope
Hypertension

• Pre-existing or Chronic

• Primary vs. secondary

• Diagnose at < 20 weeks gestation otherwise consider pre-eclampsia

• Important to treat whether pregnant or not!

Hypertension in Pregnancy

• Increase of 30/15 mmHg USED to be the definition

• Over 140/90 mmHg is HTN
  – 125/75 has been associated with increased fetal risk!

• During pregnancy
  – BP decreases in the 2nd trimester
  – Rises in the 3rd trimester towards term

• Cochrane review found no reduction in IUGR, abruption mortality, or pre-eclampsia with Rx of mild/moderate chronic hypertension (Powrie, JAMA 2007)
**Hypertensive Disease Management**

- Aldomet is the old standard but not always effective (1st choice by NHBPEP)
- Beta-blockers are safe
  - Labetolol is now probably the drug of choice
  - No large IV doses before delivery
- Diuretics are OK if used previously
- Calcium channel blockers are safe (Nifedipine)
  - Can inhibit contractions
- ACE inhibitors contraindicated
  - Secondary to fetal renal disease

**Hypertensive Disease Acute Treatment**

- Hydralazine (Apresoline)
  - 5 mg, 5-10 up to 40 mg
- Labetalol
  - 20mg, 40-80 up to 300 mg
- Methyldopa
  - 250-500 mg q6h (slow onset)
- Nifedipine
  - oral: careful with Magnesium
- Nitroglycerin
  - Start at 5 ug/min
- Sodium nitroprusside
  - start at 0.25 ug/ kg/min
  - ??? Fetal effects (CN)
- Diazoxide
  - 30-60 mg/ 5 min, 10 mg/ min
- Captopril/Enalapril
  - Contraindicated

Get Help!
Question: The difference between eclampsia and pre-eclampsia is?

1. The degree of hypertension
2. Excessive weight gain
3. The amount of proteinuria
4. Degree of vasospasm
5. Seizures

HELLP Syndrome

- Hemolysis, elevated liver, low platelets
- Subset of severe pre-eclampsia
- Often remote from term
- Epigastric or RUQ pain
- MgSO₄ treatment
- Use of steroids
- Usually means delivery

If you see this, you need help!
Peripartum Cardiomyopathy

• Development of heart failure in last month of pregnancy to 5 weeks postpartum

• Absence of recognizable heart disease or any other identifiable cause prior to the last month of pregnancy

• LV systolic dysfunction (EF<45%) or reduced fractional shortening

• Risk Factors
  – Multiple gestation
  – Multiparity and age (>30)
  – Use of oral tocolytics (terbutaline)
  – History of pre-eclampsia, postpartum hypertension

Case Presentation

• Ms. Clot, a 36 year old woman, presents to the ED complaining of pain in her left leg. She states that this area of her leg has been sore since she got up this morning.

• She says that she is about 5 or 6 weeks pregnant (her 1st) and has been throwing up constantly.

• Her BMI is around 30 but she has already lost 12 pounds. She hasn’t been able to take her prenatal vitamins or folic acid as she just can’t keep it down. She denies any bleeding.

• Exam, she appears nervous and dehydrated. Vital signs are T 37, P 94, R 18, BP 135/95. Her mucous membranes appear dry. She has some swelling in her neck. Her lungs are clear and heart sounds are normal. Her abdomen is soft and non-tender. Her legs are both slightly swollen. There is a tender area on her lower left leg, but it is not red. You decide not to perform a pelvic exam at this time.
The most likely diagnosis is?

1. Malnutrition
2. Hyperthyroidism
3. Pre-eclampsia or toxemia
4. Hyperemesis gravidarum
5. Deep venous thrombosis (VTE)

Hyperemesis Gravidarum

- Approx. 2% of all pregnancies
- Often persists throughout pregnancy
- Can be Associated with:
  - Weight loss of > 5% of body weight
  - Ketonemia
  - Electrolyte imbalance
  - Dehydration and ketonuria
  - Possible hepatic and renal damage
Nausea and Vomiting of Pregnancy

- Frequency up to 70% of all pregnancies
- Typical onset between 4 and 6 weeks gestation
  - Peak in severity and incidence between 8 and 12 weeks gestation
  - Typical resolution by 14-20 weeks gestation
- Rare weight loss, ketonemia and electrolyte imbalance
- Treatment is symptomatic
- Diet modification
- Over-the-counter remedies
- Pharmacological agents
  - Zofran
  - Steroids

Case Presentation of Ms. Clot

- Her urine dipstick shows moderate amount of ketones and you decide to hydrate her. After several hours of IV fluids, she complains more about her original left leg (calf) pain. You re-examine her leg and note that her leg is more tender when she puts her finger on this painful area. Now you think it appears pink and warm, and you are concerned about this change because the most likely diagnosis could be?
  - Congestive heart failure
  - Myocardial infarction
  - Ketoacidosis
  - Thyroid storm
  - Venous thromboembolism
Question: You are considering the diagnosis of VTE because?

1. Pregnancy is a hypercoagulable state
2. Her risk factors for VTE include obesity and age
3. Deep venous thrombosis occurs most commonly in the antenatal period
4. Deep venous thrombosis occurs most commonly on the left leg
5. All of the above

Pregnancy as a Hypercoagulable State

- Increase in clotting factors (2,7,8,9,10)
- Increase activation of platelets
- Increased venous stasis
- Decrease in Protein S
- Decrease in fibrinolytic activity
- Vascular injury at delivery
Risk Factors for Venous Thromboembolism

- Obesity
- Age
- Smoking
- Previous C-section, multiple pregnancy
- Surgery
- Oral contraceptives
- Diabetes
- Sickle cell disease
- Thrombophilias
  - Congenital and acquired
- Long haul travel

Pregnancy-related VTE

1. Most common cause of maternal mortality in the US
2. Factor V Leiden mutation is the most common genetic factor that predisposes to thrombosis
3. Prophylactic anticoagulation is warranted for Rx of the heterozygote Factor V Leiden mutation only with a history of a prior VTE
**Thrombophilias, VTE and Pregnancy**

- VTE in 0.1% of pregnancies
  - 50% of cases with VTE have thrombophilia
  - ~15% of western population have an inherited thrombophilia
- Factor 5 Leiden - homozygote 34x risk
  - Heterozygote 9x risk
- Prothrombin G20210A 26x
- Antithrombin deficiency 5x
- Protein C deficiency 5x
- Protein S deficiency 3x
- Presence of a thrombophilia does NOT result in a thrombotic event.
- Don’t screen women who do not have a positive history

---

**Question: Antiphospholipid syndrome is:**

1. More common in women than in men
2. Characterized by clinical features and specific levels of circulating antibodies
3. Associated with recurrent pregnancy loss
4. Also associated with 2\textsuperscript{nd} and 3\textsuperscript{rd} trimester pregnancy loss
5. All of the above
Antiphospholipid syndrome

- Associated with fetal loss, arterial and venous thromboses, autoimmune thrombocytopenia
- Pre-eclampsia
- IUGR
- Placental insufficiency
- Preterm birth
- Autoimmune disorder
- Testing should be limited to women with these histories

Antiphospholipid Syndrome

- Lupus anticoagulant and ACA (only 1 needed)
  - LAC x 2 six weeks apart
  - IgG > 20 gpl; even IGM > 20 gpl
- APL syndrome
  - Rx full anticoagulation
- Continue for 6-8 weeks postpartum
- No estrogen (oral contraceptives)
- Patients with no thrombotic history, prophylactic anticoagulation
Question: Most common cause of increased perinatal mortality associated with insulin-dependent diabetes is?

1. Congenital malformations
2. Neonatal hypoglycemia
3. Macrosomia
4. Hyaline membrane disease
5. Trauma at delivery
Diabetes Mellitus

- Increased risk of birth defects
- Risk is directly related to hyperglycemia as documented by HbA1C in the early trimester
- If <7 (A1C) the risk of birth defects is at baseline
- Most common defects are:
  - Macrosomia (25%)
  - CNS (20 x increase)
  - Cardiac
- Small for gestational age (IUGR) - 4%
Question: Diabetes mellitus in pregnancy is associated with?

1. Increased risk of preterm birth
2. Increased risk of pre-eclampsia
3. Increased risk of cesarean birth
4. Congenital birth defects
5. All of the above
Diabetes Mellitus

- Insulin = gold standard
- Oral hypoglycemic may be safe
- Glyburide has been used in recent study for the treatment of gestational diabetes
- Metformin (glucophage): Class B
  - Biguanide, inhibit glucose production, and enhance peripheral glucose uptake
  - Crosses the placenta
  - Used in polycystic ovarian syndrome (PCOS)

- Target glucose
  - Fasting < 95 mg/dl
  - 1h postprandial <135 mg/dl
  - 2h postprandial <120 mg/dl

Gestational Diabetes

- Carbohydrate intolerance diagnosed in pregnancy
  - Screen @ 24-28 wks, 50 gram 1 hr glucose; abnormal >135mg/dl
  - # hour 100 gram OGTT: any 2 abnormal values
  - OR
    - Fasting (200 mg/dl) or postprandial

- Treatment
  - 1st diet then insulin with same goals

- Significance
  - Increase C-section rate
  - Neonatal macrosomia (4000 grams)
  - Recurs in 2/3 of patients
  - Higher risk of carbohydrate intolerance later in life
Maternal Respiratory Function

- Tidal volume increases 48% causing hyperventilation
- \( PO_2 \) increases 104-108
- Progesterone effect
- \( pCO_2 \) decreases 27-32 mm Hg
- \( HCO_3 \) decreases 18-22 mEq/L

Asthma in Pregnancy (affects 4% of all pregnant women)

- Prevention
  - Reversible Disease
  - Avoidance of allergens, allergy control
  - Air filters, etc
- Medications
  - Inhaled beta-agonists, steroids, antibiotics, cromolyn, theophyline
  - Avoid prostaglandins and ergonovines (methergine, ergotrate, cytotec)
  - May need antibiotics
- Dehydration → IV fluids
- Pulmonary congestion and infection
- High risk of premature labor
Asthma Management

• No difference in treatment
  – Rule of thirds: 1/3 better, 1/3 worse, 1/3 same
  – No evidence that pregnancy has predictable effect
• Continue meds through delivery
• May need stress dose of steroids
  – Hydrocortisone 100 mg IV q8h
Question: All of the following increase in pregnancy except:

1. The size of the thyroid gland
2. TBG
3. TSH
4. Total T₃
5. Total T₄

Thyroid Physiology

- Altered thyroid function tests secondary to elevated estrogen in normal pregnancy
  - TSH No change
  - TBG Increased
  - Total T₄ Increased
  - Free T₄ No change
  - Total T₃ Increased
  - Free T₃ No change
  - Thyroid I¹³¹ uptake Increased
  - T₃RU Decreased
  - Thyroid size Increases 18%
Thyroid Disease in Pregnancy

• Maternal and fetal physiology
• Crosses the placenta
  – TSI
  – PTU in a small amount / methimazole in higher amounts
  – TRH
  – Iodine but the fetal thyroid cannot concentrate iodine until 10-12 weeks gestation
• Does not cross the placenta
  – TSH, T₄ and T₃ (in very small amounts only)

Hyperthyroidism

• Grave’s Disease
• Most common cause in pregnancy
• Autoimmune disease
• TSI / TSAb (antibodies) may be positive
• 95% have thyroid enlargement
• Typically worsens in the first trimester and improves in the second and third
• Risk of flair postpartum
Hyperthyroidism

• Thyrotoxicosis is uncommon in reproductive age women and occurs in 1:2,000 pregnancies

• Hyperemesis is a separate entity and confound the diagnosis of hyperthyroidism in the first trimester of pregnancy
  – Related to the structural similarities between TSH and HcG
  – Peaks at 10-12 weeks

• Toxic multinodular goiter
  – Usually in older population
  – Single toxic adenomas
    – Account for less than 10%
  – Destruction – induced / Hashimoto’s / viral
  – Rare in pregnancy
  – Antimicrosomal antibodies may be positive

Treatment of Thyrotoxicosis

• Goals
  – Symptomatic relief
  – Reduction of free T₄ to high normal

• Support
• Thioureas
• Beta blockade
• Hypertension control
• Iodide
Thioureas

- Thiourea compounds to block hormone production
  - PTU and methimazole
  - Side effects include allergy, rash, lupus-like reaction, and agranulocytosis

- Propylthiouracil (PTU)
  - Start at 300-450mg per day
  - May take 3-4 weeks to see change in lab values

- Methimazole
  - Risk of aplasia cutis?

Hypothyroidism

- Most common causes
  - Chronic lymphocytic (Hashimoto’s)
  - Thyroid ablation

- Treatment
  - Replacement therapy with monitoring of free $T_4$ (and TSH) in pregnancy
  - Monitor TSH every trimester and adjust
Maternal Complications of Untreated Thyroid Disease

- Hyperthyroidism
  - Pre-eclampsia
  - Maternal heart failure
  - Poor weight gain
  - Infection
  - Anemia

- Hypothyroidism
  - Pre-eclampsia
  - Placental abruption
  - Postpartum hemorrhage
  - Ventricular dysfunction
  - Anemia

Fetal Complications of Untreated Thyroid Disease

- Hyperthyroidism
  - Spontaneous abortion
  - Premature labor and delivery
  - Stillbirth
  - Low birth weight
  - Fetal / neonatal hyperthyroidism

- Hypothyroidism
  - Spontaneous abortion
  - Low birth weight
  - Fetal death?
  - Lower IQ?
Postpartum Subacute Thyroiditis

- Occurs in 1-5% of women postpartum
- 1 to 4 months postpartum
- Painless and autoimmune
- Differs from Hashimoto’s
- Can cause
  - Asymptomatic goiter and/or hyperthyroidism then hypothyroidism
- Hypothyroid phase usually ends by 9 months postpartum
FROM ACOG Practice Bulletin 37, 2010 with permission

Table 1. Changes in Thyroid Function Test Results in Normal Pregnancy and in Thyroid Disease

<table>
<thead>
<tr>
<th>Maternal Status</th>
<th>TSH</th>
<th>FT4</th>
<th>FTI</th>
<th>TT4</th>
<th>TT3</th>
<th>RT3U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>Increase</td>
<td>Increase</td>
<td>Decrease</td>
</tr>
<tr>
<td>Hyperthyroidism</td>
<td>Decrease</td>
<td>Increase</td>
<td>Increase</td>
<td>Increase</td>
<td>Increase or no change</td>
<td>Decrease</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>Increase</td>
<td>Decrease</td>
<td>Decrease</td>
<td>Decrease</td>
<td>Decrease or no change</td>
<td>Decrease</td>
</tr>
</tbody>
</table>

Abbreviations: TSH, thyroid stimulating hormone; FT4, free thyroxine; FTI, free thyroxine index; TT4, total thyroxine; TT3, total triiodothyronine; RT3U, total T3 uptake.

FROM ACOG Practice Bulletin 86, 2009 with permission

Table 1. Recommended Dosages and Schedules of Single-Antigen Hepatitis B Vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age Group</th>
<th>Dose</th>
<th>Volume</th>
<th>No. of Doses</th>
<th>Schedule*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engerix B</td>
<td>0-19 y</td>
<td>10 mcg</td>
<td>0.5 mL</td>
<td>3</td>
<td>Infants: birth; 1-4, 6-18 mo. Alternative for older children: 0, 1, 2, 4 mo.</td>
</tr>
<tr>
<td>(GSKSmithKline)</td>
<td>20 y and older</td>
<td>20 mcg</td>
<td>1.0 mL</td>
<td>3</td>
<td>0, 1, 6 mo.</td>
</tr>
<tr>
<td>Recombivax HB</td>
<td>0-19 y</td>
<td>5 mcg</td>
<td>0.5 mL</td>
<td>3</td>
<td>Infants: birth; 1-4, 6-18 mo. Alternative for older children: 0, 1, 2, 4 mo.</td>
</tr>
<tr>
<td>(Merck &amp; Co.)</td>
<td>11-15 y</td>
<td>10 mcg</td>
<td>1.0 mL</td>
<td>2</td>
<td>0, 4-6 mo.</td>
</tr>
<tr>
<td>20 y and older</td>
<td>10 mcg</td>
<td>1.0 mL</td>
<td>3</td>
<td>0, 1, 6 mo.</td>
<td></td>
</tr>
</tbody>
</table>

*The schedule for hepatitis B vaccination is flexible and varies. Consult the Advisory Committee on Immunization Practices (ACIP) statements on hepatitis B (2/2005 and 12/2006) at the package insert for details.

For adult doses, the Engerix B dose required is 40 mcg/2.0 mL (use the adult 20 mcg/mL formulation) on a schedule of 0, 1, 2, and 6 months.

1 For recombinant HB, a special formulation for delayed patients is available. The dose is 40 mcg/1.0 mL and it is given on a schedule of 0, 1, and 6 months.

FROM ACOG Practice Bulletin 86, 2009 with permission

Table 2. Interpretation of Hepatitis B Virus (HBV) Testing

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-HBc</td>
<td>Positive</td>
<td>Acutely infected or past infection</td>
</tr>
<tr>
<td>Anti-HBc</td>
<td>Negative</td>
<td>Not infected</td>
</tr>
<tr>
<td>Anti-HBs</td>
<td>Positive</td>
<td>Recovered from infection</td>
</tr>
<tr>
<td>Anti-HBs</td>
<td>Negative</td>
<td>Not infected</td>
</tr>
<tr>
<td>HBsAg</td>
<td>Positive</td>
<td>Acutely infected</td>
</tr>
<tr>
<td>HBsAg</td>
<td>Negative</td>
<td>Not infected</td>
</tr>
<tr>
<td>HBsAb</td>
<td>Positive</td>
<td>Recovered from infection</td>
</tr>
<tr>
<td>HBsAb</td>
<td>Negative</td>
<td>Not infected</td>
</tr>
<tr>
<td>HBV DNA</td>
<td>Positive</td>
<td>Active infection</td>
</tr>
<tr>
<td>HBV DNA</td>
<td>Negative</td>
<td>Not infected</td>
</tr>
<tr>
<td>HBeAg</td>
<td>Positive</td>
<td>Active infection</td>
</tr>
<tr>
<td>HBeAg</td>
<td>Negative</td>
<td>Not infected</td>
</tr>
<tr>
<td>HBeAb</td>
<td>Positive</td>
<td>Recovered from infection</td>
</tr>
<tr>
<td>HBeAb</td>
<td>Negative</td>
<td>Not infected</td>
</tr>
</tbody>
</table>

- HBsAg: Hepatitis B surface antigen
- Anti-HBc: Antibodies to Hepatitis B core antigen
- Anti-HBs: Antibodies to Hepatitis B surface antigen
- HBV DNA: Hepatitis B virus DNA
- HBeAg: Hepatitis B e antigen
- HBeAb: Antibodies to Hepatitis B e antigen

**Note:** HBV DNA > 100,000 copies/mL is considered an active infection. HBV DNA < 100 copies/mL is considered negative for active infection.

**Interpretation:**
- Acutely infected: HBsAg and Anti-HBs positive
- Recovered from infection: Anti-HBs positive
- Not infected: HBsAg and Anti-HBs negative
- Active infection: HBV DNA positive
- Test for HBV DNA or HBV RNA is recommended.

FROM ACOG Practice Bulletin 86, 2009 with permission

Table 3. Interpretation of Hepatitis C Virus (HCV) Test Results

<table>
<thead>
<tr>
<th>Anti-HCV Screening Test Result</th>
<th>ANTI-HCV Supplemental Test Result</th>
<th>HCV RNA</th>
<th>Anti-HCV Result</th>
<th>HCV Infection</th>
<th>Additional Testing or Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>Not needed</td>
<td>No</td>
<td>Negative</td>
<td>No</td>
<td>Supplemental anti-HCV screening</td>
</tr>
<tr>
<td>Positive</td>
<td>Not done</td>
<td>No</td>
<td>Not known</td>
<td>No</td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>Not done</td>
<td>No</td>
<td>Not known</td>
<td>No</td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>Not done</td>
<td>Positive</td>
<td>Detected 1st time</td>
<td>No</td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>Not done</td>
<td>Positive</td>
<td>Detected 2nd time</td>
<td>No</td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Detected 3rd time</td>
<td>No</td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Detected 4th time</td>
<td>No</td>
<td>Positive</td>
</tr>
</tbody>
</table>

**Note:**
- HCV RNA > 100,000 copies/mL is considered an active infection.
- HCV RNA < 100 copies/mL is considered negative for active infection.
- Anti-HCV: Antibodies to Hepatitis C virus
- HCV RNA: Hepatitis C virus RNA
- Test for HCV RNA or HCV RNA screening test is recommended.

**Interpretation:**
- Not infected: Anti-HCV negative
- Active infection: HCV RNA positive
- Additional testing: Anti-HCV positive and HCV RNA positive

**Additional Testing or Evaluation:**
- HCV RNA: Hepatitis C virus RNA
- Test for HCV RNA or HCV RNA screening test is recommended.

**Interpretation:**
- Not infected: Anti-HCV negative
- Active infection: HCV RNA positive
- Additional testing: Anti-HCV positive and HCV RNA positive

**Note:**
- HCV RNA > 100,000 copies/mL is considered an active infection.
- HCV RNA < 100 copies/mL is considered negative for active infection.
- Anti-HCV: Antibodies to Hepatitis C virus
- HCV RNA: Hepatitis C virus RNA
- Test for HCV RNA or HCV RNA screening test is recommended.

**Interpretation:**
- Not infected: Anti-HCV negative
- Active infection: HCV RNA positive
- Additional testing: Anti-HCV positive and HCV RNA positive

**Note:**
- HCV RNA > 100,000 copies/mL is considered an active infection.
- HCV RNA < 100 copies/mL is considered negative for active infection.
- Anti-HCV: Antibodies to Hepatitis C virus
- HCV RNA: Hepatitis C virus RNA
- Test for HCV RNA or HCV RNA screening test is recommended.

**Interpretation:**
- Not infected: Anti-HCV negative
- Active infection: HCV RNA positive
- Additional testing: Anti-HCV positive and HCV RNA positive

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Risk Factors Warranting Hepatitis C Screening: CDC Guidelines

Individuals who should be screened routinely:

1. Persons who ever injected illegal drugs (even once)
2. Persons notified that they received blood products before 1987 or from a donor who later tested positive for hepatitis C virus (HCV)
3. Recipients of transplants or organ transplants, particularly if received before July 1992
4. Persons on long-term hemodialysis
5. Persons with previously elevated alanine aminotransferase (ALT) or other evidence of liver disease
6. Persons seeking evaluation or care for a sexually transmitted infection, including human immunodeficiency virus

Individuals for whom routine testing is of uncertain need:

1. Recipients of tissue transplants (eg, cornea, skin, sperm, etc.)
2. Users of intranasal cocaine or other illegal noninjected drugs
3. Persons with a history of tattooing or body piercing
4. Persons with a history of sexually transmitted diseases or multiple sexual partners
5. Long-term steady sex partner of an HCV-infected individual