

APPENDIX A: ABSTRACTING MODULES BASED ON CAUSE OF DEATH

Introduction to Cause of Death Abstracting Modules

Abstractors are responsible for obtaining case information that is as complete as possible to help the review committee determine if gaps in assessment, care, or services existed. It is important for the abstractor to bring at least a minimum data set of case information to the review team. Without an understanding of the series of social and medical care events, it can be difficult for the review team to make valid recommendations for action to change systems of care. Medical records can be a few pages or thousands of pages long, often consisting of multiple provider encounters and multiple care locations. All of this can challenge the abstractor to find information that will be meaningful for the case review team.

The following abstraction modules are based on the common causes of maternal deaths and diseases in the United States. The modules represent a framework to guide abstraction for maternal mortality review committees. Each module was developed from a review of nursing and medical literature, national and international maternal mortality reports, CDC maternal mortality review data tools, national perinatal quality collaboratives, and maternal safety toolkits. Modules are structured in a framework consisting of: **definition and other common terms, timing and risk factors, signs and symptoms, treatments, labs and medications, and autopsy findings.**

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definition and other common terms, timing and risk factors, signs and symptoms, treatments, labs and medications, and autopsy findings.

The modules are intended to assist and guide the abstractor while abstracting medical records. It is beyond the scope of these modules to reference all descriptive information and treatments for each cause of death and disease. The modules are not intended to replace other reference sources the abstractor may be using. Over time, as each maternal mortality case review committee progresses, additional content information may be requested by the review team for specific cause of death scenarios. The abstractor can then personalize the modules as needed. Additionally, as knowledge of disease processes and care treatments evolve, additional content information can be added to update the modules to incorporate new standards of care.

Cause of Death Modules

- | | |
|-----------------------------|-----------------------------|
| 1. Amniotic Fluid Embolism | 7. Homicide |
| 2. Anesthesia Complication | 8. Hypertensive Disorders |
| 3. Cardiomyopathy | 9. Infection |
| 4. Cardiovascular Deaths | 10. Motor Vehicle Accidents |
| 5. Cerebrovascular Accident | 11. Overdose |
| 6. Hemorrhage | 12. Suicide |
| | 13. Thrombotic Embolism |

Additionally, four abstracting modules were developed for *chronic diseases* that the abstractor may encounter.

Chronic Disease Modules

1. Diabetes: Type I and II, and Gestational
2. Seizures
3. Sickle Cell Disease
4. Systemic Lupus Erythematosus

Module Template Category Definitions

Cause of Death/Chronic Disease:

- • **Cause of death:** identification of the assigned determination of why the mother died
- • **Chronic disease:** persistent, long-lasting illness

Other Names:

- • Identification of similar diagnoses that may be noted

Timing/Risk Factors/Associated Characteristics:

- • **Timing:** identification of four periods of health status for women of reproductive age
 - **Medical History:** personal and or family conditions that can influence health status
 - **Prenatal:** from conception to labor (antepartum)
 - **Labor and Delivery:** onset of uterine contractions, ends with delivery placenta (intrapartum)
 - **Postpartum:** period after delivery up to one year
- • **Risk Factors:** identification of associated conditions that may increase potential for poor outcome
- • **Associated Characteristics:** incidence may vary by age, race, ethnicity or marital status

Signs and Symptoms:

- • The observed and reported descriptions of a person's response to an illness

Treatment/Labs/Medication:

- • **Treatment:** identification of psychological, surgical, or medical management
- • **Labs:** identification of fluid or tissue that is obtained for clinical studies
- • **Medications:** identification of commonly used drugs

Condition:

- • Described state of health

Autopsy:

- • Description of examination and pathology of postmortem organs and tissues; often includes tests to look for the presence and concentration of drugs that may have contributed to the death

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AMNIOTIC FLUID EMBOLISM

DEFINITION

A tear in placental membranes in which amniotic fluid passes into maternal circulation. The amniotic fluid contains fetal cells, meconium, lanugo, and vernix which may produce cerebral or pulmonary emboli when entering maternal circulation. Amniotic fluid embolism may occur during any gestational period but most often occurs during induction, labor, delivery, or the immediate postpartum period. It causes an acute cascade of respiratory and cardiac arrest.

Other name: anaphylactoid syndrome of pregnancy

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Prenatal: amnioinfusion, amniocentesis, cerclage removal, placenta previa, preeclampsia, abortion, blunt abdominal trauma, induction of labor, intrauterine pressure catheter

Labor and Delivery: induction with prostins, forceps, vacuum, cesarean section, precipitous labor, meconium stained fluid, manual removal of placenta

Postpartum: clinical onset during labor or within 30 minutes of delivery of the placenta.

Associated Characteristics: African Americans may have a higher incidence; women of advanced maternal age may have a higher incidence

SIGNS / SYMPTOMS

Sudden shortness of breath, cyanosis, increased heart rate, hemorrhage, decreased BP, hypoxia, sudden cardiovascular collapse, altered mental status, seizures in absence of other causes, DIC, restlessness, feeling of panic, feeling cold, pulmonary edema, sudden cardiovascular and respiratory collapse with coagulopathy, endotracheal tube (ETT) suddenly filled with massive amounts of fluid, nausea, vomiting

TREATMENTS / LABS / MEDICATIONS

Treatments: respiratory support: oxygen, face mask, bag and mask, intubation; fluid resuscitation, intravenous fluids, blood products, cardiopulmonary resuscitation, electrocardiogram (EKG), massive transfusion protocol, chest x-ray (CXR), ventilation/perfusion (V/Q) scan, computed tomography (CT) scans, emergency delivery/perimortem cesarean section

Labs: arterial blood gases, coagulation studies, complete blood count (CBC)

Medications: advanced cardiac life support (ACLS) medications

AUTOPSY

Prompt perimortem autopsy important in sudden and unexpected collapse. Diagnosis of amniotic fluid embolism (AFE) is often one of exclusion, no definite test for AFE. On postpartum autopsy – lungs congested, airless with petechial hemorrhages on pleural surfaces; fetal cells and debris may be found in pulmonary vasculature. Look for documentation of lanugo hair squames or mucins in autopsy report. However, their absence does not rule out the diagnosis.

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ANESTHESIA COMPLICATIONS

DEFINITION

Arrest in close proximity to administration of anesthetic. Types: local, epidural, spinal and general, patient-controlled analgesia, and nitrous oxide. Patient is considered to be under anesthesia care until she is fully conscious and her vital signs are stable.

Other names: anesthesia toxicity, aspiration, drug reaction/anaphylaxis, esophageal intubation, failed tracheal intubation, high spinal/epidural, multiple attempts intubation, respiratory failure during anesthesia

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: obesity, small larynx, comorbidities (asthma, heart, liver diseases), family or personal hyperthermia reaction to anesthesia

Prenatal: preeclampsia, hemorrhage

Labor and Delivery: emergency cesarean section with recent oral intake puts mother at risk for aspiration with intubation, cardio-pulmonary arrest after anesthetic administration, general anesthesia, full stomach at delivery, ill pregnant woman, acute anaphylaxis, hemorrhaging, topping off epidural analgesia, maternal hyperthermia

Postpartum: opiate toxicity, hemorrhage, preeclampsia/eclampsia, postoperative respiratory failure, bronchospasm on extubation, spinal headache

Risk Factors: drug use, obesity, recent food/water intake

Associated Characteristics: refusal of blood transfusion; women of advanced maternal age may have a higher incidence

SIGNS / SYMPTOMS

Hypotension, decreased breathing after spinal placed, tachycardia, bradycardia, acidosis, hypoxia, hypoxia after intubation, negative CO₂ color, changes in skin color, mental status changes, cardiac arrest, breathing difficulties after anesthetic administration or removal anesthetic, agitation, nausea vomiting, loss of consciousness

TREATMENTS / LABS / MEDICATIONS

Treatments: cricothyrotomy, respiratory support including intubation and ventilation, arterial line, bronchoscopy, chest x-ray (CXR) for tube placement, blood products

Labs: arterial blood gases, lactate, intraoperative laboratory measurements,

Medications: vasopressors, opiates, anesthetic drugs, advanced cardiac life support (ACLS) medications, Fentanyl, bronchodilators, Lipid rescue, Narcan to reverse sedation

AUTOPSY

Gastric contents in lungs, description placement of ETT and CVL, toxicology reports. Pathology lungs, heart, brain.

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CARDIOMYOPATHY

DEFINITION

Peripartum dilated cardiomyopathy: onset cardiac failure beginning last month of pregnancy up to five months postpartum. Diagnosed after exclusion of other forms of cardiomyopathy, heart failure. Left ventricular dysfunction on echocardiogram.

Other names: myocarditis, sudden cardiac death

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: obesity, poor nutrition, immune disorders, alcoholism, multiple pregnancies, spitting blood, sleep apnea, diabetes, family history of hypertrophic cardiomyopathy

Prenatal: obesity, preeclampsia, hypertension

Labor and Delivery: obesity, preeclampsia

Postpartum: obesity, preeclampsia, hypertension, prolonged swelling after delivery

Risk Factors: obesity, poor nutrition, tobacco use, alcoholism, women of advanced maternal age may have higher incidence

Associated Characteristics: African American, Haitian

SIGNS / SYMPTOMS

Shortness of breath with activity, limitations with physical activity, shortness of breath when lying flat, cough, respiratory/flu-like symptoms, fatigue, swollen neck veins, swelling extremities, palpitations, fluid in the lungs, atrial fibrillation, echocardiogram ejection fraction less than 50%, pleural effusions, cardiomegaly, pulmonary venous congestion, arrhythmia, cardiac arrest, sudden cardiac death

TREATMENTS / LABS / MEDICATIONS

Treatments: chest x-ray (CXR), electrocardiogram (EKG), echocardiogram (ECHO), referral cardiologist, respiratory support, referral to consultants: maternal fetal medicine, cardiology, anesthesiologist, transfer to higher level of care within facility or to outside facility, low salt diet, automated external defibrillator (AED)/pacemaker placement, preconception counseling, access to family planning services, community referral for medications, intake and output, evaluation for heart transplant, education on risks of future pregnancies, early follow-up postpartum appointment for history cardiac symptoms, documentation education to seek care for symptoms

Labs: cardiac enzymes, arterial blood gases, lactic acid

Medications: ACE inhibitors (prior to pregnancy), beta blockers, diuretics, anticoagulants, Digoxin

AUTOPSY

Enlarged heart, dilated cardiomyopathy, fibrosis, myocytes, referral to cardiac pathologist

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CARDIOVASCULAR DEATHS

DEFINITION

The abrupt loss of heart function caused by a malfunction in the heart's electrical system or due to acute thrombosis. Normal changes in pregnancy include increased plasma volume, depressed fibrinolytic activity, and slight cardiomegaly that put women at risk.

Other names: Arrhythmic death, cardiac arrest, cardiac failure, cardiomegaly, coronary ischemic heart disease, dissection of coronary arteries, infarction, ischemic heart disease, myocardial fibrosis, myocardial infarction, myocarditis, mitral prolapse, mitral stenosis, pulmonary hypertension, sudden adult death syndrome (SADS), sudden unexpected cardiac death, valvular disease

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: diabetes, obesity, cardiomegaly, chronic kidney disease, seizures, high cholesterol, asthma, Marfan syndrome, connective tissue disorders, hypertension, congenital heart disease, pulmonary hypertension, rheumatic heart disease, mitral valve prolapse, family history heart disease, thrombophilia, previous pregnancy history of gestational diabetes, preeclampsia, or pregnancy-induced hypertension

Prenatal: obesity, preeclampsia, gestational diabetes, poor prenatal care, known cardiac disease, drug and alcohol abuse

Labor and Delivery: amniotic fluid embolism, bleeding, sepsis, emergency cesarean section, fluid overload

Postpartum: obesity, infection, hypertension signs and symptoms

Risk Factors: obesity, cocaine use, IV drug use, tobacco use, women of advanced maternal age may have higher incidence

SIGNS / SYMPTOMS

Severe chest pain, jaw or back pain, radiating chest pain, agitation, nausea, vomiting, tachypnea, tachycardia, acidosis, syncope, shortness of breath, bleeding, heart failure, epigastric pain, respiratory symptoms, wheezing, murmur, palpitations crackles in lower lobes, cyanosis, low oxygen saturation, pulmonary edema, enlarged heart, hypertension, chest x-ray with edema/congestion, generalized edema in face, fingers, feet, legs

PROCEDURES / LABS / MEDICATIONS

Treatments: echocardiogram (ECHO), electrocardiogram (EKG), computed tomography (CT) pulmonary angiogram, chest x-ray (CXR), coronary angiography, transesophageal echocardiogram (TEE), referral to cardiologist, CPR (bystander or in hospital): note timing initiation chest compressions, external defibrillation, positioning change to left side, emergency cesarean section (document timing), automated external defibrillator (AED), initiation rapid response, transfer to higher level of care (within facility or to an outside facility)

Labs: cardiac enzymes (serial) Troponin levels, CPK, CPK-MB, increased serum lactase, arterial blood gas, electrolytes

Medications: vasopressors, diuretics, hypertensive medications, cardiac medications

AUTOPSY

Cardiac size description and weight in grams, presence interstitial fibrosis, documentation cardiac arteries, ventricle thickness, pathology of cardiac muscles, renal pathology, lung pathology, description aortic valves, vegetation on mitral valve, presence hypertrophy, dissection of arteries, coronary occlusion, aneurysm. Also, check for toxicology.

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CEREBROVASCULAR ACCIDENT

DEFINITION

Loss of neurological function caused by sudden loss of blood flow to brain.

Other names: Arteriovenous malformation (A-V malformation), cerebral artery thrombosis, cerebral infarction, cerebral venous sinus thrombosis, hemorrhagic stroke, hypertensive encephalopathy, intracerebral hemorrhage, intracranial hemorrhage, subarachnoid hemorrhage, ruptured aneurysms

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: atrial fibrillation, alcoholism, hypertension, diabetes, history of a close relative with stroke, obesity, hormonal contraception, migraines, anticoagulants, cardiac dysrhythmias, previous stroke, arteriovenous malformation (A-V malformation)

Prenatal: hypercoagulable state of pregnancy, sudden death first trimester, dehydration, hypertension

Labor and Delivery: stress of labor, postdates

Postpartum: immobility, obesity, hypertension

Risk Factors: tobacco use, alcoholism, obesity

SIGNS / SYMPTOMS

Sudden weakness or numbness in face and extremities, loss of vision, difficulty speaking, sudden severe headache, dizziness, changes in neurological status, unreactive pupils, tachycardia, tachypnea, nausea, vomiting, acute hypertension, seizure activity, hemiparesis, eye pain with blurred visions

TREATMENTS / LABS / MEDICATIONS

Treatments: stroke evaluation, airway and ventilatory support, magnetic resonance imaging (MRI), computed tomography (CT) scan, arteriography, consults neurology, neurosurgery, transfer within facility or outside to higher level of care, surgery to evacuate bleeding, Burr holes, external ventriculostomy drains, palliative care, electrocardiogram (EKG), echocardiogram (ECHO), blood products: packed red blood cells, fresh frozen plasma (FFP), cryoprecipitate, intake and output

Labs: urine and serum toxicology, complete blood count (CBC), electrolytes, coagulation studies, liver enzymes

Medications: recombinant tissue plasminogen activator (tPA), Labetalol and other antihypertensive to gradually decrease BP, Mannitol, DDAVP, anticonvulsant drugs

AUTOPSY

Disruption brain pathology, toxicology

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HEMORRHAGE

DEFINITION

Episode of bleeding that compromises tissue or organ perfusion. Defined as over 500ml of blood loss for vaginal delivery or 1000 ml for cesarean section, or over 500 ml of blood loss in first 24 hours after delivery. Transfusion of four or more units of red blood cells.

Other names: Disseminated intravascular coagulation (DIC), hemorrhage shock, hypovolemic shock

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: blood coagulation disorders, previous uterine incision, previous cesarean section, prior uterine surgery, multiple gestation, greater than four vaginal births, hypertension, history of previous postpartum hemorrhage, uterine fibroids

Prenatal: spontaneous or induced abortion, placenta previa, accreta, percreta, ectopic or ruptured ectopic pregnancy, abruptio placentae, abdominal trauma, large uterine fibroids, polyhydramnios, macrosomia

Labor and Delivery: induction or augmentation of labor, prolonged or precipitous labor, uterine overstimulation, lacerations genital tract, morbidly adherent placenta, morbid obesity, uterine inversion

Postpartum: retained placenta fragments, retained products of conception (POC), retroperitoneal hematoma, infection

Associated Characteristics: refusal of blood transfusion

SIGNS / SYMPTOMS

Abdominal pain, abdominal tenderness, one-sided abdominal pain, diarrhea, vomiting, shortness of breath, boggy uterus, bleeding from surgical or puncture sites, spitting blood, descriptions of vaginal bleeding include trickle, gush, clots, oliguria, displaced uterus after bladder emptied, changes in vital signs: hypoxia saturation less than 95%, sustained tachycardia, fainting

TREATMENTS / LABS / MEDICATIONS

Treatments: documentation counseled patient on hemorrhage risks and use blood products in emergency, consent refusal for blood products, documentation consent to alternatives; documentation hemorrhage risk assessments done prenatal, L&D admission and prior to delivery and postpartum, ultrasound and/or MRI documentation of placental site, documentation of cesarean section incision, hemostasis in cesarean section operative (OR) report, massive transfusion protocol (MTP), fundal massage, activation rapid response system, documentation quantification blood loss, escalation of care, uterine artery ligation, embolization, interventional radiology, cell saver, consultants: such as obstetric (OB) oncology, interventional radiologist (IR), trauma surgeon, anesthesia, vascular surgeon, hematology, Bakri balloon, B-lynch suture, increased documentation of frequency of vital signs, respiratory support including intubation, x2 large bore intravenous catheters prior to surgery, exploratory laparotomy, hysterectomy, readiness and use, blood products packed red blood cells, fresh frozen plasma (FFP), platelets, cryoprecipitate

Labs: beta hCG (quantitative and serial serum qualitative), type and screen/cross for blood products, complete blood count (CBC), prothrombin time (PT), partial thromboplastin time (PTT), d-dimer, fibrinogen, blood type, antibody screen, arterial blood gases

Medications: Oxytocin, Cytotec, Misoprostol, Methergine, Hemabate, Prostins, vasopressors, advanced cardiac life support (ACLS) medications

AUTOPSY

Pale organs, abdominal trauma, bruising, blood in abdominal cavities, cervical tears, source of bleeding, rupture of fallopian tubes, placenta pathology; exclusion of diagnosis pulmonary or amniotic embolus

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HOMICIDE

DEFINITION

Any killing of one human being by another.

Homicides are a leading cause of pregnancy-associated deaths. Homicide victims represent all socioeconomic and demographic backgrounds but are more prevalent among women who are <25 years of age, African American, unmarried, uninsured, and/or have completed less than 12 years of education; Two out of three pregnancy-associated homicides are perpetrated by a current or former intimate partner;

Intimate Partner Violence (IPV) is a pattern of assaultive and coercive behaviors perpetrated by someone who is, was or wishes to be involved in an intimate or dating relationship. The aim of these behaviors is to establish and maintain control by one partner over the other. Abuse may be physical, emotional, and/or sexual.

Pregnant and postpartum women who experience IPV are at increased risk for homicide. Abuse to a pregnant woman may happen for first time during pregnancy..

TIMING/RISK FACTORS

Medical History: history of IPV; Past obstetric history may include teen pregnancy, therapeutic abortion, pregnancy loss, low birthweight and preterm birth, reproductive coercion, tobacco, drug or alcohol use, history of soft tissue injuries, lacerations, fractures, sexually transmitted infections (STI's), recurrent urinary tract infections (UTIs), depression, anxiety, post-traumatic stress disorder (PTSD), homelessness.

Prenatal: See Symptoms section; history of IPV or assault related trauma: overuse of health services, especially emergency room visits, intimate partner always accompanies patient- speaking for her and hovering during health visit, use of restraining orders, criminal record/incarceration of partner; partner not supportive of pregnancy, breakup of relationship with father of baby; stressful life events, new onset of IPV or increased severity from before pregnancy; delayed or no prenatal care, missed appointments, homelessness;

Labor & Delivery: NA

Postpartum: See Symptoms and Prenatal sections; low birthweight infant; new onset of IPV or increased IPV from before or during pregnancy; homelessness

SYMPTOMS

Signs of IPV may include: unexplained trauma/injuries such as injuries to eyes, nose, jaw, teeth, pelvis, abdomen, breasts; bruises, fractures, lacerations; co-morbid conditions include: tobacco, alcohol and substance use, mental health problems such as depression, anxiety, post-traumatic stress disorder

(PTSD), and medical disorders such as headaches, hypertension, asthma, chronic pain syndromes, hearing loss, fibromyalgia, irritable bowel syndrome, pelvic pain, recurrent UTIs, STIs, HIV; unintended pregnancy, poor pregnancy outcomes such as low birthweight infant and preterm birth.

TREATMENTS/LABS/MEDICATIONS

Treatments: Document IPV counseling and screenings, referral for IPV program services, mental health and substance use screenings, counseling, and treatment;

Medications: treatment for co-morbid conditions

Labs: toxicology - alcohol and/or drug use in decedent and perpetrator

AUTOPSY

Autopsy reveals method of death (gunshot, blunt/sharp force, strangulation); Police report and investigator scene investigation at site of death are usually included in the medical examiner record. These reports include circumstances at scene of homicide and may also involve interviews with witnesses and family/friends of decedent. Also look for previous scars and injuries on autopsy.

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HYPERTENSIVE DISORDERS

DEFINITION

A condition in which the blood pressure (BP) is noted greater than 140 mm Hg systolic or 90 mm Hg diastolic on three separate readings several weeks apart. Diagnosis of hypertensive disorders in pregnancy may be done based on readings hours apart in a previously normotensive woman.

Present in 50% of all pregnancies and is a major cause of maternal mortality and morbidity globally.

Systolic BP > 160 mm Hg systolic or 110 mm Hg diastolic is a medical emergency and requires urgent effective treatment.

Classification HTN in Pregnancy

- • **Chronic Hypertension:** Documentation BP \geq 140 mm Hg systolic and/or 90 mm Hg diastolic prior to 20 weeks' gestation. Use of medication for hypertension prior to pregnancy
- • **Superimposed Preeclampsia:** New onset hypertension prior to 20 weeks, may include sudden increase proteinuria, BP, HELLP syndrome, headache, epigastric pain, scotomata
- • **Gestational Hypertension:** BP \geq 140 mm Hg systolic or \geq 90 mmHg without proteinuria presenting after 20 weeks in pregnancy
- • **Preeclampsia:** BP \geq 140 mm Hg systolic or \geq 90 mm Hg after 20 weeks' pregnancy with proteinuria 300 mg or higher of protein in 24-hour urine or \geq +1 per dipstick
- • **Eclampsia:** New onset grand mal seizures in a pregnant woman with gestational hypertension or preeclampsia
- • **Severe Preeclampsia:** One or more of the following criteria in presence of preeclampsia
 1. BP \geq 160 mm HG systolic or 110 mm HG diastolic
 2. Less than 500 ml urine in 24 hours
 3. Visual and cerebral complaints
 4. Elevated liver functions (2 times normal values)
 5. Renal insufficiency (Creatinine more than 1.1mg/dL)
 6. Pulmonary edema/respiratory distress
 7. Low platelets less than 100,000
- • **HELLP syndrome:** Hemolysis, elevated liver enzymes, low platelets, occurs in 20% woman with severe preeclampsia that involves the liver
- • **Hypertensive Emergency:** Can occur in prenatal or postpartum period. defined as an acute-onset, severe systolic hypertension \geq 160 mm hg, and/or severe diastolic hypertension \geq 110 mm hg or both, persistent for 15 minutes or longer
- • **Atypical Preeclampsia:** Occurs at < 20 weeks' gestation or more than 48 hours after delivery. Diagnosis by occurrence severe preeclampsia criteria without proteinuria or elevated BP
- • **Late Postpartum Eclampsia:** > 48 after delivery up to four weeks' postpartum. For 63% of affected pregnancies there was no documentation of a previous hypertensive diagnosis. The most common presenting symptom is headache

Other common names: adult respiratory distress syndrome, cardiac failure, cerebral edema, cerebral hemorrhage, cerebral infarction, encephalopathy, hemorrhage/disseminated intravascular coagulation (DIC), hemorrhagic stroke, hepatic failure infarction, hypertensive encephalopathy, intracranial hemorrhage, mild preeclampsia, multiorgan failure, placental abruption, pregnancy induced hypertension, preexisting essential hypertension, stroke, subcapsular hemorrhage, subcapsular hematoma, thrombotic stroke

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: hypertension on/not on medication, previous cerebral vascular accident, preexisting diabetes, obesity, renal disease, previous history of preeclampsia, sleep apnea, renal artery stenosis, obesity, documentation of hypertension 12 weeks postpartum after last pregnancy, systemic lupus erythematosus, family history of hypertension

Prenatal: inadequate prenatal care, delay in diagnosis, acute fatty liver of pregnancy, abruptio placentae, stroke, HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome, oligohydramnios, intrauterine fetal growth restriction (IUGR), weight gain of more than five pounds in a week, hypertension after 20 weeks' gestation, severe IUGR with non-reassuring fetal monitoring, proteinuria, subcapsular hepatic hematoma, decreased fetal movement

Labor and Delivery: non-reassuring fetal heart tones, pulmonary edema, abruption, mode of delivery determined by condition cervix, fetus gestational age, fetal presentation, hemorrhage, DIC, BP stabilization prior to delivery or intubation, multiorgan failure

Postpartum: headache, blurred vision, fluid retention, shortness of breath

Risk Factors: obesity, cocaine use, methamphetamine use, teens and women of advanced maternal age may have higher incidence

Associated Characteristics: African American

SIGNS / SYMPTOMS

Persistent BP > 160 mm Hg systolic and or > 110 mm Hg diastolic BPs, headache, epigastric pain, nausea, vomiting, complaints visual disturbances such as spots or blurry vision, generalized edema, change in level of consciousness, hyperreflexia of deep tendon reflexes, shortness of breath, saturation less than 95%, pulmonary edema, rales, rhonchi wheezing, decreased urine output < 30 ml/hour or < 500 cc in 24 hours, complaints of chest pain, bleeding, tonic clonic seizure, complaints “I just don’t feel right,” liver capsule distention, cardiomegaly

TREATMENTS / LABS / MEDICATIONS

Treatments: monitoring fluid intake and output, fetal surveillance: NST (non-stress test), BPP (biophysical profile NST and fetal movement, tone, breathing and heart rate, amniotic fluid volume and assessment fetal growth), arterial line placement, seizure precautions, radiologic imaging such as computed tomography (CT) scans or computed tomography (CT) angiogram, MRI for encephalopathy, chest x-ray (CXR), airway support and management, monitoring for pulmonary edema, blood product transfusion, transfer to higher level of care within or outside facility, consultants: anesthesiologist, critical care subspecialists, maternal fetal medicine neurology, neonatology, cardiology, hematology, neurology, home BP monitoring, increase in surveillance visits, ongoing assessment at antepartum unit, hospitalized for fetal surveillance, plan for early delivery, note documentation BP at discharge, antihypertensive prescriptions, discharge education warning signs to include shortness of breath and head ache, blurred vision, community resources for follow-up or assistance with medications, access to medications, referral to OB in ER, early postpartum follow up 3-7 days if medications used during labor, 7-14 with no medication

Labs: liver enzymes may be elevated due to liver injury (look for ALT, AST, uric acid, bilirubin levels); serum creatinine, abnormal peripheral hemolysis, magnesium levels, proteinuria >+ 300 mg protein in 24-hour urine, dipstick 1+, serum amylase, lipase, ammonia, abnormal coagulopathy, elevated PT/PTT, placenta pathology, low platelets

Medications: antihypertensives: Include date/time does and vital sign response. Aggressive treatment BP important. Look for documentation of antihypertensive medications within 60 minutes of persistent BP > 160 mm Hg systolic and /or > /110 mm Hg diastolic. Oral Nifedipine is often given first if no IV access. Other medications: IV Labetalol, Hydralazine, Esmolol, Propofol, magnesium sulfate for seizure precautions, Benzodiazepines or Dilantin for seizures. Medications: low dose aspirin prenatally, corticosteroids for fetal lung maturation before 33 6/7 weeks

AUTOPSY

Look at cerebral pathology, intracerebral hemorrhage, encephalopathy. Also, pathology uterus, placenta, liver, lungs, and kidneys.

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INFECTIONS

DEFINITION

Caused when microorganisms invade body tissues. The altered immune state of pregnancy can make women more susceptible to infection, and infections may also take a more severe course. Documentation of an infection may be noted as *community- or hospital-acquired*; take note of this as it can impact the review committee's recommendations.

Other names: AIDS, bacteremia sepsis, community acquired sepsis, Group A streptococcal sepsis, H1N1, HIV, influenza, meningitis, multiorgan failure, pneumococcus, pneumonia, postpartum pelvic infection, puerperal sepsis, necrotizing fasciitis, septic abortion, septic shock, sepsis, Toxic Shock Syndrome

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: termination of pregnancy, miscarriage, sickle cell disease, obesity, BMI > 30, HIV, immunodeficiency states, history IV drug use, asthma, bronchitis, diabetes

Prenatal: respiratory illness with negative/positive flu swabs, urinary tract infections, prolonged rupture of membranes, positive Group B Streptococcus, late or no prenatal care, preterm birth, flu-like illness, genital tract infection at time of rupture of membranes, gestational age of occurrence, positive HIV

Labor and Delivery: traumatic vaginal delivery, retrovaginal fistula, cesarean section, chorioamnionitis, peritonitis, preterm delivery, fetal tachycardia

Postpartum: cesarean section wound infection, uterine infection, abnormal vaginal odorous discharge, necrotizing mastitis, heart valve endocarditis

Risk Factors: obesity, cocaine use, methamphetamine use. Teens and women of advanced maternal age may have higher incidence

Associated Characteristics: African American

SIGNS / SYMPTOMS

Pelvic pain, fever, malaise, abnormal vaginal discharge, abnormal odor in vaginal discharge, severe abdominal pain, enlarged uterus, cough, low temperature, shortness of breath, tachycardia, inflamed genital area, persistent vaginal bleeding, drainage incision, sore throat, low platelets, mastitis, shock, renal failure, adult respiratory distress syndrome, disseminated intravascular coagulation (DIC), multiorgan failure, body aches, chills, syncope, pulmonary edema/congestion, pleural effusions

TREATMENTS / LABS / MEDICATIONS

Treatments: chest x-ray (CXR), purified protein derivative (PPD), flu shot, intravenous fluid bolus, bronchoscopy, fetal surveillance, oxygen and respiratory support, ultrasounds, referral to multiple consultants, infectious disease, higher level of care (within facility and/or to an outside facility).

Labs: sepsis screen, complete blood count (CBC), C-reactive protein (CRP), blood cultures, lactate, throat culture, placental cultures, cervical cultures, vaginal cultures, arterial blood gases, HIV, viral load, rapid OIA for flu, RT-PCR, lactic acid, liver function, fluorescent antibody screen. Cultures may be positive for *E. Coli*, *Enterobacter aerogenes*, *Proteus vulgargis*, Hemolytic *Streptococci*, *Staphylococci*, *Clostridium Perfringens*.

Medications: antibiotics, antifungals, antivirals, immunoglobins (Note: look for time first antibiotic/antiviral given)

AUTOPSY

Check for identification of organisms or source of infection. Bacterial cultures of uterus, blood, lung, meninges, and spleen. Documentation of disseminating necrotizing fasciitis, chorioamnionitis, funisitis in placenta/cord, local inflammation, peritonitis, endomyometritis, retained products of conception.

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MOTOR VEHICLE ACCIDENTS

DEFINITION

Death as passenger, driver, or pedestrian.

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: substance use disorder

Prenatal: improper use of or failure to use seat belt, tachycardia, fetal demise, placental abruption

Labor and Delivery: n/a

Postpartum: failure to use seat belt, substance use

Risk Factor: substance use

SIGNS / SYMPTOMS

Maternal injuries from trauma, hypoxia, signs of shock, hemorrhage, documentation of misuse of seat belt, presence or absence of seat belt use, fetal tachycardia, abruption

TREATMENTS / LABS / MEDICATIONS

Treatments: documentation education on proper seat belt use in pregnancy, multidisciplinary trauma management, fetal surveillance and monitoring, perimortem cesarean section, resuscitation, blood products, ventilatory support, chest x-ray (CXR), computed tomography (CT) scans, blood products

Labs: complete blood count (CBC), arterial blood gas (ABG), toxicology

Medications: ACLS, vasopressors

AUTOPSY

Description trauma, investigation included use/non-use of seat belt, domestic issues, and/or toxicology studies.

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OVERDOSE

DEFINITION

Intentional or unintentional ingestion of potentially toxic amounts of a substance or medication.

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: anxiety, depression, psychiatric hospitalizations or treatment, prior suicide attempt, family history of suicide or suicide attempt, substance use disorder, termination of pregnancy, referral to child protection, unwanted pregnancy, chronic pain

Prenatal: late entry to care, missed appointments, substance use in pregnancy, documentation of depression and anxiety symptoms, Edinburgh Postnatal Depression screening positive, inadequate support systems, sudden onset of symptoms during the last few weeks of pregnancy, statements of inadequacy, adjustments to grief/loss, delusional beliefs about her health, reduction of prescribed medication during pregnancy, domestic violence, financial difficulties, interpersonal conflict, stillbirth, miscarriage, frequent visits emergency room with complaints pain (migraines, abdominal pain, back pain) with negative work up, requests for prescription pain meds, chronic pain

Labor and Delivery: pain control management difficulties in labor and immediate postpartum

Postpartum: inadequate support systems, depression, woman with previous mental health issues, substance use, admission for psychiatric services after delivery, stressful life events, suicidal ideation, birth trauma, mental health care, separation from newborn

Risk Factor: substance use

Associated Characteristics: single, Caucasian, teens may have higher incidence

SIGNS / SYMPTOMS

Anxiety, erratic behavior, lethargy, agitation, unexplained physical illnesses, depression, behavioral disturbances, changes in sleep or appetite, drug use, hypoxia, complaints pain despite pain medication in absence of other factors

TREATMENTS / LABS / MEDICATIONS

Treatments: substance use assessment, referral for treatment, referral pain management, referral for behavioral risk health assessment, referral social services, psychiatric care, community resources, screening perinatal depression, assessment family support systems, inpatient hospitalization

Labs: toxicology, electrolytes, complete blood count (CBC), arterial blood gas (ABG), lactic acetate, urinalysis

Medications: antidepressants, antipsychotics, antianxiety, mood stabilizers, anti-epilepsy, stimulants/ADHD, medications to sleep, Narcan, street drugs

AUTOPSY

Diagnosis of overdose made by autopsy includes circumstances surrounding event and methodology. Descriptions needle marks, tracks. Coroner, medical examiner history may include family/friends interview statements. Toxicology identifies substance misuse.

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SUICIDE

DEFINITION

Death by own hands, often violent in nature. Causing one's own death intentionally. Suicide risk is not equated with socioeconomic status. Pregnancy not considered protective for suicide.

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: anxiety, depression, bipolar, schizophrenia, psychiatric hospitalizations or treatment, prior suicide attempt, substance use disorder, obsessive compulsive disorder, termination of pregnancy, family history of bipolar disorder, depression or psychosis after childbirth, referral to child protection services, unwanted pregnancy, intimate partner violence

Prenatal: depression, anxiety symptoms, documented depression on Edinburg Depression screening, inadequate support systems, sudden onset mental health symptoms last few weeks of pregnancy, statements of inadequacy, grief/loss, delusional beliefs about health, substance use, reduction or stopping prescribed antidepressants or mental health medications during pregnancy, intimate partner violence, suicidal ideation

Labor and Delivery: n/a

Postpartum: inadequate support systems, depression six weeks following delivery, woman with previous mental health episodes, substance use, admission for psychiatric services after delivery, delay of prescribed medications, stressful life events, suicidal ideation, birth trauma

Risk Factor: substance use

Associated Characteristics: single, American Indian, Caucasian, teens may have higher incidence

SIGNS / SYMPTOMS

Anxiety, lethargy, agitation, unexplained physical illnesses, depression, behavioral disturbances, changes in sleep or appetite, substance use

TREATMENTS / LABS / MEDICATIONS

Treatments: referral for behavioral risk health assessment and community referral resources, social services psychiatric care, screening perinatal and postpartum depression, assessment family support systems, hospitalization

Labs: toxicology

Medications: antidepressants, antipsychotics, antianxiety, mood stabilizers, anti-epilepsy, stimulants/ADHD, medications to sleep, opiates

AUTOPSY

Diagnosis suicide made by autopsy. Coroner, medical examiner history may include family/friends interview statements, suicide letter may have been written. Toxicology identifies substance misuse. Circumstances surrounding event, mechanism.

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THROMBOTIC EMBOLISM

DEFINITION

Sudden obstruction of a blood vessel by debris. Deaths may be described as a collapse.

There is an increased risk of thrombosis in pregnancy due to a hypercoagulability state which is normal in pregnancy. Thrombotic embolisms can occur at any time in prenatal or postpartum period.

Deep vein thrombosis (DVT) occurs when blood clots that have formed in the deep veins of legs or other areas break off and go to the lungs.

Other names: deep vein thrombosis, embolism-non-cerebral, pulmonary embolism

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: thromboembolism, family history of thromboembolism, antiphospholipid antibody syndrome, Protein C or S deficiency, Factor V Leiden, systemic lupus erythematosus, heart disease, sickle cell disease, sickle cell syndrome, varicose veins, diabetes, obesity, BMI > 35, operative delivery, hypertension, immobility, estrogen containing hormonal contraceptives, hyperemesis, dehydration, injury lower extremities causing venous stasis, previous history of miscarriage, multiparity, pelvic inflammatory disease, cancer or cancer therapy, mechanical heart valves

Prenatal: nonadherence anticoagulants use, immobility, obesity, hyperemesis, diabetes, injury lower extremities with venous stasis, dehydration, systemic lupus erythematosus, tobacco use, hypertension, abdominal surgery

Postpartum: recent history miscarriage or termination of pregnancy, cesarean section, obesity, diabetes, bedrest, immobility, delayed ambulation, no sequential compression devices (SCDs) used, infection, trauma

Risk Factors: obesity, tobacco use

Associated Characteristics: African American, women of advanced maternal age may have higher incidence

SIGNS / SYMPTOMS

Sudden shortness of breath, tachypnea with respirations more than 24, low blood pressure, anxious, panic, cough, sudden chest pain, tachycardia, redness, pain, swelling, warmth of extremities, pain in ribs with breathing, dull chest pain, sudden cough with blood, collapse, syncope, low blood pressure, PEA (pulseless cardiac electrical activity)

TREATMENTS / LABS / MEDICATIONS

Treatments: pulse oximetry, computed tomography (CT) scan, computed tomography (CT) angiogram chest, electrocardiogram (EKG), arterial blood gas, doppler ultrasound lower extremities, chest x-ray (CXR), chest ultrasound, ventilation/perfusion (V/Q) scan, magnetic resonance imaging (MRI), sequential compression device (SCDs), anti-embolic stockings, venous filter, respiratory support: nasal cannula, mask, intubation, thrombectomy, spiral computed tomography (CT) scan, referrals to hematologist, higher level of care within or to outside facility, interventional radiologist

Labs: complete blood count (CBC), prothrombin time (PT)T, partial thromboplastin time (PTT), international normalized ration (INR), D- dimer, fibrinogen, platelets

Medications: chemical thromboprophylaxis, anticoagulation medication therapy: Heparin, Warfarin (Postpartum), Lovenox, Enoxaparin, Dalteparin, Tinzaparin, tissue plasminogen activator (tPA). Note: anticoagulation in prenatal period may be suspended before delivery and restarted after delivery to minimize bleeding complications.

AUTOPSY

Identification of source of emboli, description of leg and pelvis veins, documentation of fresh or organizing clot in vessels, inflammation of genital tract, microscopic findings of clots in vessels.

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DIABETES: TYPE I, II, AND GESTATIONAL

DEFINITION

Metabolic disease with high blood sugar levels and excessive urination caused by defect with insulin secretion. Breakdown of proteins and fats.

Type I: diabetes caused by deficiency in pancreas islet beta cells; usual onset suddenly at a young age

Type II: insulin deficiency develops gradually

Gestational Diabetes: (GDM) glucose intolerance that begins during pregnancy

Other names: diabetes mellitus, hypoglycemic “dead in bed syndrome,” labile diabetes, pregestational diabetes

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: gestational diabetes (GDM) in prior pregnancy, obesity, history delivering infant greater than nine pounds, polycystic ovarian disease, immobility, hypertension, kidney disease, retinopathy, chronic hypertension, family history of diabetes, impaired glucose metabolism

Prenatal: unstable glucose levels, macrosomia, higher risk for cesarean section, pregnancy-induced hypertension, eclampsia, obesity, congenital anomalies, miscarriage, stillbirth, preterm delivery, preeclampsia, polyhydramnios, vaginal infections, urinary tract infections, ketoacidosis, hypoglycemia, fetal hyperinsulinemia

Labor and Delivery: birth trauma, shoulder dystocia, stillbirth, dehydration, immobility

Postpartum: preeclampsia, hemorrhage, infections, obesity, cardiovascular disease

Risk Factors: obesity, sedentary lifestyle

Associated Characteristics: African American, American Indian, Asian, Hispanic, Pacific Islander, women of advanced maternal age may have higher incidence

SIGNS / SYMPTOMS

Irritability, sweating, nervousness, blurred vision, headache, tachycardia, glycosuria, thirst, increased urination, low blood sugar

TREATMENTS / LABS / MEDICATIONS

Treatment: adjustments to insulin doses, nutritional counseling, caloric restricted diet, management by specialty care maternal fetal medicine, neurologists, endocrinologist, ophthalmologist, nutritionist, urine

cultures, thyroid function, self-monitoring blood glucose levels, nutritional counseling, fetal growth surveillance and monitoring, preconception counseling, education on importance control of hypoglycemia and hyperglycemia in pregnancy, exercise therapy, increased prenatal visit monitoring

Labs: HgA1c, electrolytes and random glucose, three-hour glucose tolerance testing 24-28 weeks' gestation, baseline renal function studies, urine testing for ketones

Medications: Metformin, Glyburide, insulin, Vitamin D

AUTOPSY

Postmortem glucose and insulin levels, pathology and weight heart, brain, liver; and renal pathology

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SEIZURE DISORDERS

DEFINITION

Convulsion caused by abnormal electrical discharge activity in the brain. No specific pathological cause is found in majority of cases.

Other names: epilepsy, sudden unexplained death with epilepsy

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: epilepsy, head trauma, alcohol use with history of epilepsy, sleep deprivation, nonadherence seizure medications

Prenatal: increase plasma volume in pregnancy increases effects of drug metabolism, nonadherence to anticonvulsants, increased risk birth defects, intrauterine growth restriction, neural tube defect, maternal hypoxia and fetal distress with seizure occurrence, alcohol, sleep deprivation, injury and falls with a seizure, preterm labor, stillbirth, change in frequency and duration of seizures

Labor and Delivery: management of anticonvulsant therapy in labor, higher risk for cesarean section

Postpartum: adjustments anticonvulsant therapy

Risk Factors: alcohol use

SIGNS / SYMPTOMS

Loss of consciousness, spasms one side of body, tonic clonic movements of extremities, amnesia of event, aura, urinary and fecal incontinence, syncope, maternal hypoxia

TREATMENTS / LABS / MEDICATIONS

Treatments: documentation preconception counseling and pregnancy risks anticonvulsants, documentation adjustment anticonvulsants in pregnancy, MRI, CT scan, fetal growth monitoring, airway management, referrals to neurologist, amniocentesis, chorionic villus sampling

Labs: drug levels

Medications: folic acid prior to pregnancy, Dilantin, Phenobarbital, Valproic acid, Valprate, Carbamazepine, Topiramate, Gabapentin, Tegretol, Depakote

AUTOPSY

Signs of gastric aspiration in the lungs; brain and heart pathology; toxicology

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SICKLE CELL DISEASE

DEFINITION

Autosomal recessive disorder with abnormality in hemoglobin gene, hgSS or hgSC, that causes chronic anemia due to increased frequency of breakdown of red cells. The red blood cells are sickle-shaped and with hypoxia are easily damaged, causing painful tissue damage.

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: frequent hospitalizations for crisis

Prenatal: preeclampsia, pulmonary infarction, congestive heart failure, sickle cell crisis, urinary tract infections, chronic anemia, hypoxia, stillbirth, preterm delivery, increased episodes of painful crisis

Labor and Delivery: fluid overload, dehydration, cesarean section

Postpartum: endometritis, sepsis, acute sickle cell crisis

Associated Characteristics: African American, Mediterranean, African origin, South and Central American, Caribbean

SIGNS / SYMPTOMS

Pallor, fatigue, weakness, jaundice, vascular hypoxia, infarction, severe pain abdomen, joints, extremities, fever, chest pain

TREATMENTS / LABS / MEDICATIONS

Treatments: preconception health/care and family planning counseling, supplemental oxygen and respiratory support, blood product transfusions, serial ultrasounds to monitor fetal growth, hydration with intravenous fluids, consultants maternal fetal medicine, hematology, transfer higher level care within or outside of facility

Labs: hemoglobinopathy testing, complete blood count (CBC), reticulocyte count, blood cultures, urinalysis

Medications: narcotics for pain control, iron, antibiotics

AUTOPSY

Organ pathology, Splenic infarcts, myocardial infarction, multiorgan failure

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SYSTEMIC LUPUS ERYTHEMATOSUS

DEFINITION

Chronic autoimmune inflammatory disease of the connective tissue that can attack multiple organ systems and present periodically as flare-ups. Is due to activation of T cells and B cells, antibodies that attack individual cells.

Other names: Lupus, SLE

TIMING / RISK FACTORS / ASSOCIATED CHARACTERISTICS

Medical History: documentation flares/exacerbations, miscarriage, preeclampsia, preterm delivery, antiphospholipid syndrome, hypertension

Prenatal: preterm labor, intrauterine growth restriction, preeclampsia, hypertension, proteinuria, documentation of a flare six months prior to conception, premature rupture membranes, renal flare, urinary tract infection, diabetes

Labor and Delivery: increased chance of cesarean section due to maternal complications

Postpartum: exacerbation of symptoms, chronic vascular changes, renal disease

Associated Characteristics: African American, Asian, teens may have higher incidence

SIGNS / SYMPTOMS

Skin rash, fatigue, weakness, fever, malaise, joint pain, proteinuria

TREATMENTS / LABS / MEDICATIONS

Treatments: preconception counseling and family planning, referral to maternal fetal medicine, hematology, rheumatology, infectious disease kick counts, transfer to higher level of care within or outside facility, increased visits for monitoring during prenatal and postpartum care

Labs: platelets, proteinuria, autoantibodies, renal and cardiac labs, PT, INR, PTT, fibrinogen, CBC, blood culture, antiphospholipid, ANA, anticardiolipin antibody, liver function tests, urinalysis, 24-hour urine for creatinine clearance and total protein

Medications: immunosuppressant medications prior to pregnancy, prednisone, Hydroxychloroquine, anticoagulation during pregnancy with heparin and or aspirin

AUTOPSY

Note lungs, kidneys, cardiac pathology. Look for documentation myocarditis, interstitial inflammation.

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