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Preeclampsia

Introduction

Research presented by the March of Dimes indicates that preeclampsia affects two to eight percent of pregnancies worldwide, and leads to 15 percent of premature births in the U.S. (March of Dimes, 2020). The question is, what is preeclampsia? This course will answer that very question, while providing insight into the three essential elements of effective preeclampsia care.

Section 1: Preeclampsia

A 36-year-old pregnant woman reports to a health care facility with complaints of headaches, nausea, vomiting, dizziness, changes in vision, and trouble breathing. Upon examination, a health care professional notes that the patient's blood pressure is high. After some consideration, the health care professional begins to consider preeclampsia. The question that remains is, what is preeclampsia? This section of the course will answer that very question, while providing insight into preeclampsia and related concepts. Health care professionals should note that possessing insight into preeclampsia and related concepts is the first essential element of effective preeclampsia care. The information found within this section of the course was derived from materials provided by the National Institutes of Health (NIH) and the March of Dimes unless, otherwise, specified (National Institutes of Health [NIH], 2018; March of Dimes, 2020).

What is preeclampsia?

Preeclampsia may refer to a condition characterized by high blood pressure, which typically occurs after the 20th week of pregnancy.

Health care professionals should note the following: preeclampsia may be characterized as mild preeclampsia or severe preeclampsia; mild preeclampsia is characterized by systolic blood pressure of 140 mmHg or higher or diastolic blood pressure of 90 mmHg or higher; severe preeclampsia is characterized by systolic blood pressure of 160 mmHg or higher or diastolic blood pressure of 110 mmHg or higher.

Health care professionals should also note the following: normal blood pressure for most adults is defined as a systolic pressure of less than 120 and a diastolic pressure of less than 80; elevated blood pressure is defined as a systolic pressure between 120 and 129

with a diastolic pressure of less than 80; high blood pressure is defined as 130/80 mmHg or higher; preeclampsia can include blood pressure at or greater than 140/90 mmHg.

Additionally, health care professionals should note the following: gestational hypertension may develop into preeclampsia; gestational hypertension may refer to high blood pressure during pregnancy, which typically returns to normal within 12 weeks after delivery (note: the main difference between gestational hypertension and preeclampsia is that gestational hypertension is primarily associated with high blood pressure, while preeclampsia is associated with high blood pressure, protein in the urine, visual impairments, kidney dysfunction, liver dysfunction, fluid in the lungs, and/or difficulty breathing).

What are the risk factors associated with preeclampsia?

The risk factors associated with preeclampsia include the following:

- Previous history of preeclampsia
- Multiple gestation (i.e., pregnant with more than one baby)
- History of chronic high blood pressure, diabetes, kidney disease, or organ transplant
- First pregnancy
- Obesity
- Over 35 or under 20 years of age
- Family history of preeclampsia (i.e., a mother, sister, or grandmother had the disorder)
- Gestational diabetes
- Polycystic Ovary Syndrome (PCOS)
- Lupus or other autoimmune disorders, including: rheumatoid arthritis, sarcoidosis, and multiple sclerosis
- Thrombophilia (note: thrombophilia may refer to a condition characterized by increased risk for blood clots)
- In-vitro fertilization (IVF) or other assisted reproductive technology (ART)

- Sickle cell disease
- Obstructive sleep apnea

What causes preeclampsia?

The exact cause of preeclampsia is unknown. However, research suggests that the following factors may contribute to preeclampsia: genetics, environmental exposures, and hormonal imbalances.

When does preeclampsia occur?

As previously mentioned, preeclampsia typically occurs after the 20th week of pregnancy. With that said, preeclampsia can occur at any time during pregnancy, delivery, and up to six weeks after pregnancy; however, it most frequently occurs in the final trimester of pregnancy.

Health care professionals should note the following: preeclampsia can develop gradually, or come on quite suddenly, even flaring up in a matter of hours.

What are the signs/symptoms of preeclampsia?

The signs/symptoms of preeclampsia include the following:

- Changes in vision (e.g., blurriness)
- Headache that doesn't go away
- Nausea
- Vomiting
- Dizziness
- Pain in the upper right belly area or in the shoulder
- Sudden weight gain (e.g., two to five pounds in a week)
- Swelling in the legs, hands, or face
- Trouble breathing

How is preeclampsia diagnosed?

Mild preeclampsia may be diagnosed by a health care professional when a pregnant woman has:

- Systolic blood pressure of 140 mmHg or higher or diastolic blood pressure of 90 mmHg or higher and either
- Urine with 0.3 or more grams of protein in a 24-hour specimen (a collection of every drop of urine within 24 hours) or a protein-to-creatinine ratio greater than 0.3
  or
- Blood tests that show kidney or liver dysfunction
- Fluid in the lungs and difficulty breathing
- Visual impairments

Severe preeclampsia may be diagnosed by a health care professional when a pregnant woman has any of the following:

- Systolic blood pressure of 160 mmHg or higher or diastolic blood pressure of 110 mmHg or higher on two occasions at least four hours apart while the patient is on bed rest
- Urine with five or more grams of protein in a 24-hour specimen or three or more grams of protein on two random urine samples collected at least four hours apart
- Test results suggesting kidney or liver damage (e.g., blood tests that reveal low numbers of platelets or high liver enzymes)
- Severe, unexplained stomach pain that does not respond to medication
- Symptoms that include visual disturbances, difficulty breathing, or fluid buildup

How can preeclampsia impact the health of a pregnant woman?

Preeclampsia can lead to kidney, liver, and brain damage; blood clots; stroke (note: a stroke may occur when the blood supply to the brain is interrupted or reduced; stroke can happen when a blood clot blocks a blood vessel that brings blood to the brain, or when a blood vessel in the brain bursts open); and eclampsia (note: eclampsia may refer to a life-threatening condition characterized by seizures or a coma after preeclampsia).

Preeclampsia may also lead to postpartum hemorrhage (note: the term postpartum hemorrhage may refer to heavy bleeding after giving birth; postpartum hemorrhage can lead to shock and death; shock can occur when the body's organs don't get enough blood flow).

Health care professionals should note the following: preeclampsia can have a greater impact on the health of a pregnant woman if it occurs earlier than the 20th week of pregnancy, or in a woman who suffered from high blood pressure before pregnancy.

How can preeclampsia impact pregnancy/children?

Preeclampsia can lead to **preterm births**. Specific information regarding preterm births may be found below. The information found below was derived from materials provided by the Centers for Disease Control and Prevention (CDC) (Centers for Disease Control and Prevention [CDC], 2021).

- A preterm birth may refer to the birth of a live baby that is born before 37 weeks of pregnancy have been completed (note: the average length of a full-term pregnancy is between 39 - 40 weeks).
- The term preterm baby may refer to any baby born preterm.
- Extremely preterm birth - an extremely preterm birth may refer to the birth of a live baby that is born at or before 25 weeks of pregnancy.
- Very preterm birth - a very preterm birth may refer to the birth of a live baby that is born at less than 32 weeks of pregnancy.
- Moderate preterm birth - a moderate preterm birth may refer to the birth of a live baby that is born between 32 and 34 weeks of pregnancy.
- Late preterm birth - a late preterm birth may refer to the birth of a live baby that is born between 34 and 36 completed weeks of pregnancy.
- The warning signs of preterm labor include the following: contractions every 10 minutes or more often (note: the term contraction may refer to the tightening and shortening of the uterine muscles; contractions help push the baby out; contractions may feel like the abdomen is tightening like a fist); changes in vaginal discharge (e.g., a significant increase in the amount of discharge or leaking fluid or bleeding from the vagina); pelvic pressure (e.g., the feeling that the baby is

pushing down); low, dull backache; cramps that feel like a menstrual period; abdominal cramps with or without diarrhea.

- Women at risk for preterm births may be able to prevent preterm births with progesterone supplementation. Health care professionals should note the following: progesterone may refer to a hormone involved in the menstrual cycle, pregnancy, and reproduction; progesterone induces secretory changes in the lining of the uterus and is vital for a successful embryo implantation (note: secretory changes in the lining of the uterus prepare the uterus for a possible pregnancy); progesterone modulates a woman's immune response to prevent rejection of an embryo; progesterone suppresses uterine contractions to promote pregnancy.

- Women at risk for preterm births may be able to prevent preterm births through cervical cerclage. Health care professionals should note the following: the term cervical cerclage may refer to a procedure that uses sutures or synthetic tape to reinforce the cervix during pregnancy in women with a history of a short cervix; the sutures or synthetic tape used to reinforce the cervix help support the uterus in order to promote a full term pregnancy; the sutures or synthetic tape is removed during the delivery of a newborn baby.

- Complications associated with preterm births include the following: breathing problems, such as bronchopulmonary dysplasia and respiratory distress syndrome (RDS) (note: bronchopulmonary dysplasia may refer to a chronic lung disease that can develop in preterm babies and babies who received treatment with a breathing machine; respiratory distress syndrome [RDS] may refer to a lung disease that prevents normal breathing); feeding difficulties, such as gastroesophageal reflux disease (GERD) (note: GERD may refer to a chronic disease that occurs when acidic stomach contents flow or move back up into the esophagus); vision problems, such as retinopathy of prematurity (ROP) (note: retinopathy of prematurity [ROP] may refer to a potentially blinding eye disease that is caused by the abnormal development of retinal blood vessels in preterm babies); and cerebral palsy (note: cerebral palsy may refer to a group of disorders that affect an individual's ability to move and maintain balance and posture).

Preeclampsia can lead to **placental abruption**. Specific information regarding placental abruption may be found below.

- Placental abruption may refer to a pregnancy complication that occurs when the placenta separates from the inner wall of the uterus before birth.
- If placental abruption occurs the placenta can separate partially or completely.
- If placental abruption occurs, the child may not receive enough oxygen and nutrients.
- Vaginal bleeding is the most common symptom of placental abruption after 20 weeks of pregnancy.

Preeclampsia can lead to **intrauterine growth restriction**. Specific information regarding intrauterine growth restriction can be found below.

- Intrauterine growth restriction may refer to a condition that occurs when a fetus does not grow as expected.
- Intrauterine growth restriction can occur when a mother suffers from blood pressure high enough to narrow the blood vessels in the uterus and placenta. Health care professionals should note that narrow blood vessels in the uterus and placenta can lead to a reduction in the oxygen and nutrients supplied to a fetus, which subsequently can impact the growth of a fetus.
- An ultrasound may be used to diagnose intrauterine growth restriction (note: an ultrasound may refer to a procedure that uses high-energy sound waves to look inside the body).

Finally, preeclampsia can lead to **low birth weight**. Specific information regarding low birth weight may be found below.

- The term low birth weight may refer to weight at birth that is less than five pounds, eight ounces.
- Having a low birth weight can cause serious health problems for some children.
- Complications associated with low birth weight include the following: breathing problems, such as RDS; intraventricular hemorrhage (IVH) (note: intraventricular hemorrhage [IVH] may refer to bleeding into the fluid-filled areas, or ventricles, surrounded by the brain); patent ductus arteriosus (note: patent ductus arteriosus may refer to a persistent opening between the two major blood vessels leading from the heart); necrotizing enterocolitis (NEC) (note: necrotizing enterocolitis [NEC] may refer to the death of tissue in the intestine); jaundice

(note: jaundice may refer to a condition characterized by yellowish skin and/or yellowish whites of the eyes caused by the buildup of bilirubin in the blood); and infections.

What is HELLP syndrome?

HELLP syndrome, or Hemolysis, Elevated Liver enzymes and Low Platelets syndrome, may refer to a life-threatening pregnancy complication usually considered to be a variant of preeclampsia. Specific information regarding HELLP Syndrome may be found below. The information found below was derived from materials provided by the March of Dimes unless, otherwise, specified (March of Dimes, 2019).

- Approximately 45,000 women per year will develop HELLP syndrome in the United States.
- Pregnant women who suffer from preeclampsia or eclampsia are at higher risk of developing HELLP syndrome. Health care professionals should note that not all HELLP syndrome patients exhibit the classic signs/symptoms (e.g., high blood pressure) that typically characterizes the diagnosis of preeclampsia; HELLP syndrome can occur more often in patients with a family history of preeclampsia or HELLP syndrome, or a history of certain autoimmune conditions or clotting disorders, as well as in patients without risk factors.
- Signs/symptoms of HELLP syndrome include the following: high blood pressure; protein in the urine; increased liver enzymes; decreased platelets; the presence of hemolysis; chest pain; nausea, vomiting, or indigestion with pain after eating; consistent headaches; bleeding; shoulder pain or pain when breathing deeply; difficulty breathing; changes in vision including blurred vision, seeing double, or flashing lights; swelling, especially of the face or hands.
- The HELLP syndrome diagnostic process may include the following: blood tests to evaluate platelet levels, liver enzymes, and red blood cell count; urine test to check for abnormal proteins; magnetic resonance imaging (MRI) to determine if there is bleeding in the liver.
- Health care professionals should note the following: HELLP syndrome may be difficult to diagnose, because all of the typical signs of preeclampsia may not be apparent (e.g., high blood pressure); early diagnosis is critical because serious illness and even death can occur in about 25% of cases.

- HELLP syndrome is classified according to the severity of certain blood test values which reflect the condition of the mother's blood vessels, liver, and other organ systems (e.g., aspartate aminotransferase [AST] count; lactate dehydrogenase [LDH] count; platelet count).
- Health care professionals should note the following: aspartate aminotransferase (AST) may refer to an enzyme made by the liver; high AST quantities can indicate liver damage; lactate dehydrogenase (LDH) may refer to an enzyme that plays a role in cellular respiration; high LDH levels in blood may be a sign of tissue damage or disease; platelets may refer to colorless blood cells that help form blood clots and stop bleeding; thrombocytopenia may refer to a condition characterized by a low blood platelet count.
- Class I HELLP syndrome is classified by the following: severe thrombocytopenia; AST ≥ 70 IU/L; LDH ≥ 600 IU/L; platelets ≤ 50,000/uL.
- Class II HELLP syndrome is classified by the following: moderate thrombocytopenia; AST ≥ 70 IU/L; LDH ≥ 600 IU/L; platelets > 50,000 ≤ 100,000/uL.
- Class III HELLP syndrome is classified by the following: mild thrombocytopenia; AST ≥ 40 IU/L; LDH > 600 IU/L; platelets > 100,000 ≤ 150,000/uL.
- HELLP syndrome may lead to low birth weight and stillbirth (note: stillbirth may refer to the death or loss of a baby before or during delivery).
- The definitive treatment for women suffering from HELLP syndrome is the delivery of their baby and the placenta. Health care professionals should note the following: during pregnancy, many women suffering from HELLP syndrome require a transfusion of some form of blood product (e.g., red cells, platelets, plasma); corticosteroids may be used to improve fetal lung development in a preterm pregnancy.

What is postpartum preeclampsia?

Postpartum preeclampsia may refer to a condition characterized by high blood pressure, which occurs after a woman gives birth; preeclampsia that occurs after a woman gives birth.

Postpartum preeclampsia typically occurs within 48 hours of giving birth - however, it can develop up to six weeks after a child's birth.

Risk factors for postpartum preeclampsia include preeclampsia.

The signs/symptoms of postpartum preeclampsia include: high blood pressure, changes in vision (e.g., blurriness), headaches, nausea, vomiting, and dizziness.

The complications associated with postpartum preeclampsia include the following: HELLP syndrome, seizures, pulmonary edema, thromboembolism, and stroke.

Postpartum preeclampsia may be life-threatening, therefore, immediate treatment is required. Treatment for postpartum preeclampsia can include: supportive care, magnesium sulfate to prevent seizures, and medications to reduce blood pressure.

Section 1 Summary

Preeclampsia may refer to a condition characterized by high blood pressure, which typically occurs after the 20th week of pregnancy. The signs/symptoms of preeclampsia include the following: changes in vision (e.g., blurriness); headache that doesn't go away; nausea; vomiting; dizziness; pain in the upper right belly area or in the shoulder; sudden weight gain (e.g., two to five pounds in a week); swelling in the legs, hands or face; trouble breathing. Preeclampsia can impact the health of the pregnant woman and unborn child. Health care professionals should work to identify patients suffering from preeclampsia through patient observation and monitoring.

Section 1 Key Concepts

- The first essential element of effective preeclampsia care is to possess insight into preeclampsia and related concepts.
- Preeclampsia typically occurs after the 20th week of pregnancy - however, preeclampsia can occur at any time during pregnancy, delivery, and up to six weeks after pregnancy.

Section 1 Key Terms

Preeclampsia - a condition characterized by high blood pressure, which typically occurs after the 20th week of pregnancy

Gestational hypertension - high blood pressure during pregnancy, which typically returns to normal within 12 weeks after delivery

Thrombophilia - a condition characterized by increased risk for blood clots

Eclampsia - a life-threatening condition characterized by seizures or a coma after preeclampsia

Postpartum hemorrhage - heavy bleeding after giving birth

Preterm birth - the birth of a live baby that is born before 37 weeks of pregnancy have been completed

Preterm baby - any baby born preterm

Extremely preterm birth - the birth of a live baby that is born at or before 25 weeks of pregnancy

Very preterm birth - the birth of a live baby that is born at less than 32 weeks of pregnancy

Moderate preterm birth - the birth of a live baby that is born between 32 and 34 weeks of pregnancy

Late preterm birth - the birth of a live baby that is born between 34 and 36 completed weeks of pregnancy

Contraction - the tightening and shortening of the uterine muscles

Progesterone - a hormone involved in the menstrual cycle, pregnancy, and reproduction

Cervical cerclage - a procedure that uses sutures or synthetic tape to reinforce the cervix during pregnancy in women with a history of a short cervix

Bronchopulmonary dysplasia - a chronic lung disease that can develop in preterm babies and babies who received treatment with a breathing machine

Respiratory distress syndrome (RDS) - a lung disease that prevents normal breathing

Gastroesophageal reflux disease (GERD) - a chronic disease that occurs when acidic stomach contents flow or move back up into the esophagus

Retinopathy of prematurity (ROP) - a potentially blinding eye disease that is caused by the abnormal development of retinal blood vessels in preterm babies

Cerebral palsy - a group of disorders that affect an individual's ability to move and maintain balance and posture

Placental abruption - a pregnancy complication that occurs when the placenta separates from the inner wall of the uterus before birth

Intrauterine growth restriction - a condition that occurs when a fetus does not grow as expected

Ultrasound - a procedure that uses high-energy sound waves to look inside the body

Low birth weight - weight at birth that is less than five pounds, eight ounces

Intraventricular hemorrhage (IVH) - bleeding into the fluid-filled areas, or ventricles, surrounded by the brain

Patent ductus arteriosus - a persistent opening between the two major blood vessels leading from the heart

Necrotizing enterocolitis (NEC) - the death of tissue in the intestine

Jaundice - condition characterized by yellowish skin and/or yellowish whites of the eyes caused by the buildup of bilirubin in the blood

HELLP syndrome (Hemolysis, Elevated Liver enzymes and Low Platelets syndrome) - a life-threatening pregnancy complication usually considered to be a variant of preeclampsia

Aspartate aminotransferase (AST) - an enzyme made by the liver

Lactate dehydrogenase (LDH) - an enzyme that plays a role in cellular respiration

Platelets - colorless blood cells that help form blood clots and stop bleeding

Thrombocytopenia - a condition characterized by a low blood platelet count

Stillbirth - the death or loss of a baby before or during delivery

Postpartum preeclampsia - a condition characterized by high blood pressure, which occurs after a women gives birth; preeclampsia that occurs after a women gives birth

Section 1 Personal Reflection Question

How can preeclampsia affect pregnant women and unborn children?

Section 2: Preeclampsia Prevention and Treatment

The second essential element of effective preeclampsia care is to work to prevent and treat preeclampsia. This section of the course will review methods, strategies, and recommendations that may be used to prevent and treat preeclampsia.

Preeclampsia Prevention

- **Reduce stress** - stress can impact blood pressure. Therefore, pregnant women should work to reduce stress to help maintain a healthy blood pressure. Specific information regarding stress may be found below. The information found below was derived from materials provided by the CDC, unless, otherwise, specified (CDC, 2021).

- Stress may refer to a factor that causes emotional, physical, or psychological tension.

- Stress can be related to a "negative" event such as an accident, as well as a "positive" event such as a job promotion.

- Stress may also arise from a significant life event, such as the death of a loved one (note: a significant life event may refer to any major shift in an individual's life).

- Signs/symptoms of stress include the following: disbelief and shock; tension and irritability; fear and anxiety about the future; difficulty making decisions; feeling numb; sadness and other symptoms of depression; loss of interest in normal activities; loss of appetite; nightmares and recurring thoughts about an event; anger; increased use of alcohol and drugs; feeling powerless; crying; sleep problems; headaches; back pains; stomach problems; trouble concentrating.

- Stress can play a role in the development of the following: headaches, high blood pressure, heart disease, diabetes, skin conditions, asthma, arthritis, depression, anxiety, and substance abuse.

- Stress is associated with burn-out.

- Burn-out may refer to a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed (World Health Organization [WHO], 2019).

- Burn-out is characterized by the following three dimensions: feelings of energy depletion or exhaustion; increased mental distance from one’s job, or feelings of

negativism or cynicism related to one's job; and reduced professional efficacy (WHO, 2019).

- Burn-out can lead to both physical and behavioral signs/symptoms.

- The physical signs/symptoms of burn-out may include the following: fatigue; muscle stiffness; back pain; frequent headaches; gastrointestinal dysfunction; shortness of breath.

- The behavioral signs/symptoms of burn-out may include the following: irritability; ill-tempered behavior; emotional exhaustion; heightened emotional responses (e.g., quick to anger); distressed; suspicious and paranoid.

- **Take a "time-out," when appropriate** - taking time-outs can help individuals slow down their thoughts, and provide individuals with an opportunity to "recharge their batteries'' (note: within the context of this course, the term time-out may refer to a short pause in daily activities, which allows individuals an opportunity to compose themselves and gather their thoughts). Time-outs can be taken throughout the day and may be advantageous to individuals when they feel overwhelmed, overworked, and/or unhappy. Health care professionals should note that time-outs may allow individuals an opportunity to improve upon their state of mind in order to, ultimately, relieve stress and prevent high blood pressure.
- **Engage in breathing exercises** - breathing exercises can help individuals calm their minds and relieve stress. Therefore, individuals should consider engaging in breathing exercises when working to reduce/prevent stress and high blood pressure. Specific information and recommendations regarding breathing exercises may be found below. The information found below was derived from materials provided by the National Center for Complementary and Integrative Health (NCCIH) (National Center for Complementary and Integrative Health [NCCIH], 2021).

- A breathing exercise may refer to the practice of clearing the mind, relaxing, and breath focus.

- Research suggests that breathing exercises may reduce stress, improve mood, and potentially help to improve many health problems and promote healthy behaviors.

- Breathing exercises are generally considered to be safe for healthy individuals.

- The three essential elements of breathing exercises include the following: a quiet location with as few distractions as possible; a comfortable posture or position (e.g., sitting down; lying down; standing); and a focus of attention on the sensations of breath.

- **Engage in meditation** - to build on the previous recommendation, mediation can also help individuals calm their minds and relieve stress. Therefore, individuals should consider engaging in breathing exercises when working to reduce/prevent stress and high blood pressure. Specific information and recommendations regarding breathing exercises may be found below. The information found below was derived from materials provided by the NCCIH (NCCIH, 2021).

Meditation may refer to the practice of clearing the mind, relaxing, and focus.

Research suggests that meditation may reduce stress, anxiety, and improve mood.

Meditation is generally considered to be safe for healthy individuals.

When engaging in meditation individuals should meditate a quiet location; rest in a comfortable position; and focus their mind on an object or set of words.

- **Engage in physical activity** - physical activity can help individuals remain active, which in turn can help individuals reduce/prevent stress and high blood pressure. Therefore, individuals should consider engaging in physical activity to help reduce/prevent stress and high blood pressure. Specific recommendations regarding physical activity may be found below. The information found below was derived from materials provided by the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services, 2018).

  Physical activity may refer to bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level.

  <u>Physical Activity Recommendations for Adults</u>

  - Adults should move more and sit less throughout the day. Some physical activity is better than none. Adults who sit less and do any amount of moderate-to-vigorous physical activity gain some health benefits.

  - For substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or

an equivalent combination of moderate- and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week.

- Additional health benefits are gained by engaging in physical activity beyond the equivalent of 300 minutes (5 hours) of moderate-intensity physical activity a week.
- Adults should also do muscle-strengthening activities of moderate or greater intensity and that involve all major muscle groups on two or more days a week, as these activities provide additional health benefits.

Physical Activity Recommendations for Women During Pregnancy and the Postpartum Period

- Women should do at least 150 minutes (2 hours and 30 minutes) of moderate-intensity aerobic activity a week during pregnancy and the postpartum period. Preferably, aerobic activity should be spread throughout the week.
- Women who habitually engaged in vigorous-intensity aerobic activity or who were physically active before pregnancy can continue these activities during pregnancy and the postpartum period.
- Women who are pregnant should be under the care of a health care professional who can monitor the progress of the pregnancy. Women who are pregnant can consult a health care professional about whether or how to adjust their physical activity during pregnancy and after the baby is born.

Physical Activity Recommendations for Safe Physical Activity

- Individuals should understand the risks, yet be confident that physical activity can be safe for almost everyone.
- Individuals should choose types of physical activity that are appropriate for their current fitness level and health goals, because some activities are safer than others.
- Individuals should increase physical activity gradually over time to meet key guidelines or health goals. Inactive people should “start low and go

slow" by starting with lower intensity activities and gradually increasing how often and how long activities are done.

    - Individuals should protect themselves by using appropriate gear and sports equipment, choosing safe environments, following rules and policies, and making sensible choices about when, where, and how to be active.

    - Individuals should be under the care of a health care professional if they have chronic conditions or symptoms. Individuals with chronic conditions and symptoms can consult a health care professional or physical activity specialist about the types and amounts of activity appropriate for them.

- **Engage in yoga** - to build on the previous recommendations, individuals should consider engaging in yoga to help reduce/prevent stress and high blood pressure. Health care professionals should note the following: yoga may refer to a practice that promotes physical and mental well-being through asanas, breathing techniques, and meditation; the term asanas may refer to the physical postures of yoga.

- **Adequate nutrition** - evidence presented by the CDC suggests that individuals suffering from stress and working to prevent high blood pressure may benefit from adequate nutrition. Therefore, individuals should be encouraged to take in adequate nutrition when working to prevent high blood pressure. Specific information and recommendations regarding adequate nutrition may be found below. The information found below was derived from materials provided by the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services, 2020).

    - From 12 months through older adulthood, individuals should follow a healthy dietary pattern across their lifespan to meet nutrient needs, help achieve a healthy body weight, and reduce the risk of chronic disease (note: the term healthy dietary pattern may refer to the combination of foods and beverages that constitutes an individual's complete dietary intake over time; a description of a customary way of eating or a description of a combination of foods recommended for consumption).

    - Individuals should focus on meeting food group needs with nutrient-dense foods and beverages, and stay within calorie limits - nutrient-dense foods provide vitamins, minerals, and other health-promoting components and have no or little added sugars, saturated fat, and sodium. A healthy dietary

pattern consists of nutrient-dense forms of foods and beverages across all food groups, in recommended amounts, and within calorie limits (note: the term nutrient-dense foods may refer to the foods and beverages that provide vitamins, minerals, and other health-promoting components and have little added sugars, saturated fat, and sodium).

- Vegetables, fruits, whole grains, seafood, eggs, beans, peas, and lentils, unsalted nuts and seeds, fat-free and low-fat dairy products, and lean meats and poultry, when prepared with no or little added sugars, saturated fat, and sodium, are examples of nutrient-dense foods.

- Individuals should note that the core elements that make up a healthy dietary pattern include the following: vegetables of all types; fruits, especially whole fruit; grains, at least half of which are whole grain; dairy, including fat-free or low-fat milk, yogurt, and cheese, and/or lactose-free versions and fortified soy beverages and yogurt as alternatives; protein foods, including lean meats, poultry, and eggs; oils, including vegetable oils and oils in food, such as seafood and nuts.

- Less than 10 percent of calories per day should come from sugars; individuals should avoid foods and beverages with added sugars; less than 10 percent of calories per day should come from saturated fat; individuals should consume less than 2,300 milligrams of sodium per day.

- Women who are or who may be pregnant should not drink alcohol; it is not safe for women to drink any type or amount of alcohol during pregnancy; women who drink alcohol and become pregnant should stop drinking immediately.

- Pregnancy and lactation are special stages of life for women, and nutrition plays a vital role before, during, and after the aforementioned life stages to support the health of the mother and her child. Following a healthy dietary pattern is especially important for those who are pregnant or lactating for several reasons. Increased calorie and nutrient intakes are necessary to support the growth and development of the baby and to maintain the mother's health. Consuming a healthy dietary pattern before and during pregnancy may also help improve pregnancy outcomes. In addition, following a healthy dietary pattern before and during pregnancy and

lactation has the potential to affect health outcomes for both the mother and, subsequently, the child.

- Pregnant and breastfeeding individuals typically require more calories to meet their nutritional needs while breastfeeding; an additional 450 to 500 kilocalories (kcal) of healthy food calories per day is recommended for well-nourished breastfeeding mothers.
- The increased calorie and nutrient needs of pregnant and breastfeeding individuals should be met by consuming nutrient-dense food choices as part of a healthy dietary pattern; pregnant and breastfeeding individuals should meet their increased calorie and nutrient needs with nutrient-dense foods instead of with foods high in added sugars, saturated fat, and sodium.
- Weight gain is a natural part of pregnancy, which is why it is important to have a plan; meeting weight management goals may improve pregnancy outcomes, such as increasing the likelihood of delivering a healthy weight infant and improving the long-term health of both mother and child; women are encouraged to partner with health care professionals to achieve their goals and optimize health outcomes.
- Individuals following a vegetarian or vegan dietary pattern during pregnancy/breastfeeding may need to take special care to ensure nutrient adequacy; iron may be of particular concern because plant source foods only contain non-heme iron, which is less bioavailable than heme iron; vitamin B12 is of concern because it is present only in animal source foods; individuals following a vegetarian or vegan dietary pattern should consult with a health care professional to determine whether supplementation of iron, vitamin B12, and/or other nutrients such as choline, zinc, or iodine is necessary and if so, the appropriate levels to meet their unique needs.
- Vitamin B12 is transferred through the placenta to the fetus during pregnancy and through breast milk after birth; infants who drink breast milk from a mother who consumes adequate amounts of vitamin B12 or infants who drink infant formula, will receive enough vitamin B12; however, if a breastfeeding mother is deficient in vitamin B12, her infant may also become deficient.

- Seafood intake during pregnancy is recommended, as it is associated with favorable measures of cognitive development in young children; individuals who are pregnant or lactating should consume at least eight and up to 12 ounces of a variety of seafood per week, from choices lower in methylmercury (note: methylmercury can be harmful to the brain and nervous system if an individual is exposed to too much of it over time; this is particularly important during pregnancy because eating too much of it can have negative effects on the developing fetus).
- Individuals who are planning or capable of pregnancy should take a daily supplement containing 400 to 800 mcg of folic acid; the critical period for supplementation starts at least one month before conception and continues through the first two to three months of pregnancy.
- The Dietary Guidelines for Americans recommends that lactating parents consume 290 mcg of iodine and 550 mg of choline daily throughout the first year postpartum. Iodine can be found in dairy products, eggs, seafood, or in iodized table salt. Choline can be found in dairy and protein food groups, such as eggs, meats, some seafood, beans, peas, and lentils.

- **Adequate sleep** - research presented by the CDC suggests that adequate sleep is essential for the overall health of a pregnant woman. Therefore, pregnant women should work to achieve adequate sleep to improve health and help prevent high blood pressure. Specific recommendations regarding sleep may be found below. The information found below was derived from materials provided by the CDC (CDC, 2020).
    - Pregnant women should sleep seven to nine hours per 24 hours.
    - To achieve adequate sleep, pregnant women should establish a comfortable sleep environment; individuals can establish a comfortable sleep environment by ensuring their room is not too hot or too cold and/or by acquiring what they consider to be a comfortable bed/bedding.
    - To achieve adequate sleep, pregnant women should limit the amount of light in a sleep environment; too much light, whether natural or not natural, in an individual's sleep environment can impact an individual's ability to fall asleep and stay asleep.

- To achieve adequate sleep, pregnant women should limit circadian rhythm disturbances; the term circadian rhythm may refer to the natural, internal process that regulates the sleep-wake cycle, which repeats every 24 hours; the following methods may be used to limit circadian rhythm disturbances: maintain a consistent schedule, avoid excessive traveling, and avoid consistently staying up all night.
- To achieve adequate sleep, pregnant women should seek natural light at appropriate times; natural light can help maintain a healthy sleep-wake cycle; the term sleep-wake cycle may refer to the natural 24 hour daily sleep pattern which consists of approximately 16 hours of daytime wakefulness and approximately eight hours of night-time sleep.
- To achieve adequate sleep, pregnant women should not use alcohol as a sleep aid; pregnant women should avoid alcohol consumption.
- To achieve adequate sleep, pregnant women should consider consuming foods that promote sleep; some foods, through various processes, can promote sleep; the following foods may promote sleep: fish, whole grains, yogurt, almonds, cherries, and bananas.
- To achieve adequate sleep, pregnant women should avoid large meals before bedtime; even though some foods may promote sleep, large meals before bed should be avoided; large meals, meals consisting of 800 calories or more, may lead to prolonged digestion, which in turn could impact sleep.
- To achieve adequate sleep, pregnant women should avoid fried food before bedtime; to build on the previous recommendation, individuals should avoid fried foods before bedtime; fried foods can lead to digestion issues, which possesses the potential to impact sleep.
- To achieve adequate sleep, pregnant women should avoid excessive fluid intake before bedtime; excessive fluid intake can lead to sleep disruptions, which may impact an individual's ability to fall asleep and stay asleep.
- To achieve adequate sleep, pregnant women should avoid excessive naps during the day; excessive naps (i.e., naps lasting over 30 - 120 minutes) may help individuals rest during the day; however, they can impact an individual's ability to fall asleep and stay asleep.

- To achieve adequate sleep, pregnant women should avoid the use of electronic devices before bedtime; electronic devices, such as tablets, smartphones, and laptops, emit short-wavelength, artificial blue light, which can affect the release of melatonin, and, ultimately, impact sleep; melatonin may refer to a hormone that regulates the sleep-wake cycle; individuals should stop using electronic devices, at least, 30 - 60 minutes before bedtime.

- To achieve adequate sleep, pregnant women should consider removing clocks and/or smartphones from sight when attempting to fall asleep and stay asleep; clocks and/or smartphones too close to the bed or in sight from the bed my lead to sleep related anxiety (e.g., an individual may continuously check his or her clock or smartphone while attempting to fall asleep, leading to an anxious feeling related to the time and/or information visible on the smartphone).

- To achieve adequate sleep, pregnant women should consider turning off smartphones before bedtime; it may be best for some individuals to simply turn off their smartphones before bed to avoid any related anxiety and/or agitation that may negatively impact sleep.

- To achieve adequate sleep, pregnant women should avoid going to bed too early; going to bed too early (i.e., when an individual is not tired) can also lead to anxiety and/or agitation, and, thus, should be avoided.

- To achieve adequate sleep, pregnant women should keep a consistent sleep schedule; individuals working to achieve adequate sleep should keep a consistent sleep schedule (i.e., go to sleep and wake up at approximately the same times every day, including weekends); keeping a consistent sleep schedule can help individuals condition themselves to fall asleep and stay asleep.

- **Low-dose aspirin** - research indicates that low-dose aspirin (81 mg/day) has been used to effectively prevent or delay the onset of preeclampsia (American College of Obstetricians and Gynecologists, 2018). The American College of Obstetricians and Gynecologists issued the Hypertension in Pregnancy Task Force Report recommending daily low-dose aspirin beginning in the late first trimester for women with a history of early-onset preeclampsia and preterm delivery at less than 34 0/7 weeks of gestation, or for women with more than one prior

pregnancy complicated by preeclampsia (American College of Obstetricians and Gynecologists, 2018). Additional recommendations regarding low-dose aspirin and preeclampsia may be found below. The information found below was derived from materials provided by the American College of Obstetricians and Gynecologists (American College of Obstetricians and Gynecologists, 2018).

- Low-dose aspirin (81 mg/day) prophylaxis is recommended in women at high risk of preeclampsia and should be initiated between 12 weeks and 28 weeks of gestation (optimally before 16 weeks) and continued daily until delivery.
- Low-dose aspirin prophylaxis should be considered for women with more than one of several moderate risk factors for preeclampsia.
- Low-dose aspirin prophylaxis is not recommended solely for the indication of prior unexplained stillbirth, in the absence of risk factors for preeclampsia.
- Low-dose aspirin prophylaxis is not recommended for prevention of fetal growth restriction, in the absence of risk factors for preeclampsia.
- Low-dose aspirin prophylaxis is not recommended for the prevention of spontaneous preterm birth, in the absence of risk factors for preeclampsia.
- Low-dose aspirin prophylaxis is not recommended for the prevention of early pregnancy loss.

<u>Preeclampsia Treatment</u>

- If the pregnancy is at 37 weeks or later, delivery of the fetus is recommended to treat preeclampsia and avoid further complications (NIH, 2018).
- If the pregnancy is at less than 37 weeks, health care professionals may consider the following treatment options: bed rest for the pregnant individual in order to help lower blood pressure and increase blood flow to the placenta; close monitoring of the pregnant individual and the fetus (note: monitoring of the pregnant individual may include: platelet counts, liver enzymes, kidney function, and urinary protein levels; monitoring of the fetus might include: ultrasound, heart rate monitoring, assessment of

fetal growth, and amniotic fluid assessment); anticonvulsive medications, such as magnesium sulfate, may be used to prevent seizures (NIH, 2018).

- If a pregnant individual is diagnosed with severe preeclampsia, health care professionals may consider the following treatment options: close monitoring in a health care facility; intravenous medication to control blood pressure and prevent seizures or other complications; steroid injections to help speed up the development of the fetus's lungs (NIH, 2018).

- When a woman has severe preeclampsia and is at 34 weeks of pregnancy or later, the American College of Obstetricians and Gynecologists recommends delivery as soon as medically possible; if the pregnancy is at less than 34 weeks, health care professionals may prescribe corticosteroids to impact the health of the fetus (e.g., promote lung development) (note: preterm delivery may be necessary; the symptoms of preeclampsia typically dissipate within six weeks of delivery) (NIH, 2018).

- As previously mentioned, preeclampsia treatment may include antenatal corticosteroids. Specific recommendations regarding antenatal corticosteroids may be found below. The information found below was derived from materials provided by the American College of Obstetricians and Gynecologists (American College of Obstetricians and Gynecologists, 2020).

    - A single course of corticosteroids is recommended for pregnant women between 24 0/7 weeks and 33 6/7 weeks of gestation who are at risk of preterm delivery within seven days, including for those with ruptured membranes and multiple gestations. It also may be considered for pregnant women starting at 23 0/7 weeks of gestation who are at risk of preterm delivery within seven days, based on a family's decision regarding resuscitation, irrespective of membrane rupture status and regardless of fetal number.

    - Administration of corticosteroids for pregnant women during the periviable period who are at risk of preterm delivery within seven days is linked to a family's decision regarding resuscitation and should be considered in that context.

- A single course of betamethasone is recommended for pregnant women between 34 0/7 weeks and 36 6/7 weeks of gestation at risk of preterm birth within seven days, and who have not received a previous course of antenatal corticosteroids.
- Regularly scheduled repeat courses or serial courses (more than two) are not currently recommended.
- A single repeat course of antenatal corticosteroids should be considered in women who are less than 34 0/7 weeks of gestation who are at risk of preterm delivery within seven days, and whose prior course of antenatal corticosteroids was administered more than 14 days previously. Rescue course corticosteroids could be provided as early as seven days from the prior dose, if indicated by the clinical scenario.
- Whether to administer a repeat or rescue course of corticosteroids with preterm prelabor rupture of membranes (PROM) is controversial, and there is insufficient evidence to make a recommendation for or against.
- Continued surveillance of long-term outcomes after in utero corticosteroid exposure should be supported.
- Quality improvement strategies to optimize appropriate and timely antenatal corticosteroid administration are effective and should be encouraged.

Section 2 Summary

Health care professionals should work to prevent and treat preeclampsia, when appropriate. Recommendations that may be used to prevent preeclampsia include the following: reduce stress; take a "time-out," when appropriate; engage in breathing exercises; engage in meditation; engage in physical activity; engage in yoga; adequate nutrition; adequate sleep; low-dose aspirin. Preeclampsia treatment may include the following: blood pressure monitoring, supportive care, antenatal corticosteroids, blood pressure medications, anti-seizure medications, and induced labor. Finally, health care professionals should provide preeclampsia prevention and treatment education to patients, when applicable.

Section 2 Key Concepts

- The second essential element of effective preeclampsia care is to work to prevent and treat preeclampsia.
- The definitive treatment for women suffering from preeclampsia is the delivery of their baby.

Section 2 Key Terms

Stress - a factor that causes emotional, physical, or psychological tension

Significant life event - any major shift in an individual's life

Burn-out - a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed (WHO, 2019)

Time-out (within the context of this course) - a short pause in daily activities, which allows individuals an opportunity to compose themselves and gather their thoughts

Breathing exercise - the practice of clearing the mind, relaxing, and breath focus

Meditation - the practice of clearing the mind, relaxing, and focus

Physical activity - bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level (U.S. Department of Health and Human Services, 2018)

Yoga - a practice that promotes physical and mental well-being through asanas, breathing techniques, and meditation

Asanas - the physical postures of yoga

Healthy dietary pattern - the combination of foods and beverages that constitutes an individual's complete dietary intake over time; a description of a customary way of eating or a description of a combination of foods recommended for consumption (U.S. Department of Health and Human Services, 2020)

Nutrient-dense foods - the foods and beverages that provide vitamins, minerals, and other health-promoting components and have little added sugars, saturated fat, and sodium (U.S. Department of Health and Human Services, 2020)

Circadian rhythm - the natural, internal process that regulates the sleep-wake cycle, which repeats every 24 hours

Sleep-wake cycle - the natural 24 hour daily sleep pattern which consists of approximately 16 hours of daytime wakefulness and approximately eight hours of night-time sleep

Section 2 Personal Reflection Question

How can health care professionals use the above methods, strategies, and recommendations to effectively prevent and treat preeclampsia?

Section 3: Preeclampsia and COVID-19

Due to the ever evolving coronavirus disease 2019 (COVID-19) pandemic, the third essential element of effective preeclampsia care is to possess insight into COVID-19, and the potential impact of COVID-19 on preeclampsia and pregnancy. With that in mind, this section of the course will highlight information regarding COVID-19, and the potential impact of COVID-19 on preeclampsia and pregnancy. The information found within this section of the course was derived from materials provided by the CDC and the Preeclampsia Foundation unless, otherwise, specified (CDC, 2022; Preeclampsia Foundation, 2021).

- Coronavirus disease 2019 (COVID-19) may refer to a respiratory illness that can spread from person to person that is caused by a virus known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).
- It is currently believed that the virus that causes COVID-19 is transmitted or spread through person-to-person contact (note: the term person-to-person contact may refer to the transmission of a communicable disease/illness from a host to a healthy individual by way of body fluids [e.g., respiratory droplets, blood]).
- It may be possible for an individual to obtain COVID-19 by touching a surface or an object that has become contaminated with the COVID-19 virus. For example, an individual may become infected with COVID-19 if he or she touches a surface contaminated with the virus and then touches his or her own mouth, nose, and/or eyes.

- Evidence suggests that the estimated incubation period for COVID-19 is between two and 14 days with a median of five days. Health care professionals should note that some individuals become infected and do not develop any symptoms or feel ill.

- The potential symptoms of COVID-19 include the following: fever, chills, cough, shortness of breath, aches and pain, fatigue, headaches, nasal congestion, runny nose, sore throat, nausea, vomiting, and diarrhea.

- The diagnostic process for COVID-19 may include the use of a viral test or an antibody test.

- The viral test checks specimens from the nose or mouth (saliva) to determine if an individual is infected with the COVID-19 virus. The two types of viral tests include nucleic acid amplification tests (NAATs) and antigen tests.

    - **Nucleic acid amplification tests (NAATs)** - NAATs detect the COVID-19 virus's genetic material and are commonly used in laboratories.

    - **Antigen tests** - antigen tests detect viral proteins (note: antigen tests may not be as sensitive as NAATs; the results of an antigen test may need to be confirmed with a NAAT).

- Antibody tests, otherwise referred to as serology tests, may be used to determine if an individual was infected with COVID-19 in the past. Essentially, antibody tests assess for the presence of antibodies in the blood to determine if an individual was infected with the COVID-19 virus.

- Viruses constantly change through mutation. Virus mutations lead to variants. Multiple variants of the virus that causes COVID-19 are currently being documented in the United States and throughout the world (note: new variants of the COVID-19 virus are expected to occur; individuals should take steps to reduce the spread of infection, such as getting a COVID-19 vaccine). Specific information regarding the major COVID-19 variants may be found below.

    - Variant B.1.1.7 - variant B.1.1.7 was identified in the United Kingdom (UK) in the Fall of 2020. Variant B.1.1.7 spreads easily and quickly when compared to other COVID-19 variants. Research indicates that variant B.1.1.7 may be associated with an increased risk of death compared to other COVID-19 variants. Health care professionals should note that

variant B.1.1.7 was first detected in the United States at the end of December 2020.

- Variant B.1.351 - variant B.1.351 emerged independently in South Africa. Variant B.1.351 also spreads easily and quickly when compared to other COVID-19 variants. Variant B.1.351 may also be more deadly. Health care professionals should note that variant B.1.351 was detected in the United States at the end of January 2021.

- Variant P.1 - variant P.1 emerged in Brazil, and was first identified in travelers from Brazil, who were tested during routine screening. Variant P.1 contains a set of additional mutations that may affect its ability to be recognized by antibodies. Health care professionals should note that variant P.1 was first detected in the United States at the end of January 2021.

- Delta variant (otherwise referred to as variant B.1.617.2) - the Delta variant was first identified in India. The Delta variant spreads more easily when compared to other variants. The Delta variant may cause more severe COVID-19 cases when compared to other variants. Health care professionals should note the following: breakthrough infections in people who are fully vaccinated are expected, but vaccines are effective at preventing severe illness, hospitalizations, and death; early evidence suggests that fully vaccinated people who become infected with the Delta variant can spread the virus to others; all FDA-approved or authorized vaccines are effective against severe illness, hospitalization, and death; nearly all variants circulating in the United States respond to treatment with FDA-authorized monoclonal antibody treatments.

- Omicron variant (otherwise referred to as variant B.1.1.529) - the Omicron variant was first identified in South Africa. The Omicron variant may spread more easily when compared to other variants, including the Delta variant. Health care professionals should note the following: breakthrough infections in people who are fully vaccinated are expected, but vaccines are effective at preventing severe illness, hospitalizations, and death. Early evidence suggests that fully vaccinated people who become infected with the Omicron variant can spread the virus to others; all FDA-approved or authorized vaccines are expected to be effective against severe illness, hospitalizations, and deaths; the recent emergence of the Omicron variant

further emphasizes the importance of vaccination and boosters; some monoclonal antibody treatments may not be as effective against infection with Omicron.

- The risks of developing problems in pregnancy such as preeclampsia are greater if pregnant women are infected with COVID-19.
- COVID-19 infection increases risk of developing life-threatening preeclampsia and, overall, worsens pregnancy outcomes.
- The risks of having worse effects from COVID-19 are greater if women are pregnant.
- Research presented by the CDC indicates the following: if a woman is pregnant or was recently pregnant, she is more likely to get severely ill from COVID-19 compared to individuals who are not pregnant; pregnancy causes changes in the body that could make it easier to get very sick from respiratory viruses like the one that causes COVID-19; changes in the body can continue after pregnancy.
- Research presented by the CDC indicates the following: individuals with COVID-19 during pregnancy are more likely to experience complications that can affect their pregnancy and developing baby compared to individuals without COVID-19 during pregnancy (e.g., COVID-19 during pregnancy increases the risk of delivering a preterm [earlier than 37 weeks] or stillborn infant); individuals with COVID-19 during pregnancy may also be more likely to have other pregnancy complications (e.g., preeclampsia).
- In 2020 the INTERCOVID study was conducted to evaluate the risks associated with COVID-19 in pregnancy on maternal and neonatal outcomes compared with not-infected, concomitant pregnant individuals. The INTERCOVID study was a cohort study that took place from March to October 2020, involving 2,130 pregnant women in 43 institutions in 18 countries. COVID-19 in pregnancy was determined by laboratory confirmation of COVID-19 and/or radiological pulmonary findings or two or more predefined COVID-19 symptoms. The primary outcome measures of the INTERCOVID study were indices of (maternal and severe neonatal/perinatal) morbidity and mortality; the individual components of these indices were secondary outcomes; models for these outcomes were adjusted for country, month entering study, maternal age, and history of morbidity. The results of the INTERCOVID study included the following: women with COVID-19 diagnosis were at higher risk for preeclampsia/eclampsia, severe

infections, intensive care unit admission, maternal mortality, preterm birth, medically indicated preterm birth, severe neonatal morbidity index, and severe perinatal morbidity and mortality index. The conclusion of the INTERCOVID study indicated the following: in this multinational cohort study, COVID-19 in pregnancy was associated with consistent and substantial increases in severe maternal morbidity and mortality and neonatal complications when pregnant women with and without COVID-19 diagnosis were compared; the findings should alert pregnant individuals and clinicians to implement strictly all the recommended COVID-19 preventive measures.

- The American College of Obstetricians and Gynecologists and the Society for Maternal Fetal Medicine (SMFM) indicate that vaccination is the best method to reduce maternal and fetal complications of SARS-CoV-2 infection.
- COVID-19 vaccination is recommended for all individuals 12 years and older, including individuals who are pregnant, breastfeeding, trying to get pregnant now, or might become pregnant in the future.
- Research presented by the CDC indicates the following: no unexpected pregnancy or infant outcomes have been observed related to COVID-19 vaccination during pregnancy.
- Research presented by the NIH indicates the following: a study that used data from three vaccine safety reporting systems in the United States reported that the frequency of adverse events among 35,691 vaccine recipients who identified as pregnant was similar to the frequency observed among nonpregnant patients; local injection site pain, nausea, and vomiting were reported slightly more frequently in pregnant individuals than in nonpregnant individuals; other systemic reactions were reported more frequently among nonpregnant vaccine recipients, but the overall reactogenicity profile was similar for pregnant and nonpregnant patients; surveillance data from 3,958 pregnant patients who were enrolled in CDC's v-safe Vaccine Pregnancy Registry showed that, among 827 people who completed their pregnancies, there were no obvious safety signals among obstetric or neonatal outcomes when rates of pregnancy loss (spontaneous abortion or stillbirth), preterm birth, congenital anomalies, infants who were small for gestational age, and neonatal death were compared to historic incidences in the peer-reviewed literature (NIH, 2021).

- The following vaccines are currently available for the prevention of COVID-19: the Pfizer-BioNTech COVID-19 vaccine, the Moderna COVID-19 vaccine, and the Johnson & Johnson's Janssen vaccine (note: the aforementioned COVID-19 vaccines are authorized or approved for use in the United States to prevent COVID-19; Pfizer-BioNTech or Moderna COVID-19 mRNA vaccines are preferred; vaccines reduce the risk of severe illness, hospitalization, and death from COVID-19). Specific information regarding the aforementioned vaccines may be found below.
    - Pfizer-BioNTech COVID-19 vaccine
        - Recommended for individuals five plus years old.
        - Primary Series - two doses given three weeks (21 days) apart.
        - Booster dose - individuals ages 18 years and older should receive a booster dose of either the Pfizer-BioNTech or Moderna COVID-19 vaccine five months after the last dose in their primary series; teens 12 - 17 years old should get a Pfizer-BioNTech COVID-19 vaccine booster five months after the last dose in their primary series.
        - When are individuals fully vaccinated - individuals who receive the Pfizer-BioNTech COVID-19 vaccine are fully vaccinated two weeks after the second dose.
    - Moderna COVID-19 vaccine
        - Recommended for individuals 18 plus years old.
        - Primary Series - two doses given four weeks (28 days) apart.
        - Booster Dose - individuals ages 18 years and older should receive a booster dose of either the Pfizer-BioNTech or Moderna COVID-19 vaccine five months after the last dose in their primary series.
        - When are individuals fully vaccinated - individuals who receive the Moderna COVID-19 vaccine are fully vaccinated two weeks after the second dose.
    - Johnson & Johnson's Janssen vaccine
        - Recommended for individuals 18 plus years old.

    - Primary Series - one dose.
    - Booster Dose - individuals ages 18 years and older should receive a booster dose of either the Pfizer-BioNTech or Moderna COVID-19 vaccine at least two months after the first dose of the Johnson & Johnson's Janssen COVID-19 vaccine.
    - When are individuals fully vaccinated - individuals who receive the Johnson & Johnson's Janssen vaccine are fully vaccinated two weeks after the first dose.

- To provide further protection against COVID-19, pregnant women should be advised to wear the most protective mask that fits well.
- To provide further protection against COVID-19, pregnant women should receive the following information: masking is a critical public health tool for preventing spread of COVID-19, and it is important to remember that any mask is better than no mask; to protect oneself and others from COVID-19, the CDC continues to recommend that individuals wear the most protective mask they can that fits well and that they will wear consistently; masks and respirators are effective at reducing transmission of SARS-CoV-2, the virus that causes COVID-19, when worn consistently and correctly; some masks and respirators offer higher levels of protection than others, and some may be harder to tolerate or wear consistently than others (note: a respirator may refer to a personal protective device that is worn on the face or head and covers at least the nose and mouth); it is important to wear a well-fitting mask or respirator correctly; while all masks and respirators provide some level of protection, properly fitting respirators provide the highest level of protection; wearing a highly protective mask or respirator may be most important for certain higher risk situations, or by some people at increased risk for severe disease.
- To provide further protection against COVID-19, pregnant women should receive the following information: when choosing a mask, individuals should look at how well it fits; gaps can let air with respiratory droplets leak in and out around the edges of the mask.
- To provide further protection against COVID-19, pregnant women should receive the following information: when choosing a respirator, individuals should look at how well it fits and read the manufacturer's instructions; instructions should include information on how to wear, store, and clean or properly dispose of the

respirator; it is important to wear respirators properly, so it forms a seal to the face; most publicly available respirators are disposable and should be discarded when they are dirty, damaged, or difficult to breathe through.

- To provide further protection against COVID-19, pregnant women should be advised to engage in effective hand hygiene; hand hygiene may refer to a process of cleaning the hands in order to prevent contamination and/or the spread of infectious agents (e.g., viruses); effective hand hygiene occurs when dirt, soil, microorganisms, and other contaminants are removed from the hands; effective hand hygiene may include hand washing with soap and water, and hand sanitizing with an alcohol-based handrub.

- Health care professionals can prevent the transmission of the virus that causes COVID-19 by utilizing standard precautions; standard precautions may refer to infection control practices that may be used to prevent the transmission of diseases; the minimum infection prevention practices that apply to all patient care.

- Health care organizations and health care professionals can prevent the transmission of the virus that causes COVID-19 by developing and adhering to COVID-19 policies and procedures. COVID-19-related policies and procedures may include the following components: a process for ensuring all staff (except for those staff who have pending requests for, or who have been granted, exemptions to the vaccination requirements, or those staff for whom COVID-19 vaccination must be temporarily delayed, as recommended by the CDC, due to clinical precautions and considerations) have received, at a minimum, a single-dose COVID-19 vaccine, or the first dose of the primary vaccination series for a multi-dose COVID-19 vaccine prior to staff providing any care, treatment, or other services to patients; a process for ensuring that all staff are fully vaccinated, except for those staff who have been granted exemptions to the vaccination requirements, or those staff for whom COVID-19 vaccination must be temporarily delayed, as recommended by the CDC, due to clinical precautions and considerations; a process for ensuring the implementation of additional precautions, intended to mitigate the transmission and spread of COVID-19, for all staff who are not fully vaccinated for COVID-19; a process for tracking and securely documenting the COVID-19 vaccination status of all staff; a process for tracking and securely documenting the COVID-19 vaccination status of any staff who have obtained any booster doses as recommended by the CDC; a process by

which staff may request an exemption from the staff COVID-19 vaccination requirements based on an applicable federal law; a process for tracking and securely documenting information provided by those staff who have requested, and for whom the health care facility has granted, an exemption from the staff COVID-19 vaccination requirements; a process for ensuring that all documentation, which confirms recognized clinical contraindications to COVID-19 vaccines and which supports staff requests for medical exemptions from vaccination, has been signed and dated by a licensed practitioner, who is not the individual requesting the exemption, and who is acting within their respective scope of practice as defined by, and in accordance with, all applicable State and local laws, and for further ensuring that such documentation contains: all information specifying which of the authorized COVID-19 vaccines are clinically contraindicated for the staff member to receive and the recognized clinical reasons for the contraindications; and a statement by the authenticating practitioner recommending that the staff member be exempted from the health care facility's COVID-19 vaccination requirements for staff based on the recognized clinical contraindications; a process for ensuring the tracking and secure documentation of the vaccination status of staff for whom COVID-19 vaccination must be temporarily delayed, as recommended by the CDC, due to clinical precautions and considerations, including, but not limited to, individuals with acute illness secondary to COVID-19, and individuals who received monoclonal antibodies or convalescent plasma for COVID-19 treatment; and contingency plans for staff who are not fully vaccinated for COVID-19 (Code of Federal Regulations, 2022).

In addition to the aforementioned information, health care professionals should note COVID-19 treatment recommendations and the key considerations for the care of pregnant women, which may be found below. The information found below was derived from materials provided by the NIH (NIH, 2021).

- Treatment options for COVID-19 include medications (e.g., acetaminophen; ibuprofen; sotrovimab) and supportive care.
- The COVID-19 Treatment Guidelines Panel recommends the following: management of nonhospitalized patients with acute COVID-19 should include providing supportive care, considering the use of COVID-19-specific therapy for patients who have a high risk for disease progression, taking steps to reduce the

risk of SARS-CoV-2 transmission (e.g., isolating patients), and advising patients on when to contact a health care professional and seek an in-person evaluation.

- The COVID-19 Treatment Guidelines Panel recommends the following: when possible, patients with symptoms of COVID-19 should be triaged via telehealth visits to determine whether they require COVID-19-specific therapy and in-person care (note: telehealth may refer to the use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health, and health administration).

- The COVID-19 Treatment Guidelines Panel recommends using a single intravenous infusion of sotrovimab 500 mg, administered as soon as possible and within 10 days of symptom onset, to treat nonhospitalized patients (aged ≥12 years and weighing ≥40 kg) with mild to moderate COVID-19 who are at high risk of clinical progression, as defined by criteria in the Food and Drug Administration (FDA) Emergency Use Authorization (EUA) for the product.

- Health care professionals should note the following: antiviral medications reduce the ability of a virus to multiply and spread through the patient's body; monoclonal antibody treatments may help the immune system recognize and respond more effectively to the SARS-CoV-2 virus; oral antiviral medications that target specific parts of the SARS-CoV-2 virus can help reduce its multiplication and spread through a patient's body.

- Pregnant individuals should be counseled about the increased risk for severe disease from SARS-CoV-2 infection and receive recommendations on ways to protect themselves and their families from infection.

- If hospitalization for COVID-19 is indicated for a pregnant patient, care should be provided in a facility that can conduct maternal and fetal monitoring, when appropriate.

- Management of COVID-19 in pregnant patients should include: fetal and uterine contraction monitoring based on gestational age, when appropriate; individualized delivery planning; a multispecialty, team-based approach that may include consultation with obstetric, maternal-fetal medicine, infectious disease, pulmonary-critical care, and pediatric specialists, as appropriate.

- In general, the therapeutic management of pregnant patients with COVID-19 should be the same as for nonpregnant patients. The COVID-19 Treatment Guidelines Panel recommends against withholding treatment for COVID-19 and SARS-CoV-2 vaccination from pregnant or lactating individuals because of theoretical safety concerns.
- Pregnant or lactating patients with COVID-19 and their clinical teams should discuss the use of investigational drugs or drugs that are approved for other indications as treatments for COVID-19; during this shared decision-making process, the patient and the clinical team should consider the safety of the medication for the pregnant or lactating individual and the fetus and the severity of maternal disease.
- The decision to feed the infant breast milk while the patient is receiving therapeutic agents for COVID-19 should be a collaborative effort between the patient and the clinical team, including infant care providers; the patient and the clinical team should discuss the potential benefits of the therapeutic agent and evaluate the potential impact of pausing lactation on the future of breast milk delivery to the infant.
- Managing pregnant outpatients with COVID-19 is similar to managing nonpregnant patients; health care professionals should offer supportive care, take steps to reduce the risk of SARS-CoV-2 transmission, and provide guidance on when to seek an in-person evaluation.
- In pregnant patients, SpO_2 should be maintained at 95% or above on room air at sea level; therefore, the threshold for monitoring pregnant patients in an inpatient setting may be lower than in nonpregnant patients; in general, there are no changes to fetal monitoring recommendations in the outpatient setting, and fetal management should be similar to the fetal management used for other pregnant patients with medical illness; however, these monitoring strategies can be discussed on a case-by-case basis with an obstetrician; pregnant and lactating patients should be given the opportunity to participate in clinical trials of outpatients with COVID-19 to help inform decision-making in this population.
- When possible, patients with symptoms of COVID-19 should be triaged via telehealth visits to determine whether they require COVID-19-specific therapy and in-person care; outpatient management may include the use of patient self-assessment tools; during initial triage, health care professionals should determine

which patients are eligible to receive supportive care at home and which patients warrant an in-person evaluation; local emergency medical services, if called by the patient, may also be of help in deciding whether an in-person evaluation is indicated; patient management plans should be based on the patient's vital signs, physical exam findings, risk factors for progression to severe illness, and the availability of health care resources.

- All patients with dyspnea, oxygen saturation (SpO_2) ≤94% on room air at sea level (if this information is available), or symptoms that suggest higher acuity (e.g., chest pain or tightness, dizziness, confusion or other mental status changes) should be referred for an in-person evaluation by a health care professional; the criteria used to determine the appropriate clinical setting for an in-person evaluation may vary by location and institution; it may also change over time as new data and treatment options emerge; there should be a low threshold for in-person evaluation of individuals with medical conditions that are associated with a risk of progression to severe COVID-19; the health care professionals who perform the initial triage should use their clinical judgment to determine whether a patient requires ambulance transport.
- All outpatients should receive instructions regarding self-care, isolation, and follow-up, and should be advised to contact a health care professional or a local emergency department for any worsening symptoms.

Section 3 Summary

The third essential element of effective preeclampsia care is to possess insight into COVID-19, and the potential impact of COVID-19 on preeclampsia and pregnancy. Health care professionals should note the following: the risks of developing problems in pregnancy such as preeclampsia are greater if pregnant women are infected with COVID-19. Health care professionals should also note the following: pregnant individuals should be counseled about the increased risk for severe disease from SARS-CoV-2 infection and receive recommendations on ways to protect themselves and their families from infection; the therapeutic management of pregnant patients with COVID-19 should be the same as for nonpregnant patients; the COVID-19 Treatment Guidelines Panel recommends against withholding treatment for COVID-19 and SARS-CoV-2 vaccination from pregnant or lactating individuals because of theoretical safety concerns.

Section 3: Key Concepts

- The third essential element of effective preeclampsia care is to possess insight into COVID-19, and the potential impact of COVID-19 on preeclampsia and pregnancy.

Section 3 Key Terms

Coronavirus disease 2019 (COVID-19) - a respiratory illness that can spread from person to person that is caused by a virus known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)

Person-to-person contact - the transmission of a communicable disease/illness from a host to a healthy individual by way of body fluids

Respirator - a personal protective device that is worn on the face or head and covers at least the nose and mouth

Hand hygiene - a process of cleaning the hands in order to prevent contamination and/or the spread of infectious agents

Standard precautions - infection control practices that may be used to prevent the transmission of diseases; the minimum infection prevention practices that apply to all patient care

Telehealth - the use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health, and health administration

Section 3 Personal Reflection Question

How can health care professionals work to prevent the transmission of the COVID-19 virus to pregnant patients?

Conclusion

Preeclampsia may refer to a condition characterized by high blood pressure, which typically occurs after the 20th week of pregnancy. The three essential elements of effective preeclampsia care include the following: possess insight into preeclampsia and related concepts; work to prevent and treat preeclampsia; and possess insight into

COVID-19, and the potential impact of COVID-19 on preeclampsia and pregnancy. Finally, health care professionals should work to observe and monitor pregnant individuals for preeclampsia in order to optimize patient care.

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