

Chronic Conditions in Pregnancy

Optimizing Care to Lower Morbidity and Mortality

KAREN CARLSON MD, FACOG, AOA
ASSOCIATE PROFESSOR & VICE CHAIR OF STUDENT/OUTREACH EDUCATION
DEPARTMENT OF OB-GYN AT UNMC AND NE MEDICINE
NPQIC MEMBER/ACOG AIM REPRESENTATIVE
NEBRASKA SEVERE MATERNAL MORBIDITY COMMITTEE
QUALITY TRIAD COUNSEL MEMBER
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Objectives

- Discuss common chronic conditions in pregnancy
 1. Obesity
 2. Diabetes
 3. Hypertension
- Review how these conditions impact the morbidity and mortality of pregnancy
- Analyze the optimal care of these conditions before and during pregnancy

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Definition

- **Severe maternal morbidity**
 - Unexpected outcomes of labor and delivery
 - Significant resulting consequences to a woman's health
 - Long or short-term
 - Merit quality review
- Increasing prevalence of SMM

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Obesity

- How does obesity impact the morbidity and mortality of pregnancy?
- What is the optimal care of obesity before and during pregnancy?

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Obesity in Pregnancy

- Definition is BMI \geq 30
- $\frac{1}{2}$ of women of childbearing age are overweight or obese
- Higher prevalence
 - Low-income populations
 - Non-Hispanic black women (57 %)
 - Older maternal age
 - Higher parity
- Lower prevalence
 - Non-Hispanic Asian women (17 %)
 - Non-Hispanic White women
- Pre-pregnancy obesity in US increasing
 - 2016 US had 26% obese pre-pregnancy
 - 2019 US had 29% obese pre-pregnancy

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Obesity in Pregnancy

- Growing challenge for obstetrical providers
- Associated with severe maternal and perinatal morbidity and mortality
 - Gestational diabetes
 - 6.3% in obese and 9.5% in morbidly obese
 - Gestational hypertension
 - Preeclampsia
 - Risk doubled with each 5-7kg/m² increase from pre-pregnancy BMI
 - Stroke
 - Obstructive sleep apnea (20 % of pregnant patients)
- Antenatal, intrapartum, and postpartum complications

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New York Times



Jennifer S. Altman for The New York Times

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Obesity in Pregnancy

- Antepartum complications
 - Higher miscarriage rates
 - Challenging to screen for anomalies
 - Higher incidence of fetal anomalies
 - Cardiac
 - Neural tube defects
 - Spina bifida
 - Orofacial
 - Hydrocephaly
 - Anorectal atresia
 - Limb reduction defects
 - Challenging fetal surveillance
- Antepartum complications
 - Cardiac dysfunction
 - Proteinuria
 - Nonalcoholic fatty liver
 - Sleep apnea
 - Stillbirth
 - Proportional increases
 - DM
 - Preeclampsia

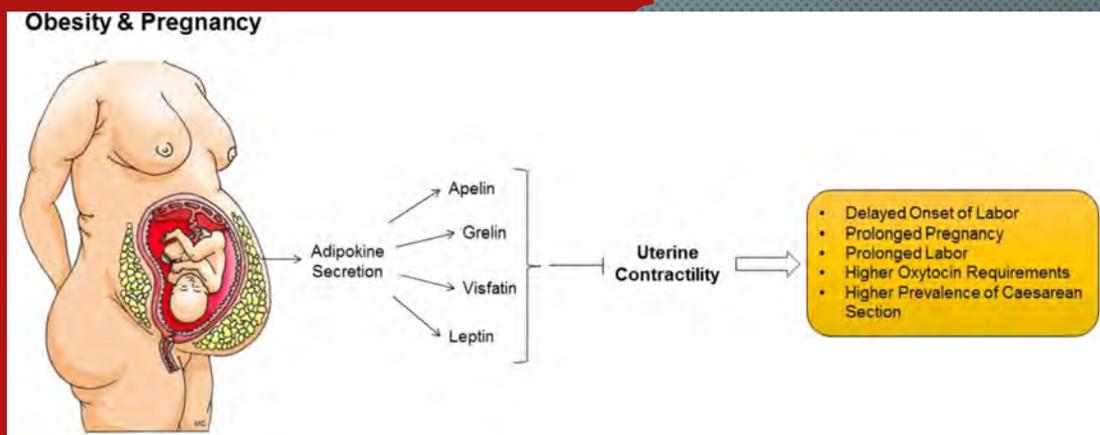
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Obesity in Pregnancy

- Intrapartum complications
 - More doses of ripening agents
 - Higher doses of oxytocin
 - Difficulty monitoring in labor
 - Prolonged labor
 - More failed inductions
 - Shoulder dystocia
 - Increased operative deliveries
 - Increased cesarean deliveries
 - Anesthesia complications
 - Impaired respiratory function with spinal
 - Up to 2 hours after procedure
 - Endometritis
 - TOLAC
 - 2X increase morbidity
 - 5X increase in neonatal injury

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Obesity in Pregnancy



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Obesity in Pregnancy

- Postpartum complications
 - Postpartum hemorrhage
 - Puerperal pyrexia
 - Sepsis risk 3.6 vs 2.0 per 10,000 in normal weight
 - Venous thromboembolism
 - Weight-based dosage of enoxaparin (0.5 mg/kg every 12 hours)
 - Longer hospital stay
 - Wound dehiscence
 - Infection
 - Surgical site
 - Wound
 - Early termination of breast feeding
 - Anemia
 - Postpartum depression



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Obesity in Pregnancy

- Increased fetal complications
 - Macrosomia
 - Unexplained stillbirth
 - Increase in prolonged pregnancy
 - More labor inductions
 - NICU admission
 - Neonatal death
 - More twins
 - Higher NIPT test failures (decreased fetal fraction)
- Higher miscarriage rates
 - 4-fold increase in miscarriage with fertility treatment

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Obesity in Pregnancy

- 2020-2025 Dietary Guidelines for Americans
 - Recommends people achieve healthy weight before pregnancy
- 40% of women are at a healthy weight in 2020
- Weight loss before pregnancy is recommended for obese women
 - Supported by FIGO and ACOG
 - Improve pregnancy outcomes
- Weight loss postpartum is also recommended
 - Minimize cumulative weight gain
 - Minimize complications in subsequent pregnancies

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Obesity in Pregnancy

- Healthy lifestyle lowers risks
 - Birth defects
 - Suboptimal fetal development
 - Chronic health problems of mother and child
- Ideally, goal is to achieve healthy weight **BEFORE PREGNANCY**
 - Losing 5-10% of body weight over 6 months is realistic target

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Diet Quality

- Obese women typically have low diet quality
 - Nutritionally compromised before pregnancy
 - Consume 10% more empty calories than normal weight women
- Interventions are needed to improve diet quality pre-pregnancy
 - Beneficial to placenta and fetus
 - Better obstetrical outcomes
 - Improved perinatal survival
 - Decreased risk of preterm birth, HTN, and DM
 - Better long-term health
- Can use FIGO Nutrition Checklist to evaluate nutritional adequacy
 - Pregnant women fall short of recommendations
 - Vegetables, fruits, whole grains, dairy, and seafood
 - Overconsume sodium, saturated fat, and added sugars

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Preconception Dieting

- Severe dieting around conception (within 3 months)
 - Not recommended
 - Severe fat restrictions
 - Intermittent fasting
 - Cleanses and detox
 - Nutrient deficiencies
 - Adverse pregnancy outcomes
- Low carbohydrate diets not recommended before conception
 - Limits intake of folic acid
 - 30% increase in neural tube defects
 - High in saturated fat and may increase fetal macrosomia
- Vegetarian diets
 - May be low in folate, B12, iron, and zinc
 - Lowers risk of excessive weight gain
 - Lowers risk of gestational DM

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Bariatric Surgery

- Bariatric surgery before pregnancy
 - Reduced obesity related comorbidities and complications
 - Improves pregnancy outcomes
- Increased risk
 - Fetal growth restriction and SGA infants
 - Malnutrition
 - Preterm birth
 - Congenital abnormalities
 - Perinatal mortality
- Postpone pregnancy until a stable weight is achieved
 - 1 year after sleeve gastrectomy
 - 1 year after Roux-en-Y bypass
 - 2 years after adjustable gastric band procedure

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Weight Loss in Pregnancy

- Weight loss during pregnancy
 - Lower risk of fetal macrosomia and large infants
 - Lower risk of cesarean delivery
 - Higher risk of low birth weight
 - No benefits to reduce preeclampsia or DM
 - May increase preterm delivery
 - Increase ketones and thus adverse events
 - Stillbirth
 - Weight gain of 5-9 kg during pregnancy recommended

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Weight loss postpartum

- Weight loss postpartum
 - During lactation
 - 0.5 kg weight loss per week for 4 months
 - Consumption of at least 1800 calories per day
 - Goal to return to pre-pregnancy weight

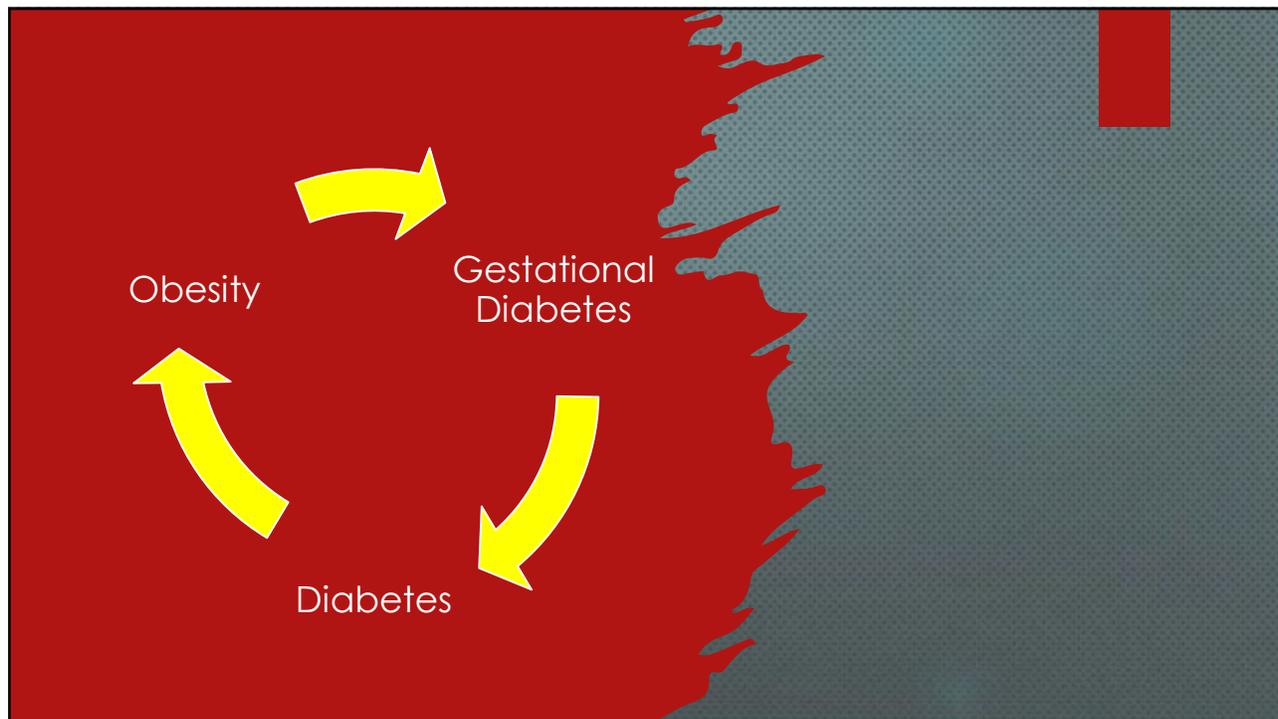
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Diabetes in Pregnancy

- ★ Diabetes affects 1 in 6 pregnancies worldwide



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Incidence of Diabetes in Pregnancy

- AJOG 2000 – 2019
- 76.7 million delivery hospitalizations
 - 179,885 had Type 1 diabetes
 - 430,544 had Type 2 diabetes
 - 99,327 had unspecified diabetes
 - Prevalence of Type 2 diabetes increased from 1.8 to 7.3 per 1000 deliveries
 - Prevalence of unspecified DM from 1.5 to 3.2 per 1000
 - Chronic DM complications increased from 2.7% to 5.6%

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Diabetes in Pregnancy

- AJOG 2000 – 2019
- Pregestational DM was associated with severe maternal morbidity
 - Cesarean delivery
 - Hypertensive disorders of pregnancy
 - Preterm birth
 - Stillbirth
 - Macrosomia
 - Cardiac and non-cardiac congenital defects
 - Shoulder dystocia
 - **Goal of hgb a1c 6.5 at conception**
- Conclusion
 - Pregestational DM increasing due to quadrupling of prevalence of Type 2 DM
 - Prevalence of chronic DM complications doubled
 - **Optimizing diabetes care in childbearing age is a major public health importance**

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Diabetes Before Pregnancy

- Half of all pregnancies are not planned
 - Folic acid 1 month prior to pregnancy
 - Neural tube development occurs within 1st month after conception
 - Screen for retinopathy and nephropathy
 - Dietician consultation

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Diabetes in Pregnancy

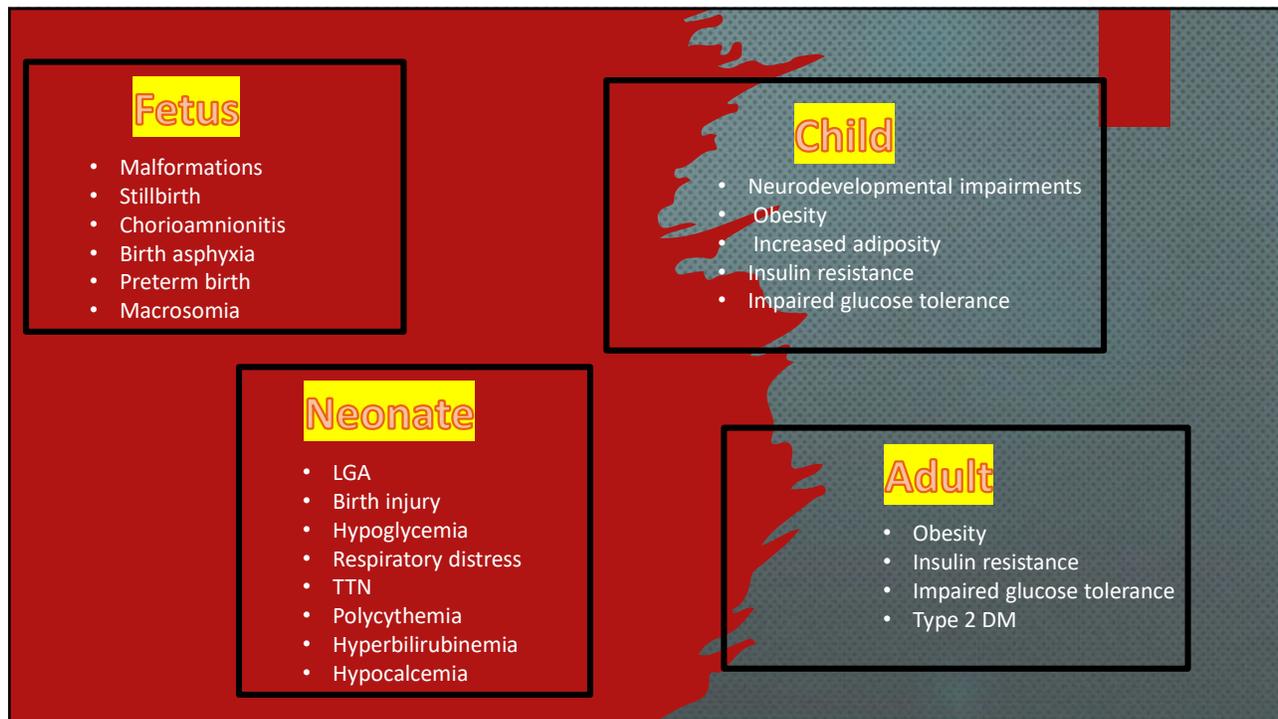
- Risk factors for gestational diabetes
 - Overweight
 - Excessive gestational weight gain
 - Westernized diet
 - High in saturated fat
 - High in processed and red meat
 - High in refined sugars
 - Ethnicity
 - Advanced maternal age
 - Family history of diabetes
 - Personal history of gestational diabetes
 - Insulin resistance (PCOS)

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Gestational Diabetes

- Gestational diabetes
 - Adverse pregnancy outcomes higher than general population
 - 95% increase in cost per pregnancy (over \$5 billion internationally annually)
 - GDM treatment clearly reduces adverse pregnancy outcomes
 - Early screening and treatment before 20 weeks is controversial. Expert opinion recommendation.
 - Impact on long-term offspring outcomes remains to be determined
 - Multiple criteria for diagnosing GDM are acceptable in US
 - WHO has adopted one step approach
 - Higher prevalence of GDM
 - Higher costs of providing treatment
 - Lack of data showing benefit
 - ACOG continues to recommend two step approach
 - Additional increased risk with only elevated fasting on 3 hour
 - Perinatal and long-term offspring outcomes are directly related to glycemic control during pregnancy

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Gestational Diabetes

- Gestational diabetes
 - Optimizing diagnosis and treatment
 - Prevent adverse metabolic outcomes in offspring
 - Elevated obesity risk due to genetics
 - Treatment
 - Nutritional therapy and exercise (GDMA1)
 - 80-90% of patients meet target glucose goals
 - Fasting and 1- or 2-hour postprandial blood sugars
 - 2017 CONCEPTT study of CGM
 - Useful tool with pregestational diabetes
 - Decrease hgb a1c at 34 weeks
 - Less LGA infants



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Gestational Diabetes

- Treatment
 - Nutritional therapy and exercise (GDMA1)
 - Decreased risk of macrosomia
 - Decreased neonatal adiposity
 - Increased likelihood to achieve postpartum weight goals
 - 30 grams carb breakfast then 45-60 grams at lunch and dinner
 - 2-3 snacks
 - Bedtime snack helps counteract ketosis from overnight fasting
 - 2 meal replacements per day showed initial good results
 - Medication (GDMA2)
 - Women who need medication have more adverse outcomes (higher glucose levels)

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- Gestational diabetes treatment
 - **Insulin**
 - Recommended by ACOG and the American Diabetes Association
 - If glycemic goals are not met with diet and exercise
 - Does not cross the placenta to a significant degree
 - Long acting
 - Intermediate acting
 - Rapid acting
 - Weekly or more frequent dose adjustments are made
 - 20-25% of glucose values at a particular time are above target goals
 - **Oral agents**
 - Controversial
 - Long-term data outcomes for offspring are lacking
 - Glyburide
 - Metformin
 - Reasonable alternative to insulin per ACOG and Society of Maternal Fetal Medicine

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Gestational Diabetes

- Gestational diabetes treatment
 - Oral agents
 - Glyburide
 - Significant and highly variable transplacental transfer
 - Similar glycemic control as insulin
 - Recent data concerns about increased risk of macrosomia and neonatal hypoglycemia
 - Long term safety data are lacking
 - Promotes weight gain
 - No studies on safety in pregnancy and not recommended
 - GLP-1 receptor agonists (GLP-1RA)
 - Sodium glucose-cotransporter 2 inhibitors (SGLT-2 inhibitors)
 - Stop 3 months prior to conception

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- Metformin
 - Freely crosses placenta
 - No teratogenic effects
 - Decreases miscarriage rates
 - Well-tolerated with extended release
 - Mixed outcomes compared to insulin
 - Up to one half of women treated with metformin still need insulin therapy
 - Lowers insulin requirements
 - Less maternal weight gain
 - Lower postprandial glucose
 - Less gestational hypertension
 - Less gestational diabetes
 - Long-term effects on childhood development UNCLEAR
 - 2 studies showed children weighed more at 4 and 9 years of age
 - May have less body fat
 - MiTy Trial currently underway
 - RCT looking at perinatal and neonatal outcomes of insulin plus metformin

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- Exercise
 - 30 mins of moderate intensity aerobic exercise at least 5 days per week
 - Exercise improves glycemic control
 - Insulin-sensitizing effects
 - Post-meal walking is frequently recommended
 - Skeletal muscle is the largest mass of insulin sensitive tissue
 - Increased muscle mass helps glycemic control
 - Uptake of glucose into muscles increases
 - Aerobic exercise reduces visceral obesity
 - Combination of exercise may be best
 - Aerobic exercise - more beneficial
 - Resistance exercise - also beneficial
 - Many people falsely believe weight-based exercise is not safe in pregnancy



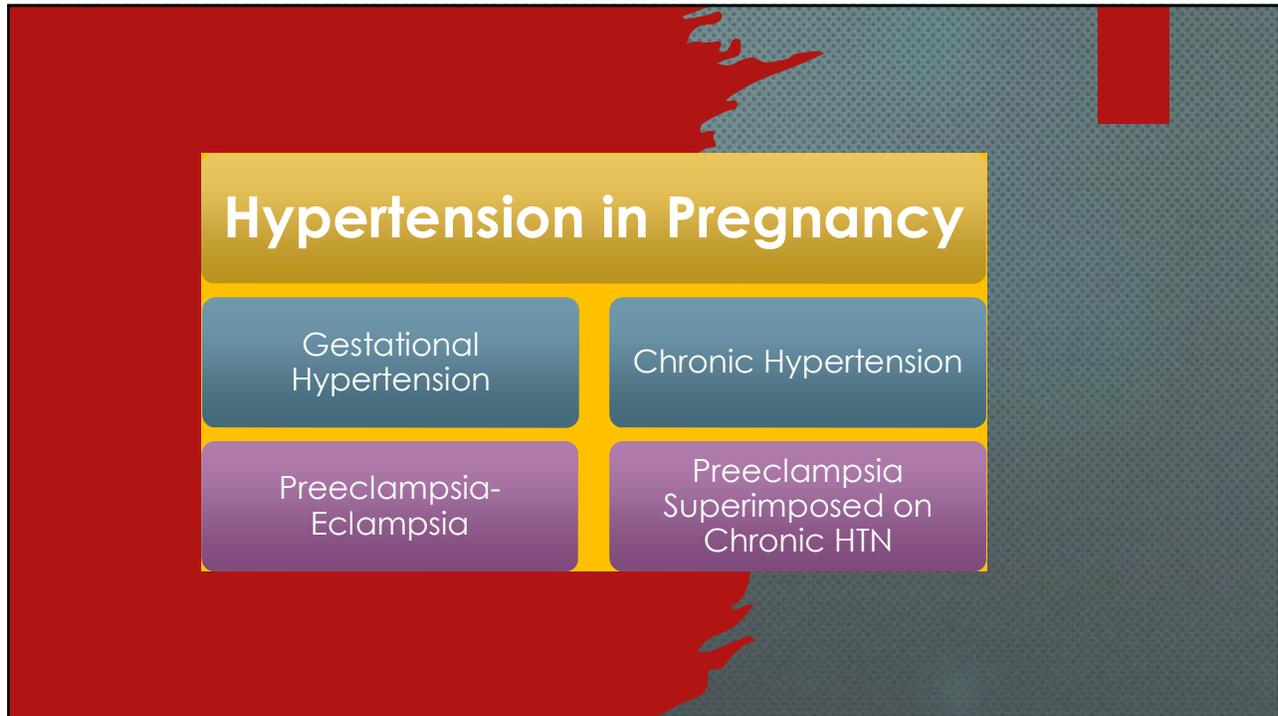
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Hypertension in Pregnancy

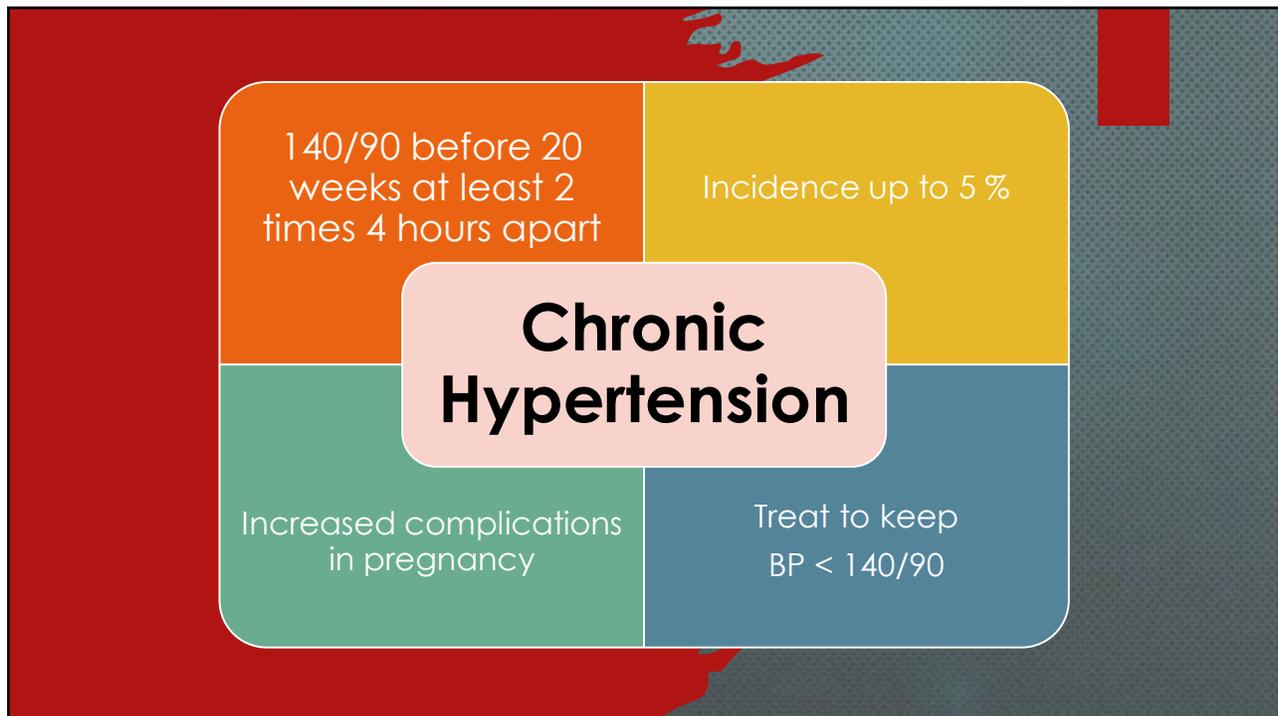


- How does HTN impact the morbidity and mortality of pregnancy?
- What is the optimal care of hypertensive disease before and during pregnancy?

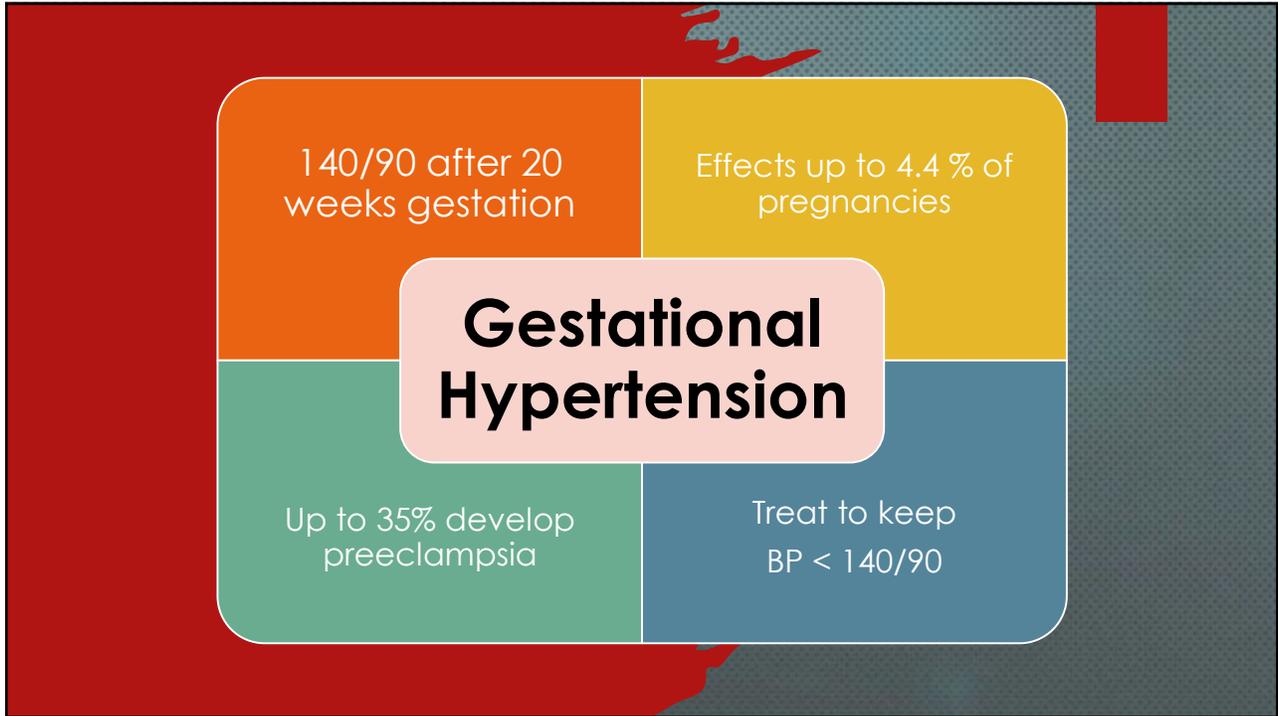
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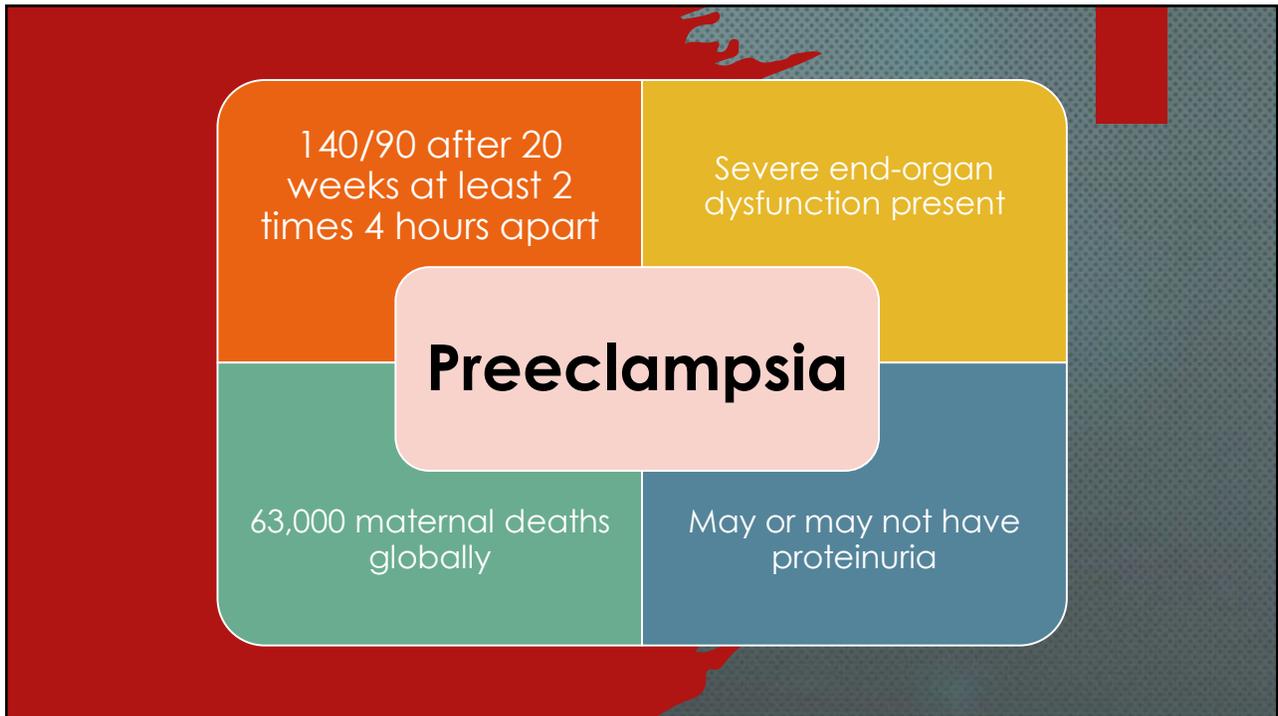
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Hypertension in Pregnancy

- Hypertensive disorders of pregnancy
 - One of the leading causes of maternal and perinatal mortality worldwide
 - Cause of over 500,000 fetal and neonatal deaths per year
 - Cause of over **70,000 maternal deaths** per year
 - Compared to 1980, in 2003 there was a 6.7-fold increased risk of preeclampsia (severe)
 - Pathogenesis of preeclampsia is poorly understood

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- ACOG recommendation level A
 - Any high-risk factor or > 1 moderate risk factor start 81 mg ASA daily between 12-16 weeks
 - ASA modulates platelet function
 - Modulates inflammation
 - Reduces placental dysfunction
- ACOG recommendation level A
 - Gestational hypertension or preeclampsia **WITHOUT** severe features
 - Deliver by **37 0/7** weeks
 - Treat with magnesium in labor if severe range BP
- ACOG recommendations level B
 - Gestational hypertension or preeclampsia **WITH** severe features
 - Deliver by **34 0/7** weeks
 - Treat with magnesium in labor
 - Follow management guidelines for severe preeclampsia remote from term
 - Severe hypertension 160/110
 - Confirmed and persistent at 15 minutes
 - Treat within 30–60 minutes

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One high risk factor

- ✓ Hx preeclampsia
- ✓ Multifetal pregnancy
- ✓ Diabetes
- ✓ Chronic HTN
- ✓ Renal disease
- ✓ Autoimmune disease

More than one moderate risk factor

- ✓ Obesity Over 30 BMI
- ✓ Nulliparous
- ✓ IVF pregnancy
- ✓ Family history of preeclampsia
- ✓ Black race, low income
- ✓ Previous small baby
- ✓ AMA
- ✓ Previous adverse pregnancy outcome

Current recommendations

- ACOG, USPTF, and SMFM
- Low-dose aspirin (81 mg/day)
- Initiated 12 – 16 weeks
- Continued daily until delivery



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Hypertension in Pregnancy/AJOG Special Report/ Sept 2023

- **Care Plan for Individuals at Risk for Preeclampsia**
 - Patients at moderate to high risk for preeclampsia
 - Safe, cost-effective, minimally intrusive
- Ideal management is prevention
 - Treat preconceptually
 - Treat HTN over 140/90
 - Decrease risk and severity of preeclampsia
 - Reduced morbidity for infant
- Assess risk factors
 - Identify patients at risk
 - COVID-19 in pregnancy
 - Vaccinate to prevent
 - Biochemical tests in development to help with this
- Social determinants of health screening
 - Independent risk for preeclampsia

Roberts, James M et al. "Care Plan for Individuals at Risk for Preeclampsia: Shared Approach to Education, Strategies for Prevention, Surveillance, and Follow-Up." *American journal of obstetrics and gynecology*. 229.3 (2023): 193-213. Web

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Plan for Care

- Some practices may consider universal ASA
- Preventive behaviors
 - Nutrition
 - Mediterranean diet
 - Vit D 4000 IU daily
 - Calcium in diet \geq 1000 mg daily
 - If low dietary intake add 500 mg daily
 - Exercise
 - Aerobic and strength
 - Sleep \geq 7 hours per night
- BP checks every 2 weeks until 20 weeks then weekly
 - Home BP monitoring strongly recommended
- Baseline labs
- Baseline cardiac evaluation with ECHO and EKG
 - AMA, obesity, chronic HTN, DM
- Postpartum BP checks daily until 3 week visit

Roberts, James M et al. "Care Plan for Individuals at Risk for Preeclampsia: Shared Approach to Education, Strategies for Prevention, Surveillance, and Follow-Up." *American journal of obstetrics and gynecology*. 229.3 (2023): 193–213. Web

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APPENDIX A
Guidelines for Persons At-Risk for Preeclampsia

If you are at risk for getting preeclampsia, this handout can help you learn what you and your health care provider can do to keep you healthy. The back page of this handout has instructions for how to take your blood pressure and additional resources to learn about preeclampsia.

To discuss with my healthcare provider	To do on my own
<p>Ask your healthcare provider:</p> <ul style="list-style-type: none"> ☐ If you can take low-dose aspirin and when to start during this pregnancy ☐ If exercise is safe for you during this pregnancy ☐ To provide counseling (ideally by a registered dietitian) ☐ If you are concerned you are sleeping too little or too much ☐ If your blood pressure is too high, how can it be better controlled with medications that are safe to take during pregnancy ☐ At what blood pressure value you should report to your health care provider immediately ☐ Discuss local resources that can help you address social challenges that may affect your health care. (for example, reliable transportation) <p>Use your "BRAIN" when evaluating new health information and recommendations:</p> <ul style="list-style-type: none"> ☐ Benefits - What are the benefits to this intervention? ☐ Risks - What are the risks? ☐ Alternatives - What are the alternatives? ☐ Intuition - What does my intuition tell me? ☐ Nothing - What if I do nothing? <p>Use "CDS" words to speak up for yourself:</p> <ul style="list-style-type: none"> ☐ I am Concerned ☐ I am if uncomfortable ☐ I don't feel I am safe 	<p>Check for signs of preeclampsia and know when and how to report them to your provider:</p> <ul style="list-style-type: none"> ☐ Headache that won't go away ☐ Seeing spots or auras ☐ Pain in your upper right abdomen ☐ Nausea/vomiting (2nd half of pregnancy) ☐ Fast weight gain (\geq 5 pounds in a week) ☐ Hard time breathing ☐ Swelling of your face or hands ☐ "Just not feeling right" ☐ Unexplained "anxiety" <p>☐ Take low-dose aspirin every day (81 mg) starting between 12-16 weeks of pregnancy and continued daily until you give birth.</p> <p>☐ Take your blood pressure at home (Use a validated blood pressure cuff to measure your blood pressure one time every 2 weeks until 26 weeks of your pregnancy, then one time every week. Record the results to share with your provider. Immediately report any result of 140/90 mmHg or higher or other value provided by your care provider)</p> <p>☐ Eat a healthy diet: Obtain advice (ideally from a registered dietitian) to learn how to eat to help prevent preeclampsia (including eating a Mediterranean-style diet) and follow the Dietary Guidelines for pregnancy. Have calcium in your diet assessed.</p> <p>☐ Take Vitamin D (800 - 2000) IU (including amount in your prenatal vitamins)</p> <p>☐ If diet assessment determines you have a low calcium intake ($<$ 800 mg/day) consult with your diet counselor to increase calcium intake to 1000 mg/day. If this is not possible, take a calcium supplement of 500 mg/day.</p> <p>☐ Exercise 3-4 sessions between 30-60 minutes each week of moderate aerobic and strength training exercise if your doctor or midwife tells you it's safe.</p> <p>☐ Sleep: Sleep 7 or more hours per night.</p>

Roberts, James M et al. "Care Plan for Individuals at Risk for Preeclampsia: Shared Approach to Education, Strategies for Prevention, Surveillance, and Follow-Up." *American journal of obstetrics and gynecology*. 229.3 (2023): 193–213. Web

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Instructions for *Monitoring Blood Pressure* at Home

- Choose an at-home blood pressure monitoring device**
 - Choose a blood pressure cuff that is approved for use in pregnancy (*see list below)
 - Make sure that the cuff fits your arm size correctly
 - Tip: Have your healthcare provider check your BP cuff to ensure it is sized correctly and takes accurate readings
- Before taking your blood pressure...**
 - Make sure you:
 - don't eat, have caffeine, use tobacco, take medicines, or exercise within 30 minutes of measuring your blood pressure
 - have an empty bladder
 - wear loose clothing with sleeves that can be pushed up to your shoulder easily
- Sit correctly**
 - Rest for 3-5 minutes while:
 - sitting with your back straight and supported (on a dining chair rather than a sofa)
 - your arms are open and not crossed
 - your feet should be flat on the floor and your legs should not be crossed
- Position your arm and cuff**
 - Arm: Your arm should be supported on a flat surface (like a table) with the upper arm at heart level. Always use the same arm.
 - Cuff:
 - Place the bottom of the cuff right above the bend of the elbow. Check your monitor's instructions for a picture or ask your healthcare provider to show you.
 - Do not place the cuff over clothing.
- Take 2 or 3 measurements and write down results**
 - Do not talk when you are measuring your blood pressure
 - Take your blood pressure at about the same time each day
 - Each time you measure, take 2 to 3 readings 1 minute apart and write the numbers down
 - If your monitor has built-in memory to store your readings, take it with you to your appointments

Roberts, James M et al. "Care Plan for Individuals at Risk for Preeclampsia: Shared Approach to Education, Strategies for Prevention, Surveillance, and Follow-Up." *American journal of obstetrics and gynecology*. 229.3 (2023): 193-213. Web

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APPENDIX B

Health Care Provider Guidelines for Care of Individuals at Risk for *Preeclampsia*

The Care Plan for *Individuals at Risk for Preeclampsia* is for pregnant persons considered at risk for preeclampsia at least sufficient to recommend prophylactic aspirin therapy during pregnancy. The following checklist summarizes the Care Plan's recommendations for health care providers.

Antenatal Care

- Identify individual as at-risk for preeclampsia
- Evaluate individuals with prior preeclampsia for post-traumatic stress disorder and provide resources and/or refer for counseling if necessary
- Customize care plan recommendations relative to social determinants of health and individual needs
- Manage pre-existing disorder(s) that increase the risk for preeclampsia
- COVID-19 vaccination or booster is recommended for individuals who are not fully vaccinated
- Recommend self-monitoring of blood pressure at home every 2 weeks until 20 weeks, then weekly until birth or more frequently if indicated
- Provide self-monitoring blood pressure education, cuff size assessment, and access to appropriately-sized, validated cuff

Pharmacologic recommendations

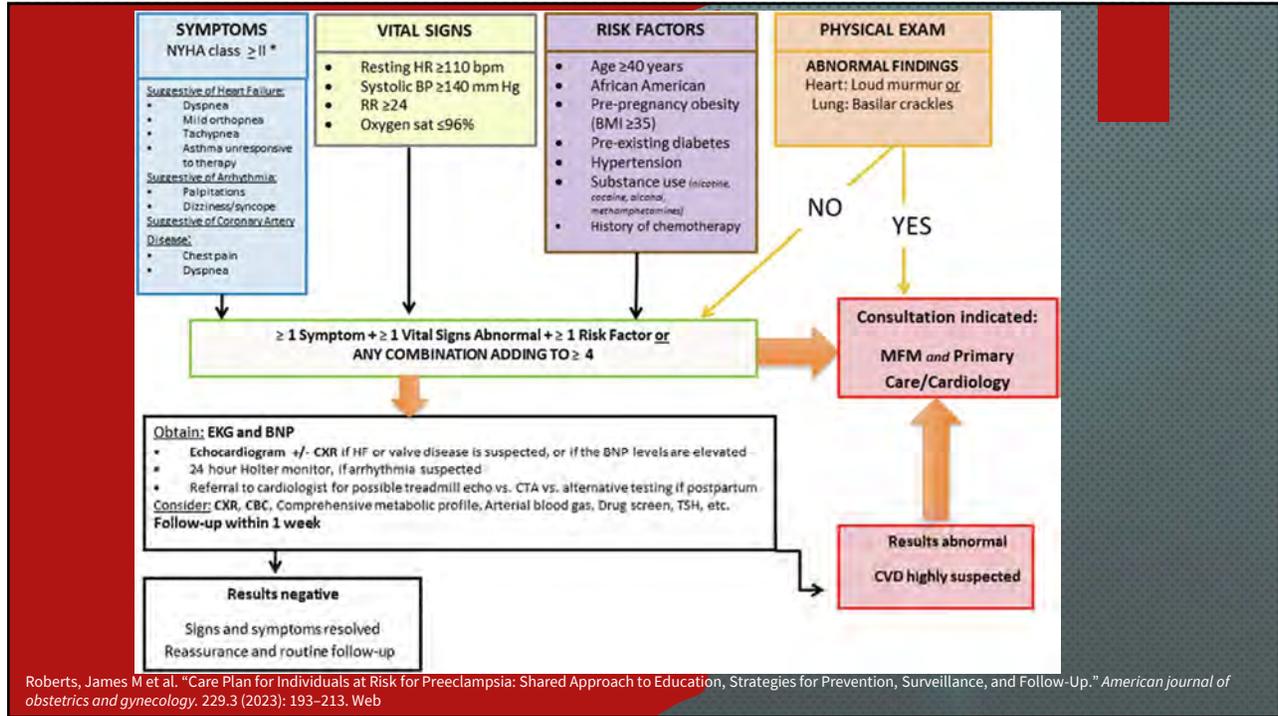
- Initiate low-dose aspirin therapy (81 mg/day) between 12 and 28 weeks' gestation (optimally before 16 weeks weeks. There is reasonable data to support that aspirin doses >100mg may be acceptable alternatives to 81mg.)
- Continue low-dose aspirin therapy until birth or pregnancy cessation
- Provide education and guidance that will support adherence to low-dose aspirin therapy
- For persons with chronic hypertension, administer antihypertensive therapy for BP >160/90 mmHg

Behavioral recommendations

- Diet: Provide counseling and education tailored to individual and caloric needs (registered dietitian or nutritionist if available) including an estimate of calcium intake
- Diet: Refer to WIC (when applicable)
- Diet: Recommend Mediterranean-style diet
- Diet: Recommend 600-2000IU/day vitamin D (including Vitamin D in prenatal vitamins)
- Diet: Recommend diet counseling for calcium deficient individuals (person who consumes <800mg/day) to increase calcium intake to 1000 mg/day. If this is not possible, supplement with 500mg/day
- Exercise: Assess contraindications for exercise
- Exercise: When safe, recommend 3-4 sessions per week, 30-60 minutes each of moderate aerobic and strength training exercise
- Sleep: Recommend at least 7 hours of sleep
- Sleep: For persons with obstructive sleep apnea, continue treatment
- Discontinue smoking and support smoking cessation

Roberts, James M et al. "Care Plan for Individuals at Risk for Preeclampsia: Shared Approach to Education, Strategies for Prevention, Surveillance, and Follow-Up." *American journal of obstetrics and gynecology*. 229.3 (2023): 193-213. Web

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CHIPS and CHAP trials

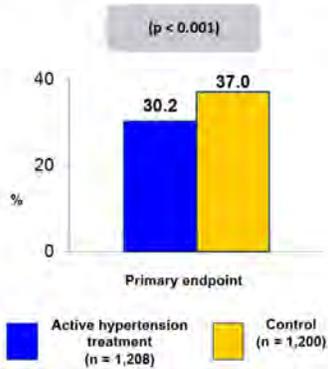
- The Control of HTN in Pregnancy Study (CHIPS)
- Chronic HTN and Pregnancy trial (CHAP) (April 2022) (NEJM)
- CHAP
 - Treatment of chronic hypertension in pregnancy
 - Goal of < 140/90
 - Improved maternal and fetal outcomes
- CHIPS
 - Gestational and chronic hypertension
 - Target DBP 85 mmHg
 - Improved outcomes

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CHAP

#ACC22

Trial Description: Pregnant individuals with mild chronic hypertension were randomized in 1:1 fashion to a blood pressure goal of <140/90 vs. control, where antihypertensive therapy was withheld unless blood pressure was ≥160/105 mm Hg.



RESULTS

- Primary outcome, composite of pre-eclampsia with severe features, medically indicated preterm birth at <35 weeks' gestation, placental abruption, or fetal/neonatal death, for active treatment vs. control: 30.2% vs. 37.0% ($p < 0.001$)
- Safety outcome, small-for-gestational-age birth weight below the 10th percentile for gestational age: 11.2% vs. 10.4% ($p = 0.56$)
- Pre-eclampsia with severe features: 23.3% vs. 29.1%

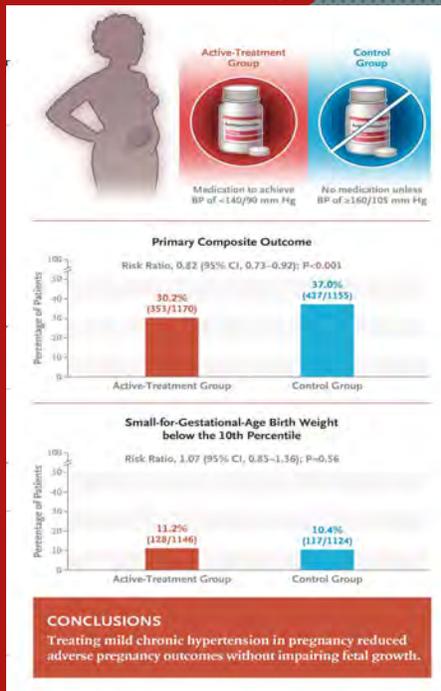
CONCLUSIONS

- Antihypertensive therapy improves pregnancy outcomes among pregnant women with mild chronic hypertension
- Treatment of hypertension improved outcomes without increasing risk for low birth weight

Tita AT, et al. *N Engl J Med* 2022;386:1781-92

Developed by Dr. Neil Keshavan in collaboration with the ACC.org Editorial Board

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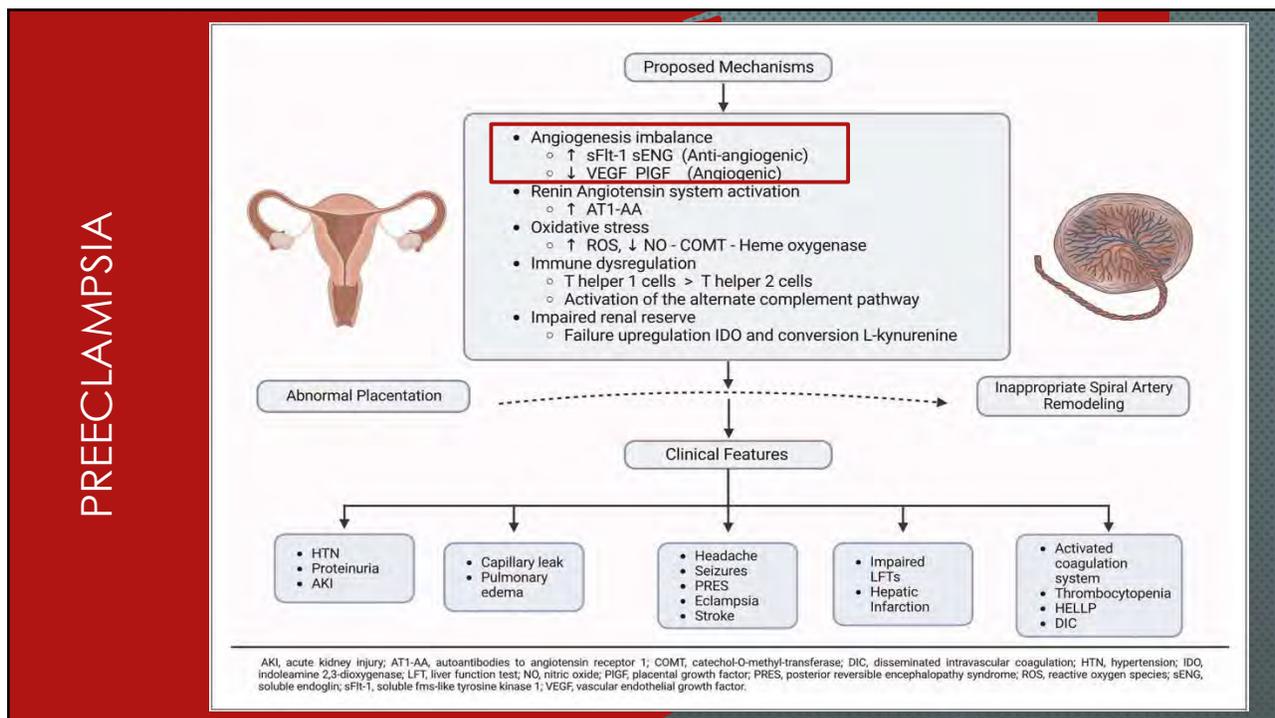
Treatment

- Preferred medications
 - Nifedipine
 - Labetalol
 - Hydralazine
 - Methyldopa

- Agents to avoid
 - Diazoxide
 - Nitroprusside
 - Spironolactone
 - Atenolol
 - ACE inhibitors
 - Angiotensin receptor antagonists (ARB)

- Alternate medications
 - Amlodipine
 - Metoprolol
 - Carvedilol
 - Clonidine
 - Nicardipine
 - Hydrochlorothiazide
 - Furosemide

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Angiogenic Factors as Biomarkers for Preeclampsia with Severe Features

- NEJM Nov 2022
- Angiogenic placental growth factors
 - Tyrosine kinase 1 (sFlt-1)
 - Placental growth factor (PlGF)
- sFlt-1/PlGF ratio of ≤ 38
 - Hospitalized patients 23-35 weeks
 - Rule out preeclampsia in women with suspected pre-eclampsia
 - No preeclampsia in subsequent 1 week
 - NPV of 99.3%
 - Sensitivity (LOW) of 80.0%
 - ACOG does not support use

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Angiogenic Factors as Biomarkers for Preeclampsia with Severe Features

- NEJM Nov 2022
- Placental growth factor (PlGF) <100 pg/ml
 - Helps rule out preeclampsia in women with suspected preeclampsia
 - Before 35 weeks
 - No preeclampsia requiring delivery in subsequent 2 weeks
 - Sensitivity of 96%
 - NPV of 98%
- ACOG does not support use
- No test to "RULE-IN" preeclampsia or predict development

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Predicting preeclampsia

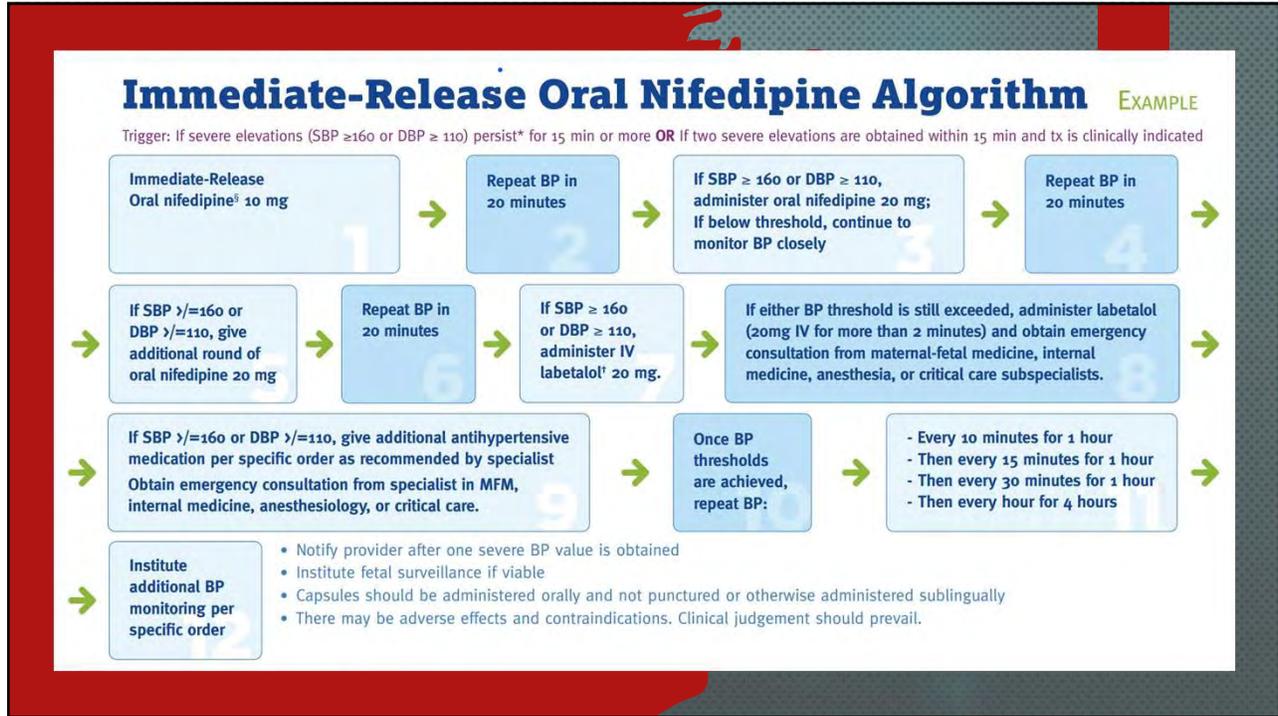
- ACOG does not support in clinical use – still experimental
- Fetal Medicine Foundation
 - Triple test
 - First trimester prediction model for preeclampsia
 - Mean arterial pressure
 - Uterine artery pulsatility index
 - Serum placental growth factor
 - 90% detection of early preeclampsia
 - 75% detection of preterm preeclampsia
 - 10% false positives

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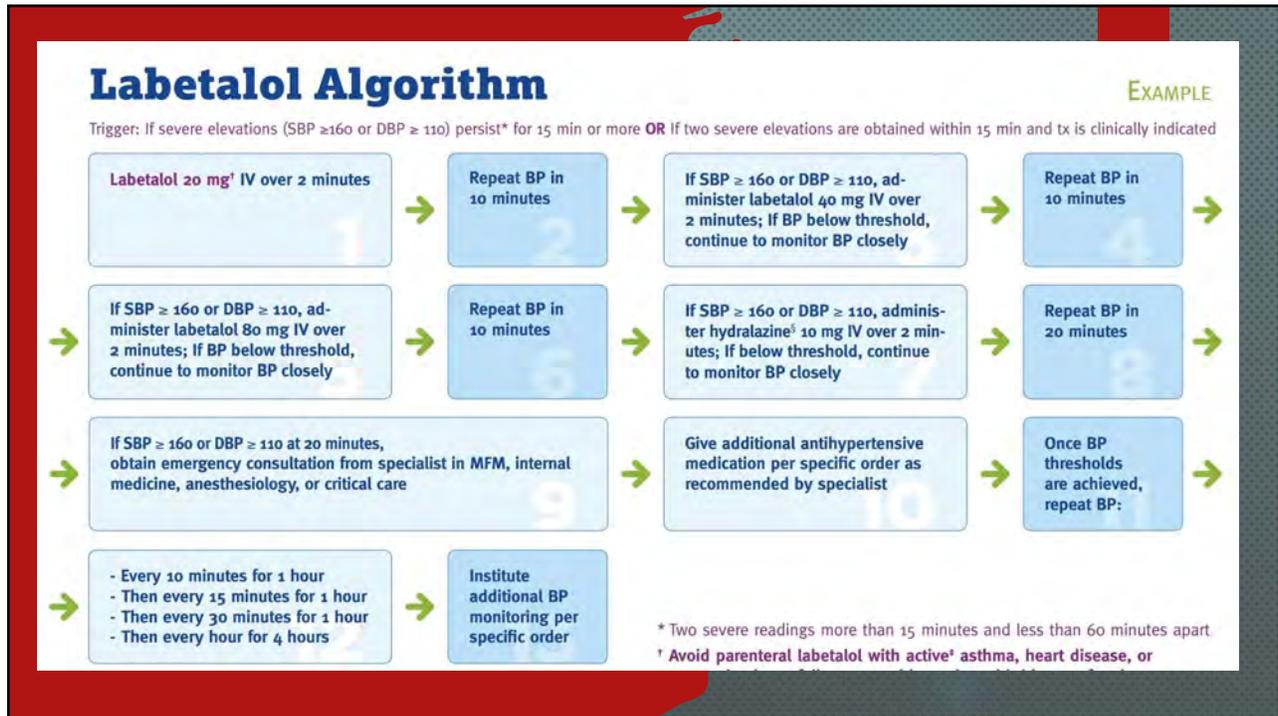
Timely Treatment Severe Range BP

- Administer first line antihypertensive agent
- Timely treatment will decrease the incidence of stroke
- Nifedipine 10 mg orally
 - May repeat every 20 mins if still severe hypertension (10 mg, 20 mg, 20 mg)
- Hydralazine 5-10 mg IV
- Labetalol 20 mg IV

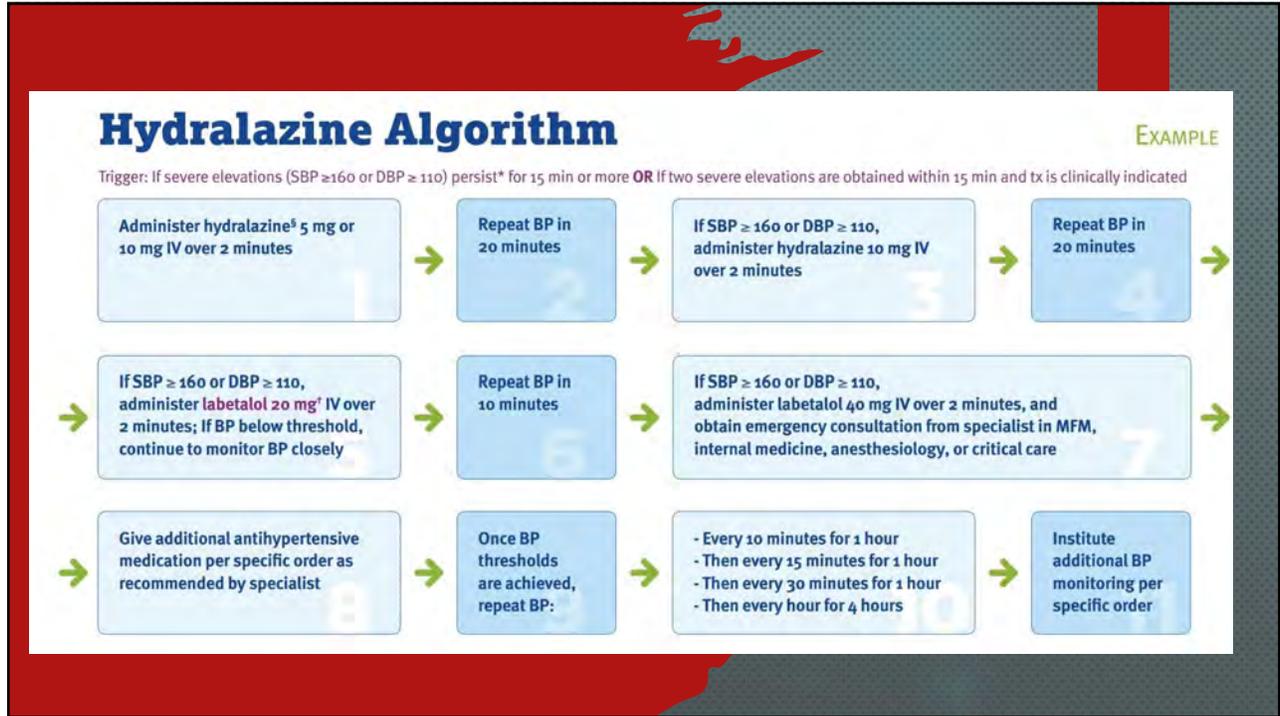
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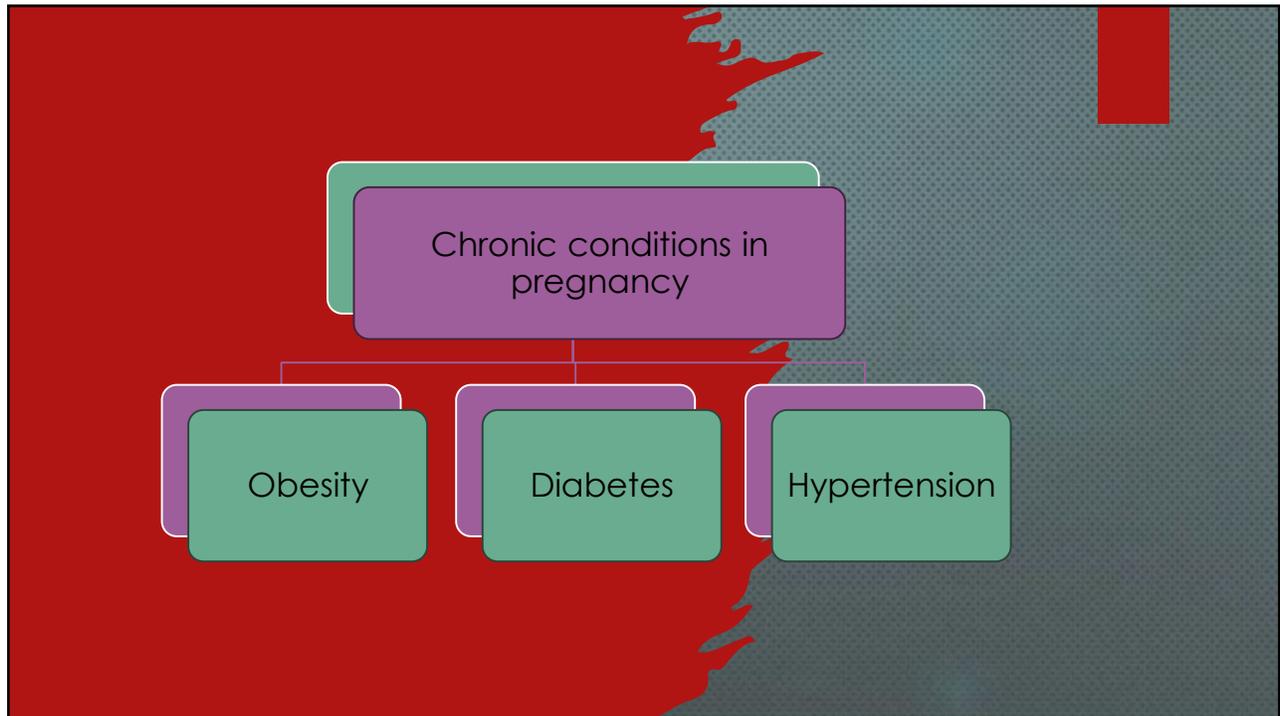
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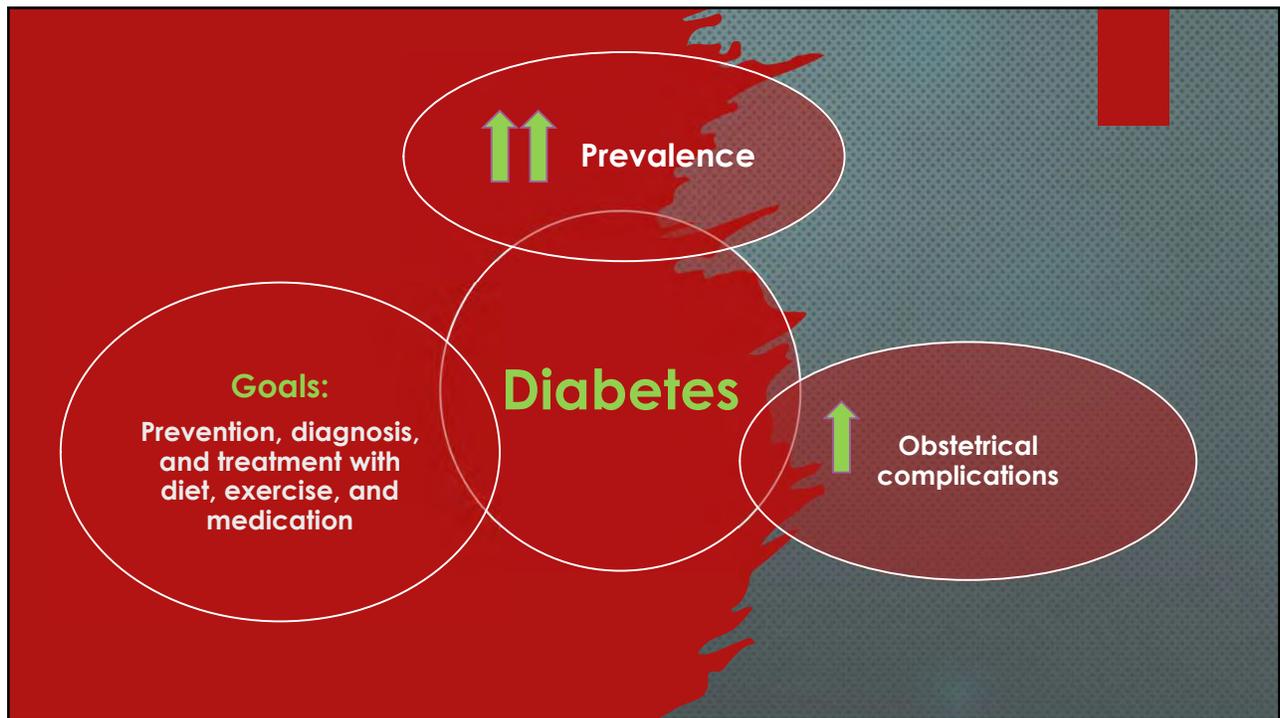
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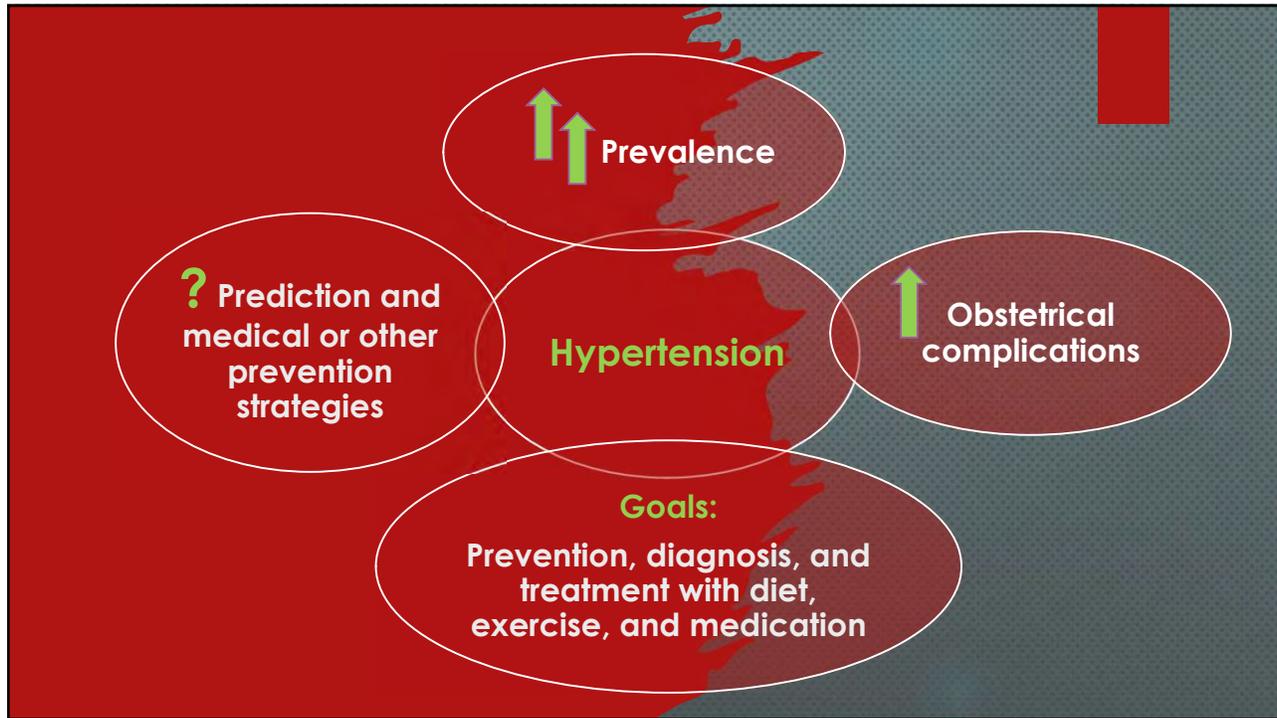
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Thank you!
Questions??

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