# Pregnancy-Related Complications

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# Hypertensive Disorders of Pregnancy (HDP)

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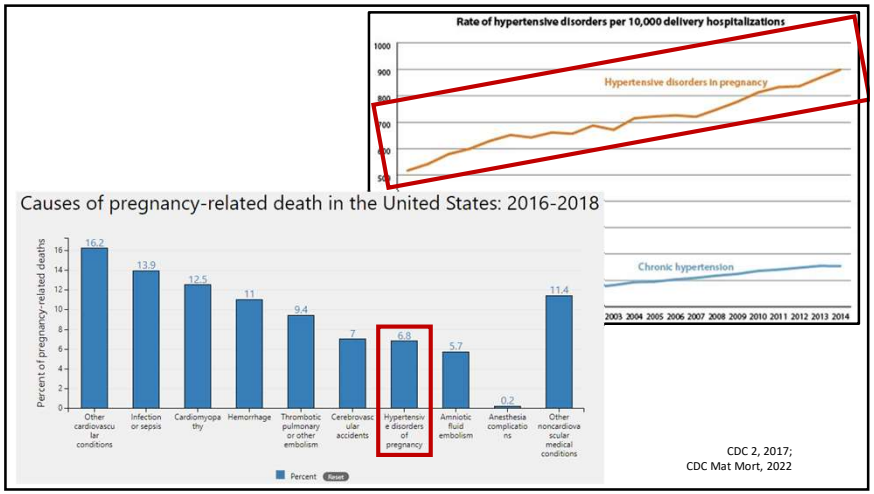


CDC 2, 2017;
CDC Mat Mort, 2022

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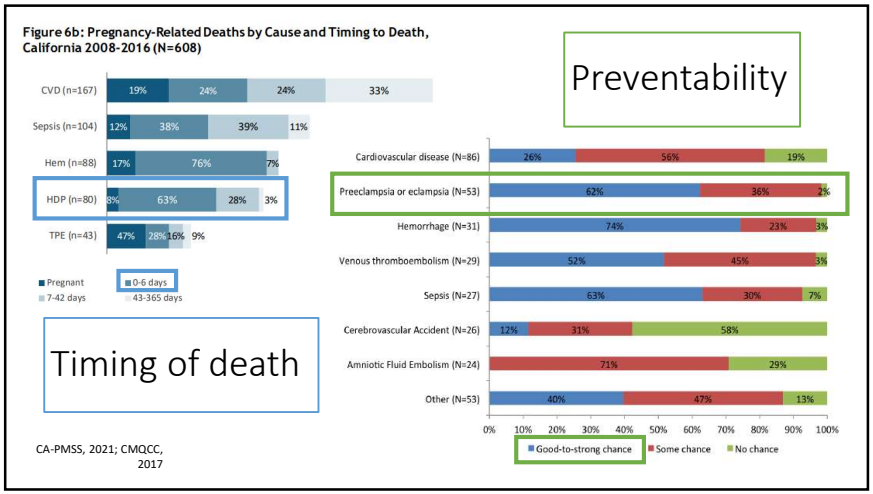


CA-PMSS, 2021; CMQCC, 2017

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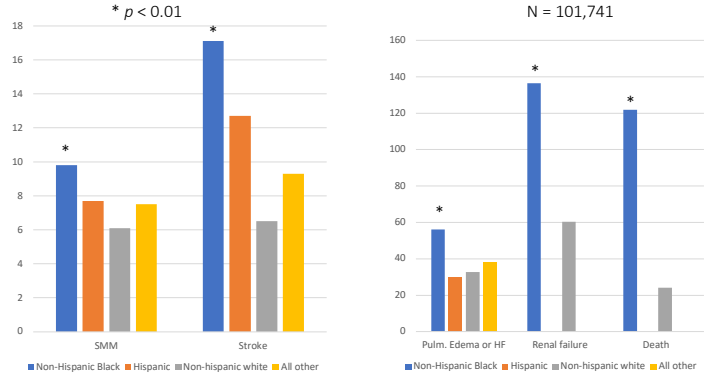
## Racial disparities : People with preeclampsia




Gyamfi-Bannerman, et al., 2019

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## Definitions

- **Gestational hypertension**
  - Dx ≥ 20w
  - 50% develop pre-e
- **Chronic hypertension**
  - HTN <20w
- **Preeclampsia without severe features***
- **Preeclampsia – with severe features***
- **HELLP syndrome**
- **Eclampsia**
  - Seizures from HDP

ACOG, 2020

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| Preeclampsia Dx Criteria | Severe Features |
|---|---|
| Elevated BP after 20w<br>• ≥140 SBP or ≥ 90 DBP x2 < 4 hrs apart<br>• ≥160 SBP or ≥ 110 DBP x2 ~ 15 mins apart | Elevated BP after 20w<br>~~• ≥140 SBP or ≥ 90 DBP x2 < 4 hrs apart~~<br>• ≥160 SBP or ≥ 110 DBP x2 ~ 15 mins apart |
| AND | |
| Proteinuria<br>• ≥ 300 in 24hr<br>• P/C ≥ 0.3<br>• Dipstick 2+ (last resort) | ~~Proteinuria~~<br>~~• ≥ 300 in 24hr~~<br>~~• P/C ≥ 0.3~~<br>~~• Dipstick 2+ (last resort)~~ |
| Thrombocytopenia<br>• < 100,000 | Thrombocytopenia<br>• < 100,000 |
| Renal insufficiency<br>• Serum creatinine > 1.1 or doubling | Renal insufficiency<br>• Serum creatinine > 1.1 or doubling |
| Impaired liver function<br>• Liver labs twice normal | Impaired liver function<br>• Liver labs more than twice normal AND RUQ/epig pain |
| Pulmonary edema | Pulmonary edema |
| Neuro changes<br>• New onset headache (meds don't work)<br>• Visual symptoms | Neuro changes<br>• New onset headache (meds don't work)<br>• Visual symptoms |

ACOG, 2020

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Improper **implantation** (trophoblast)

↓

Spiral arteries: abnormally narrow & shallow

↓

Placental hypoperfusion, hypoxia, ischemia

↓

Hormones & factors produced to ↑ placental perfusion

↓

★ Systemic endothelial dysfunction of pregnant person ★

↓

**Systemic inflammation, vasoconstriction, microemboli, multiorgan damage, hemoconcentration**

↓

**PREECLAMPSIA**

Ives, 2020

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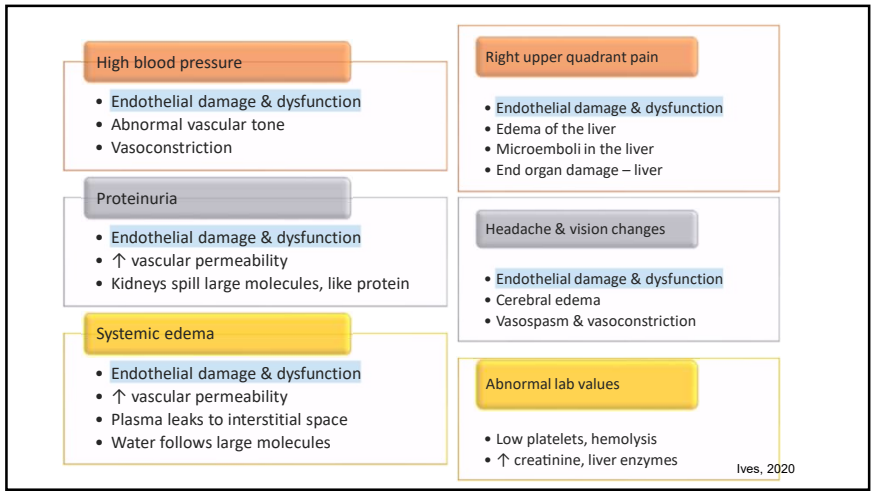


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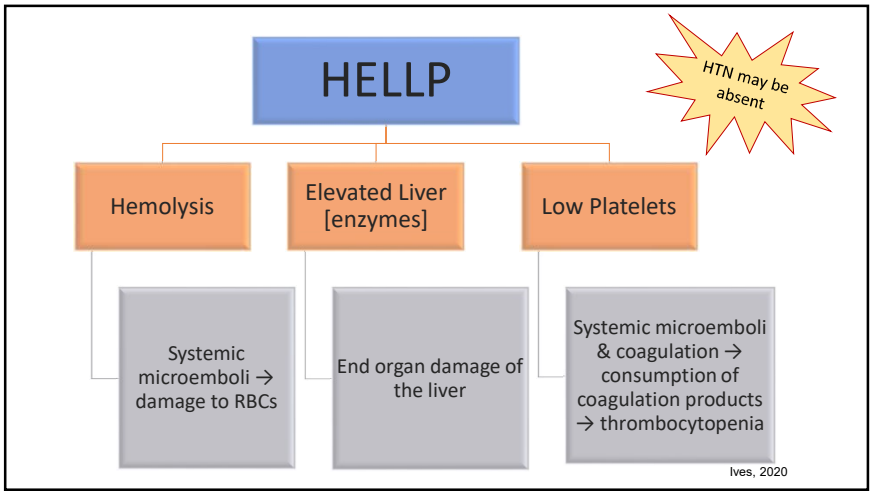


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## Effects fetus and neonate

- **Decreased placental perfusion**
  - Blood vessel insults, immune response
- **Oligohydramnios, growth restriction, fetal demise, Category II or III**
- **Early delivery, preterm delivery**
  - Increased intervention, cost

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## Prevention

**Preventive measures**

- Low dose aspirin in high-risk patients – initiated 2nd trimester
- Calcium may be helpful in populations with low intake

**Not effective**

- Vitamin C and E are not effective
- No evidence that bed rest is helpful (probably harmful)
- No evidence that salt restriction or dietary changes are helpful

ACOG, 2013

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## Treatment

**Antihypertensives**
- Oral labetalol
  - 200mg q12 – 800mg q8
- Oral nifedipine, short acting

**Fetal monitoring**
- NSTs and AFI

**Home monitoring**
- BP & symptoms

**Severe range BP management**
- If severe range BP met x2

**Labetalol IV**
- 10-20mg, then 20-80 q 10-30min
- Avoid with active asthma, cardiac disease

**Hydralazine IV**
- 5mg, then 5-10 q 20-40min

**Nifedipine po**
- 10-20mg, then q20
- May see reflex tachycardia

ACOG, 2020

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## Treatment – Magnesium Sulfate

**Uses**
- Eclamptic seizure prevention
  - Initial or refractory
- Neuroprotection for preterm neonate

**Administration**
- On a pump!
- 4-6g bolus, 2g/hr
  - BMI & renal considerations

**Assessment & Monitoring**
- VS, LOC, SpO2, lung sounds, DTRs
- I&O!
- Magnesium levels (~4.5-7.5)

**Signs of toxicity**
- REPORT TO PROVIDER
  - Urine output < 30 mL/hr
  - RR < 12
  - SpO2 < 95%
  - Persistent hypotension
  - Absence of DTRs
  - Altered LOC

**Reversal medication**
- Calcium gluconate
- Have on unit (no need at the BS)

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## Delivery considerations

**Gestational hypertension**
- Delivery ≥ 37w or at diagnosis

**Chronic hypertension**
- Delivery ≥ 37w

**Preeclampsia without severe features**
- Delivery ≥ 37w or at diagnosis

**Preeclampsia – with severe features**
- Delivery ≥ 34w, after stabilization, or after ROM
- <34w case specific

**HELLP syndrome**
- Upon diagnosis (some say)
  - Consider stabilization & tertiary care

**Eclampsia**
- Following stabilization

ACOG, 2020

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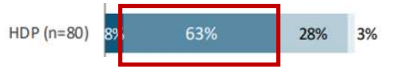
## Postpartum




Pregnant
7-42 days
0-6 days
43-365 days

**Risk of complications remains**

**Physiologic changes**
- BP decreases in first 48 hours after delivery
- BP increases 3-6 days postpartum (after discharge)

**Medication considerations for lactation**
- Lactation med books

**May happen with no prior hx HDP**

Follow-up, per ACOG, within 72 hours after delivery and again 7-10 days after discharge or earlier with symptoms

CA-PMSS, 2021;ACOG, 2013

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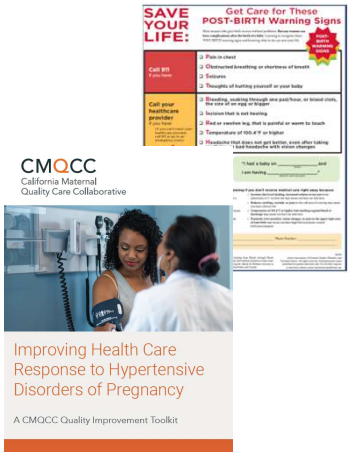
## Great resources to review!

- CMQCC Hypertensive Disorders of Pregnancy Toolkit
  - https://www.cmqcc.org/resources-tool-kits/toolkits/HDP
- Preeclampsia Foundation
  - www.preeclampsia.org
- AWHONN POST-BIRTH Warning signs
  - https://www.awhonn.org/education/hospital-products/post-birth-warning-signs-education-program/

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## Perinatal Stroke

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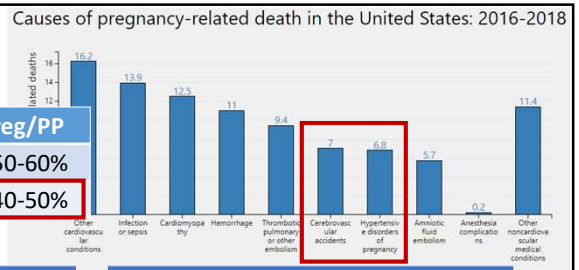
## Perinatal stroke

| Type | Adults | Preg/PP |
|---|---|---|
| Thrombotic | 87% | ~50-60% |
| Hemorrhagic | 13% | ~40-50% |




**0.03% of pregnancies**
- 3x risk in pregnancy vs. non-preg adults
- Most common in 3rd trimester & 6w pp

**4.2% die during hospitalization**
- Significantly more likely to die while pregnant after hemorrhagic stroke

Chen, 2016; Elgendy, 2020; Miller, 2020.

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## 3x risk of stroke in pregnancy

| | General adult population | Pregnancy/postpartum |
|---|---|---|
| Risk factors/ demographics | Black race, obesity, smoking, hyperlipidemia, coronary artery disease, dysrhythmias, cardiac disease, migraine, rheumatologic diseases, diabetes | Same, plus age & preeclampsia/eclampsia (6x higher) |
| **Etiology:** Thrombotic stroke | Atrial fibrillation, large vessel atherosclerosis, cerebral small vessel disease | Carotid/vertebral artery dissection, cardioembolism (due to patent foramen ovale), reversible cerebral vasoconstriction syndrome, peripartum cardiomyopathy |
| **Etiology:** Hemorrhagic stroke | Vascular malformation rupture | Substandard treatment of severe range blood pressures, reversible cerebral vasoconstriction syndrome, posterior reversible encephalopathy syndrome. |

Cleary, 2016; Chen, 2016; Elgendy, 2020; Miller, 2020.

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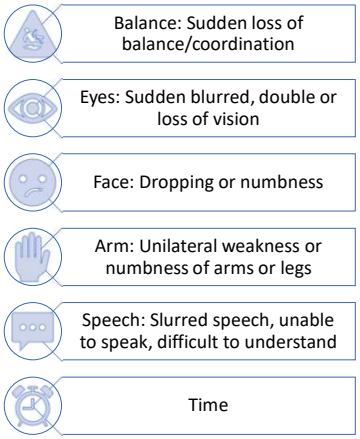
## Concerning symptoms

- Headache worse than normal, plus stroke symptoms →
  - Particularly "worst headache of my life" or "thunderclap"
- Unilateral severe neck pain with headache
- Postural headache that is relieved when sitting up
  - Increased intracranial pressure
- Seizure




Miller, 2020.

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## Interventions

- Call "code stroke" (emergent neuro eval), charge nurse, anesthesia, OB
- Assess "last known well" time
- Emergent brain imaging (ideally within 20 mins of arrival) Safe in pregnancy

**Ischemic:**

- Fibrinolytic therapy (TPA) within 4.5 hrs
- Mechanical thrombectomy within 6 hours if large occlusion
- Safe in pregnancy, monitor closely

**Hemorrhagic:**

- BP control, reversal of anticoagulation, source control if able

Miller, 2020.

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# Perinatal Diabetes

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These are NORMAL alterations in the pregnant person
Allows for excess glucose in the pregnant person's circulation, for fetal availability and development

## >20 weeks

- Decreased insulin sensitivity
- Increased insulin secretion
- Increased insulin resistance
- Decreased glucose uptake

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These are ABNORMAL alterations in the pregnant person

- Further increase in insulin resistance
- Decreased numbers of insulin receptors
- Decreased binding of insulin to target cells
- HYPERGLYCEMIA

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Definitions

**GDM:**
- Onset or recognition of abnormal carbohydrate metabolism **during pregnancy**

**GDM A1:**
- Controlled with **diet and exercise**

**GDM A2:**
- Controlled with diet, exercise, **medications**

Pregestational:
- **Prior Dx** of T1DM or T2DM

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## Diabetes in Pregnancy

DM is the most common metabolic disorder complicating pregnancy

GDM accounts for 95% of DM in pregnancy

US incidence of DM in pregnancy is estimated to be 7-14%

Hx of GDM increases lifetime risk of developing T2DM (7x)

Around 1/3 people who have diabetes who can become pregnant are unaware that they have the disease

ACOG, 2018

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## Risk factors

| | | | |
|---|---|---|---|
| Pregnancy BMI > 25 | High-incidence race or ethnicity* | Physical inactivity | DM in first degree relative |
| Hx neonate > 9 lbs | Hypertension or cardiovascular disease | Age > 45 year | Hx of abnormal glucose tolerance or A1c > 5.6 |
| | PCOS | HDL cholesterol level < 35 mg/dl or triglyceride level > 250 mg/dl | |

* Hispanic, Black, Native Am, Asian, Pacific Islander

ACOG, 2018

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## Screening

**Optional <20w**
for high-risk patients

- Fasting plasma glucose
- Random BG
- A1C

**Standard 24-28w**

- Oral glucose tolerance test (OGTT)
  - Non-fasting 1 hr OGTT
  - If glucose high, followed by fasting 3 hr OGTT

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## Why treat?

- ↓ fetal/neonatal hypoglycemia, death, other complications
- ↓ shoulder dystocia & birth trauma
- ↓ preeclampsia
- ↓ LGA, > 4,000g, neonatal fat mass
- ↓ cesarean delivery
- ↓ incidence of DKA

More likely to meet postpartum weight loss goals

ACOG, 2018

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First Line: Dietary / Nutritional counseling & exercise (as tolerated)

May consider oral agents or insulin

- 26-46% will eventually require insulin
- ***Insulin in conjunction with diet & exercise is preferred treatment***

ACOG, 2018

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## Delivery considerations

Balances IUFD risk with preterm birth risk

| | |
|---|---|
| A1GDM uncomplicated | • 39w, expectant mgmt to 39w6d |
| A2GDM uncomplicated | • 39w to 39w6d |
| A2GDM, BG uncontrolled | • 37w to 38w6d |
| A2GDM, BG uncontrolled despite in-hospital attempts | • 34w to 36w6d may be justified |

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## Postpartum

**Chest/breastfeeding**

- Highly recommended for at least 6 months!
- Reduces incidence of childhood obesity and diabetes
- Helps reduce or delay onset of T2DM
- Meds safe for lactation

**At risk for hypoglycemia!**

- More insulin sensitive for ~2 weeks postpartum
- When chest/breastfeeding
- Due to sleep disturbance, eating at different times

**Screening for T2DM**

- 4-12 wks postpartum & every 1-3 years
- Recommended by ACOG & ADA

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## Diabetic ketoacidosis in pregnancy

- Endocrine emergency!
- VERY RARE 1-2% in pregnancy complicated by glucose intolerance
- Risk factors:
  - Hx PREgestational DM (vs. GDM)
  - 30% of cases after steroids (fetal lung maturity)
- DKA with euglycemia more common in pregnancy

Reliable dx: Anion gap > 12

- Difference of positive and negative electrolytes
- (Na+ + K+) – (Cl- + HCO3-)

Villavicencio, et al., 2022

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## Diabetic ketoacidosis : Treatment

1. Fluid resuscitation
2. Insulin infusion
3. Electrolyte monitoring
4. Management of precipitating factors

Villavicencio, et al., 2022

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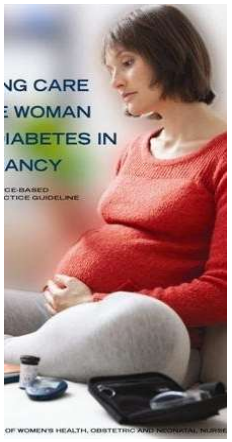
## Perinatal Diabetes: References and Resources


- American College of Obstetricians and Gynecologists. (2018). ACOG practice bulletin, no. 190, interim update: Gestational diabetes mellitus. *Obstetrics & Gynecology; 131*(2): e49-e64.
- AWHONN. (2016) Nursing care of the woman with diabetes in pregnancy: Evidence-based clinical practice guideline.
- California's Sweet Success Program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# Cardiac Complications

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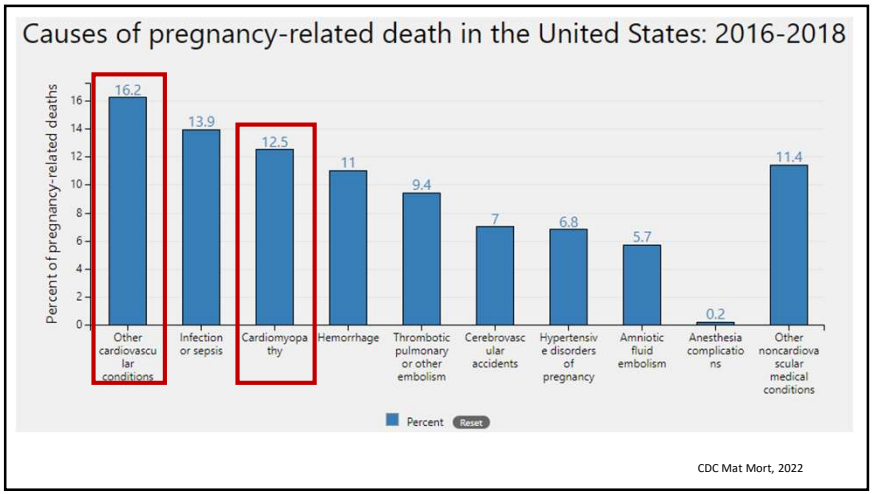


CDC Mat Mort, 2022

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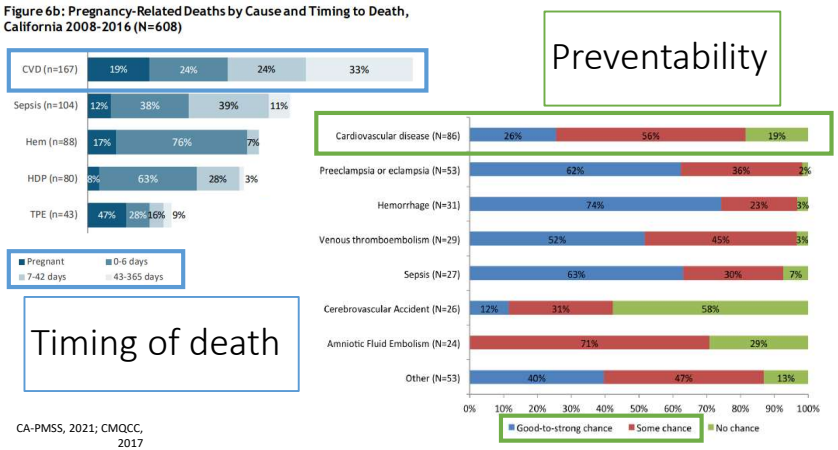


CA-PMSS, 2021; CMQCC, 2017

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## Cardiac complications & cardiomyopathy

- These leading causes of maternal mortality are on the rise
  - Many preventable
- Acquired heart disease is the leading cause of cardiac deaths
  - 97% in Illinois

Heart failure | MI | Dys/arrhythmia | Aortic dissection

**Cardiomyopathy**

ACOG, 2018

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## When to notify

| | ROUTINE CARE<br>Reassurance | CAUTION*†<br>Nonemergent Evaluation | STOP†‡<br>Prompt Evaluation Pregnancy Heart Team |
|---|---|---|---|
| **History of CVD** | None | None | Yes |
| **Self-reported symptoms** | None or mild | Yes | Yes |
| Shortness of breath | No interference with activities of daily living; with heavy exertion only | With moderate exertion, new-onset asthma, persistent cough, or moderate or severe OSA§ | At rest; paroxysmal nocturnal dyspnea or orthopnea; bilateral chest infiltrates on CXR or refractory pneumonia |
| Chest pain | Reflux related that resolves with treatment | Atypical | At rest or with minimal exertion |
| Palpitations | Few seconds, self-limited | Brief, self-limited episodes; no lightheadedness or syncope | Associated with near syncope |
| Syncope | Dizziness only with prolonged standing or dehydration | Vasovagal | Exertional or unprovoked |
| Fatigue | Mild | Mild or moderate | Extreme |
| **Vital signs** | Normal | | |
| HR (beats per minute) | <90 | 90–119 | ≥120 |
| Systolic BP (mm Hg) | 120–139 | 140–159 | ≥160 (or symptomatic low BP) |
| RR (per minute) | 12–15 | 16–25 | ≥25 |
| Oxygen saturation | >97% | 95–97% | <95% (unless chronic) |
| **Physical examination** | Normal | | |
| JVP | Not visible | Not visible | Visible >2 cm above clavicle |
| Heart | S3, barely audible soft systolic murmur | S3, systolic murmur | Loud systolic murmur, diastolic murmur, S4 |
| Lungs | Clear | Clear | Wheezing, crackles, effusion |
| Edema | Mild | Moderate | Marked |

ACOG, 2018

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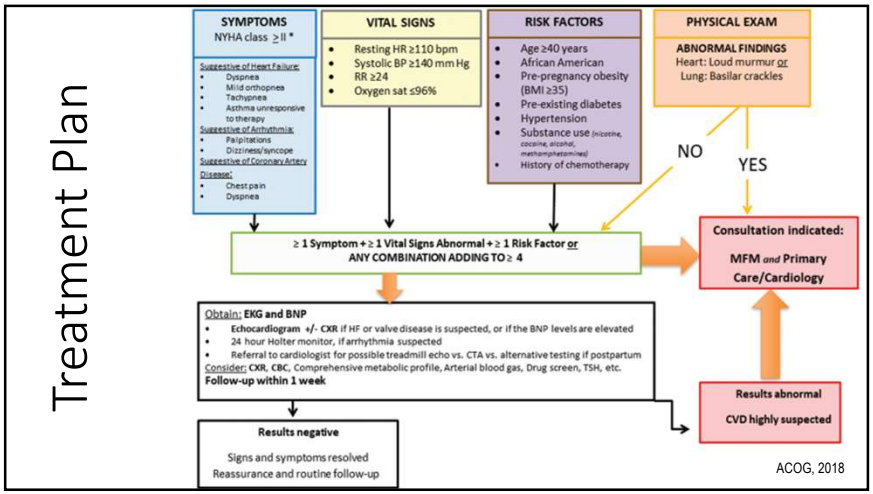
## Treatment Plan




ACOG, 2018

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# Anaphylactoid Syndrome of Pregnancy

## (a.k.a., Amniotic Fluid Embolism)

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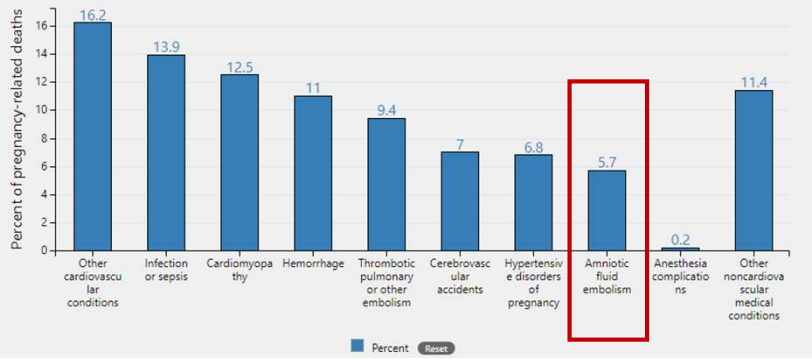
## Causes of pregnancy-related death in the United States: 2016-2018




CDC Mat Mort, 2022

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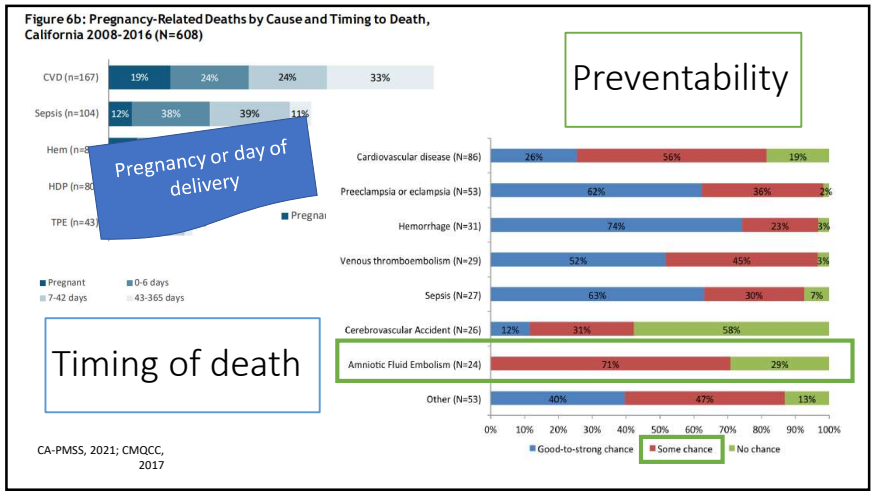


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## Anaphylactoid syndrome of pregnancy
(formerly known as Amniotic Fluid Embolism)

- RARE: ~7-8 per 100,000
- Dx of exclusion. Rule out:
  - Anaphylaxis
  - Aortic dissection
  - Embolism (cardiac, pulmonary, cerebrovascular)
  - Cardiac complication
  - Septic shock
- Treatment:
  - Multidisciplinary & individualized
  - Hemodynamic support
  - Delivery
  - End-organ support
- No current early dx or prevention
- No current overarching best treatment

Acute activation of proinflammatory mediator system
- Neuro changes, fluid shift, imbalances

Coagulopathy
- DIC

Cardiovascular collapse
- Hypotension, dyspnea, hypoxia, tachycardia, sense of doom

NOT due to fetal/amniotic debris in birthing person system, but how the person responds to debris

Balinger, et al., 2015

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# Thank you!

## Pregnancy-Related Complications


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