Assessment of the OB Patient Presenting to the ED

Cardiac Complications in Pregnancy and Postpartum

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Disclosures

• Speakers have identified no financial disclosures or conflict of interests
Note on Terminology

• Throughout this presentation, the terms “mother” or “maternal” or “she or “her” are used in reference to the birthing person. Recognition that not all birthing people identify as mothers or women. We believe all birthing people are equally deserving of patient-centered care that helps them attain their full potential and live authentic health lives.
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• Click Sign In
• Click Sign in with your email
• Click Create New Account

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Once your account is created and paired to your number, text 48778 to (844) 980-0525.
EMS Credits

- Send Marleine EMS license #
- In Chat put in full name and facility
- Must attend live Zoom Meeting
Upcoming Topics

August – Maternal Venous Thrombosis/Sepsis

September - TBD - This will be our last monthly offering

Interest in continuing if CEU’s not offered – Quarterly?
Simulations

Visits

• Our Team will start reaching out to facilities to schedule visits
Cardiac Complications in Pregnancy and Postpartum
Objectives

• Discuss why symptoms of cardiac disease may be falsely attributed to the common symptoms in a normal pregnancy
• Review CVD Assessment Algorithm for Pregnant and Postpartum Women
• Describe the clinical uses of BNP in pregnancy
• Discuss why CVD is a leading preventable cause of mortality and morbidity in the obstetrical patient
• Review Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm
Case Study

• 24 y/o Black Female
• Mildly Obese
• Complaints:
  • Cough
  • Fatigue
Case Study

VS:
98.0
P 130
R 22
BP 140/100
O2 Sat 96%

Lung Sounds
Few scattered crackles

Heart Sound
Irregular – states she has “racing” heartbeat at times
Case Study

While in your ED – Continues to worsen

30 min later:

Increased shortness of breath

HR 130’s - SVT

RR 48 and shallow
Case Study

- 45 minutes later
  - Becomes unresponsive
Critical Questions
Appendix G: Stop Sign for Patient Information

Tell us if you
ARE PREGNANT or
HAVE BEEN PREGNANT
within the past 6 weeks

Come to the front of the line if you have:

- Persistent headache
- Visual change
  (floaters, spots)
- History of
  preeclampsia
- Shortness of breath
- History of high
  blood pressure
- Chest pain
- Heavy bleeding
- Weakness
- Severe abdominal
  pain
- Confusion
- Seizures
- Fevers or chills
- Swelling in hands
  or face

Every Patient

• Obtain a focused pregnancy and cardiac history in all care settings, including emergency department, urgent care and primary care
• In all care environments assess and document if a patient presenting is pregnancy or has been pregnant within the past year
• Assess if escalating warning signs for an imminent cardiac event are present
• Utilize standardized cardiac risk assessment tools to identify and stratify risk
• Conduct a risk appropriate work-up for cardiac conditions to establish diagnosis and implement the initial management plan
• Screen each person

Cardiac Conditions in Obstetrical Care | AIM Program (Previously Council on Patient Safety) (safehealthcareforeverywoman.org)
Background

• Cardiovascular Disease (CVD) complicates 1% of all pregnancies
• Severity has increased
• Postpartum hospitalizations for cardiovascular complications have tripled
• More than 25% of pregnancy-related mortality in the US (2011 to 2013 attributed to CVD or cardiomyopathy
• Approx 25% of these deaths are preventable if recognized earlier in pregnancy
Causes of pregnancy-related death in the United States: 2016-2018

- Other cardiovascular conditions: 16.2%
- Infection or sepsis: 13.9%
- Cardiomyopathy: 12.5%
- Hemorrhage: 11%
- Thrombotic pulmonary or other embolism: 9.4%
- Cerebrovascular accidents: 7%
- Hypertensive disorders of pregnancy: 6.8%
- Amniotic fluid embolism: 0.2%
- Anesthesia complications: 0.1%
- Other noncardiovascular medical conditions: 11.4%
• Only a small fraction of these women had a known diagnosis of CVD prior to death

• Most women who died had presented with symptoms either during pregnancy or after childbirth
Racial Disparities

Pregnancy-Related Mortality Ratio by Race/Ethnicity: 2016-2018

- Non-Hispanic Black: 41.4
- Non-Hispanic American Indian or Alaska Native: 26.5
- Non-Hispanic Asian or Pacific Islander: 14.1
- Non-Hispanic White: 13.7
- Hispanic: 11.2
Racial Disparities

• Black women:
  • Present at significantly younger ages, and more commonly in postpartum period
  • Receive care less often and later in pregnancy
  • Have higher rates of obesity and hypertensive disorders, often more severe
  • Some risk factor modifiable, but are not easily achieved (health care access, diet, physical activity

<table>
<thead>
<tr>
<th>Pregnancy-Associated but Unable to Determine Pregnancy Relatedness</th>
<th>Suicide</th>
<th>Cardiac Arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cardiac Arrhythmia caused by cardiomegaly left ventricular hypertrophy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Homicide (Domestic violence)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Cardiac Disorders

• Risk factors and symptoms associated with cardiomyopathy were not recognized by healthcare providers.

• Warnings of cardiac symptoms were not included on postpartum discharge instructions when risk factors were present.

• Tobacco cessation not discussed or not documented
Peripartum Cardiomyopathy

• Defined as a reduced ejection fraction of less than 45% presenting near the end of pregnancy or in the few months after delivery in a woman with no history of structural heart disease

• The cause of peripartum cardiomyopathy (PPCM) remains unknown

• 37% of those diagnosed with PPCM had some type of hypertension during pregnancy (preeclampsia, gestational or chronic hypertension)

• Likely an underestimate, as hypertensive disorders often are used as exclusion criteria when diagnosing PPCM

Pregnancy is like a stress test for rest of your life

- Diabetes
- Hypertension
- CVD
Pregnancy Pathophysiology

- Blood volume increases ~ 40% - 50% with peak at 32 weeks
  - 45% in plasma volume and 30% red cell mass (relative anemia)
  - 1600 ml – singleton
- ↓ albumin/oncotic pressure
- ↑ cardiac output (30 – 50%)
  - Maternal posture affects cardiac output after 20 weeks
  - Increased 6 – 7 l/min
  - Increase peaks by 30 weeks
  - Increased 2 -3 weeks post partum
- Increased stroke volume and heart rate = increased cardiac output
- Heart increases in size and is displaced upward
- Plasma volume increases more than RBC volume creating a physiologic anemia
- Pregnancy is a hypercoagulable state

(132) Pregnancy and Cardiovascular Disease (Valeria Duarte, MD) April 8, 2021 - YouTube
Pregnancy Pathophysiology

• Placenta – low vascular resistance
• Stoke volume – climbs dramatically and peaks at 30 weeks
• 2\textsuperscript{nd} trimester – often seek consultation – stress of CV system
  • Palpitation
  • Shortness of breath
• Peripartum cardiomyopathy – 80 to 90 % within one month of delivery
Acquired heart disease in pregnancy

• Rheumatic disease is now uncommon in the US but common in the developing world and among immigrant populations
• Pregnancy makes this worse
• Scarlet Fever
Recognition

• Complicates 1% of all pregnancies
• Severity of disease has increased
• Postpartum hospitalizations for cardiovascular complications have tripled

Cardiac Conditions

• Disorders of the cardiovascular system which may impact maternal health

- Congenital Heart Disease
- Cardiac valve disorders
- Cardiomyopathies
- Arrhythmias
- Coronary artery disease
- Pulmonary Hypertension
- Aortic dissection
Risk Factors

- Age ≥ 40 years
- African American
- Pre-pregnancy obesity (BMI ≥ 35)
- Pre-existing diabetes
- Hypertension
- Substance use: Nicotine, cocaine, alcohol, methamphetamines
- History of chemotherapy
## Maternal Early Warning Criteria

<table>
<thead>
<tr>
<th>Measure</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic Blood Pressure (mm Hg)</td>
<td>&lt;90 or &gt;160</td>
</tr>
<tr>
<td>Diastolic Blood Pressure (mm Hg)</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Heart rate (beats per minute)</td>
<td>&lt;50 or &gt;120</td>
</tr>
<tr>
<td>Respiratory rate (breaths per min)</td>
<td>&lt;10 or &gt;30</td>
</tr>
<tr>
<td>Oxygen saturation on room air, at sea level %</td>
<td>&lt;95</td>
</tr>
<tr>
<td>Oliguria, mL/hr for ≥2 hrs</td>
<td>&lt;35</td>
</tr>
<tr>
<td>Maternal agitation, confusion, or unresponsiveness</td>
<td></td>
</tr>
<tr>
<td>Woman with preeclampsia reporting a non-remitting headache or shortness of breath</td>
<td></td>
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</tbody>
</table>
Vital Signs

- Resting HR ≥ 110 bpm
- Systolic BP ≥ 140 mmHg
- RR ≥ 24
- Oxygen sat ≤ 96%
Symptoms

Suggestive of Heart Failure

• Dyspnea
• Mild orthopnea
• Tachypnea
• Asthma unresponsive to therapy

Suggestive of arrythmia

• Palpitations
• Dizziness/syncope
Physical Exam

• Rapid or irregular heart rate may be abnormal (a minor degree of tachycardia is common in normal pregnancy)
• Rales are not a normal finding
• A soft crescendo-decrescendo systolic murmur over the aortic or pulmonic valve indicative in increased flow is normal
• A diastolic or loud systolic murmur, or holosystolic murmur is not normal
• Dependent edema is to be expected late in pregnancy, but is not a prominent symptom in early in pregnancy
JVD

- Noninvasive
- Key symptom of heart failure, and other heart and circulatory problems
- Not an assessment that is common when assessing a pregnant person

Jugular Vein Distention: Symptoms and Causes (clevelandclinic.org)
BNP

• B Type Natriuretic Peptide
• Neurohormone secreted by the cardiac ventricles in response to ventricular volume expansion and pressure overload
• Routinely used in ED’s to differentiate cardiac vs pulmonary etiology of dyspnea
• BNP – when released – meant to get rid of water
• Relaxes vascular smooth muscle
• Inhibits renin-angiotensin-aldosterone system
• Increases natriuresis and diuresis
Clinical Uses of BNP in Pregnancy

Diagnosis of heart failure
- In women with dilated CMP, higher BNP predicts adverse cardiovascular outcomes
- Higher predictive value than X-ray

Asymptomatic left ventricular function
- Useful to evaluate shortness of breath

Predictor of cardiovascular outcome
- In pregnant women with congenital heart disease, higher BNP levels are associated with poor outcomes
BNP

- Normal level < 100 pg/ml
- 100 – 400 dependent on other symptoms and findings of heart failure
- > 400 indicative of heart failure
CVD Algorithm for Pregnant and Postpartum Women

Red Flags
Red Flags – Prompt Evaluation

- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥ 120 bpm
- Resting systolic BP ≥ 160 mmHg
- Resting RR ≥ 30
- Oxygen saturations ≤ 94% with or without personal history of CVD

CCOC Implementation Webinar Recording.mp4 (dropbox.com)
CVD Assessment Algorithm
For Pregnant and Postpartum Women

Red Flags
- Shortness of breath at rest
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PROMPT EVALUATION and/or hospitalization for acute symptoms

CONSULTATIONS with MFM and Primary Care/Cardiology

Personal History of CVD
Without Red Flags

CONSULTATIONS with MFM and Primary Care/Cardiology

Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum | California Maternal Quality Care Collaborative (cmqcc.org)
Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum | California Maternal Quality Care Collaborative (cmqcc.org)
Key Points

• First Presentation of CVD may be during pregnancy or early postpartum
• The highest risk period for CVD worsening is between 24-28 weeks or postpartum
• CVD symptoms or vital sign abnormalities should not be ignored in pregnant
• Symptoms related to physiologic changes of pregnancy should be improving in the postpartum period
• ANY visits to the ED for dyspnea should raise suspicion for cardiovascular disease
• Postpartum dyspnea or new onset cough in concerning or CVD
Key Points

• New onset asthma is rare in adults
• Bilateral crackles on lung examination are most likely associated with congestive heart failure
• Improvement of dyspnea with bronchodilators does not confirm the diagnosis of asthma as CHF may also improve with bronchodilators
• Likewise a lack of response to bronchodilators should prompt the entertainment of a diagnosis other than asthma
Postpartum Presentations to the ED, PCP or OB Provider

• Symptoms of cardiac disease may be falsely attributed to the common discomforts of pregnancy
  • Shortness of breath
  • Fatigue

• Pre-existing cardiovascular disease and/or new onset peripartum cardiomyopathy may initially be present during pregnancy or in the post-partum period
CA-PAMR Findings
Timing of Diagnosis and Death
2002-2006

- **Timing of CVD Diagnosis (n=64)**
  
  - Preexisting (prior to pregnancy)
  - Prenatal period
  - At labor and delivery
  - Postpartum period
  - Postmortem

- **Timing of Death**
  
  - 30% of all CVD deaths were >42 days from birth/fetal demise vs. 7.3% of non CVD pregnancy-related deaths
  - Driven by Cardiomyopathy deaths, with 42.9% deaths >42 days

Questions to ask upon presentation

• Shortness of Breath
  • Worsened level of exercise tolerance
  • Difficulty performing activates of daily living unexpected fatigue
  • Symptoms that are deteriorating – especially chest pain, palpitations, or dizziness
  • New onset coughing or wheezing
  • Leg edema and if it is improving or deteriorating
  • Inability to lay flat – if this is a change, how many pillows used to sleep
  • Failure to lose weight or unusual weight gain and how much
  • A history of cardiac or pulmonary conditions
  • A history of substance use/tobacco use
  • Has been seen by other providers or in other Emergency Departments since giving birth
Signs & Symptoms of Heart Disease During Pregnancy and Postpartum

Heart disease is the leading cause of death among women in the U.S. who are pregnant or gave birth in the last 5 months (postpartum).

Options to watch for in late pregnancy and up to five months postpartum:

- Extreme swelling or weight gain
- Extreme fatigue
- Fainting
- Palpitations
- Persistent cough
- Chest pain or fast heart beat
- Swollen ankles or feet
- Shortness of breath (especially when lying down)

Go to the Emergency Department:
- If you have any of these symptoms and they do not go away.

If any woman can develop heart disease in pregnancy or postpartum, but you are at higher risk if:

- Have prior heart disease
- Are over 40 years old
- Have preeclampsia or high blood pressure (hypertension)
- Are African American
- Daughter or sister has had a heart attack
- Are obese

Bottom line:

- Trust your instincts when you feel something is wrong.
- When you see a healthcare provider, bring your partner, friend or family member who can support you and help explain these symptoms are not normal for you.
- See a second opinion if you don’t feel listened to or if your symptoms are not taken seriously.

Get online support and information:

- www.myheartchecks.com
- www.womenheart.org

Endnote:

- "If any woman can develop heart disease in pregnancy or postpartum, but you are at higher risk if:

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DID YOU HAVE COMPLICATIONS DURING PREGNANCY?

You may be at a higher risk for heart disease over your lifetime.

Which pregnancy complications can increase your risk for heart disease as you age?

- **High Blood Pressure**
  - 5-10% of all pregnant women

- **Gestational Diabetes**
  - 7-14% of all pregnancies

- **Preterm Birth**
  - 11.3% of births were born between 2012

- **Gestational Hypertension**
  - Often seen in Pregnant Induced Hypertension (PIH) and diabetic pregnancy

- **Preeclampsia**
  - Is a condition where blood pressure can rise during pregnancy

If you had **Preeclampsia**, you have:

- the risk of heart attack and stroke
- the risk of heart failure
- the risk of high blood pressure for the rest of your life

If you had **Gestational Diabetes**, you are:

- more likely to develop Type 2 diabetes within 3 years, putting you at higher risk for heart disease.

- **Women with Preterm Birth and Preeclampsia** have a higher chance of death from heart disease.

If you had complications in pregnancy, you can lower your risk:

**New Mothers**

- See your health care provider 3-6 months after birth to check your overall health status and discuss your pregnancy and any complications you experienced.

- Avoid smoking and use alcohol moderately.

- Talk to your doctor about the need for any routine vaccinations.

**Mothers With Kids Over One Year**

- Get annual checkups and be screened for heart disease.

- Monitor your weight, blood pressure, and cholesterol levels.

- Be active daily for at least 30 minutes.

- Eat a heart-healthy diet rich in fruits, vegetables, and whole grains.

- Limit sodium and avoid processed foods.

If you are at high risk for heart disease, your provider may recommend medications to help lower your risk.

REMEMBER!

It’s a MYTH that ALL pregnancy-related high blood pressure and gestational diabetes complications go away after the baby is born.

Let more information and stay heart healthy. www.sister2sister.org

¿TUVO COMPLICACIONES DURANTE SU EMBARAZO? Usted puede correr mayor riesgo de enfermedades del corazón por el resto de su vida.

¿Cuáles son las complicaciones del embarazo que pueden aumentar el riesgo de enfermedades del corazón en el futuro? Las mujeres con DIABETES GESTACIONAL tienen un mayor riesgo de enfermedades del corazón en el futuro.

Si tuvo una complicación en el embarazo, usted puede disminuir su riesgo:

Nuevos mamás

- Mantenga un estilo de vida saludable:
  - Mantenga un peso saludable:
  - Mantenga una actividad física regular:

- Consulte con su proveedor de atención médica para planificar su siguiente embarazo para mantenerse en lo más saludable posible.

- **¡RECUERDE!**

- Es un **MITO** que TODAS las complicaciones de la diabetes gestacional desaparezcan después de que nazca el bebé.

Obtenga más información y mantenga su corazón sano. www.cmowc.org (en inglés)

CMOWC
Obstetrics Mobile Stimulation Unit

- **Presión Arterial Alta**
  - 5-10% de todas las mujeres embarazadas

- **Diabetes Gestacional**
  - 7-14% de todos los embarazos

- **Nacimiento Prematuro**
  - 11.3% de todos los bebés nacieron prematuramente en el 2012

- **Hiperpresión Gestacional**
  - Preeclampsia, enfermedad conocida como hipertensión inducida por el embarazo o toxemia del embarazo

- **Eclampsia**
  - Edema y migraña HELLP (páginas next page) que incluye hemólisis, eritrosedimentación lenta y plaqueta baja en el sangre.

Si tuvo Preeclampsia o Diabetes Gestacional, hay 40% más de posibilidades de desarrollar enfermedades del corazón y más de 3 veces más riesgo de muerte por enfermedad del corazón.

Si tuviste diabetes durante el embarazo, hay 50% más de posibilidades de desarrollar enfermedades del corazón.

Las mujeres con DIABETES GESTACIONAL tienen un 2 veces más riesgo de desarrollar enfermedades del corazón.

Si usted tiene NACIMIENTO PREMATURO, tiene 2 veces más riesgo de desarrollar enfermedades del corazón.

Las mujeres con DIABETES GESTACIONAL tienen un 3 veces más riesgo de desarrollar enfermedades del corazón.

Si tuvo complicación en el embarazo, usted debe saber:

- Vacunación:
  - Mantenga un peso saludable:
  - Mantenga una actividad física regular:

- Consulte con su proveedor de atención médica para planificar su siguiente embarazo para mantenerse en lo más saludable posible.

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CMOWC
Obstetrics Mobile Stimulation Unit
Perimortem C-Sections
• 2 potential patients
• Best hope for fetal survivor is maternal survival
• At 20 weeks the size of the uterus begins to adversely affect the attempted resuscitation
Medications

• Treatment during pregnancy is the same as in non pregnant patients
• Exception – amiodarone, long half life and should be avoided
• Most antiarrhythmic drugs except adenosine, cross the placenta
• Can give Lidocaine

AAFP – ALSO
Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm

Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm

Continue BLS/ACLS:
- High-quality CPR
- Defibrillation when indicated
- Other ACLS interventions (eg, epinephrine)

Assemble maternal cardiac arrest team

Consider etiology of arrest

Perform maternal interventions
- Perform airway management
- Administer 100% O₂, avoid excess ventilation
- Place IV above diaphragm
- If receiving IV magnesium, stop and give calcium chloride or gluconate

Perform obstetric interventions
- Provide continuous lateral uterine displacement
- Detach fetal monitors
- Prepare for perimortem cesarean delivery

Continue BLS/ACLS
- High-quality CPR
- Defibrillation when indicated
- Other ACLS interventions (eg, epinephrine)

Perform perimortem cesarean delivery
- If no ROSC in 5 minutes, consider immediate perimortem cesarean delivery

Neonatal team to receive neonate

Maternal Cardiac Arrest
- Team planning should be done in collaboration with the obstetric, neonatal, emergency, anesthesia, intensive care, and cardiac arrest services.
- Priorities for pregnant women in cardiac arrest should include provision of high-quality CPR and relief of aortic arch compression with lateral uterine displacement.
- The goal of perimortem cesarean delivery is to improve maternal and fetal outcomes.
- Ideally, perform perimortem cesarean delivery in 5 minutes, depending on provider resources and skill sets.

Advanced Airway
- In pregnancy, a difficult airway is common. Use the most experienced provider.
- Provide endotracheal intubation or supraglottic advanced airway.
- Perform waveform capnography or capnometry to confirm and monitor ET tube placement.
- Once an advanced airway is in place, give 1 breath every 8 seconds (10 breaths/min) with continuous chest compressions.

Potential Etiology of Maternal Cardiac Arrest
- A. Anesthetic complications
- B. Bleeding
- C. Cardiovascular
- D. Drugs
- E. Embolic
- F. Fever
- G. General nonobstetric causes of cardiac arrest (H’s and T’s)
- H. Hypertension

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Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm (heart.org)
Uterine Displacement

- One person so provide uterine displacement
- Left Lateral
- One or two handed method
- Relieve compression of inferior vena cava and the aorta by shifting the gravid uterus left and upward off the maternal vessels
Chest Compressions

<table>
<thead>
<tr>
<th>Lateral</th>
<th>Move up</th>
<th>Check</th>
</tr>
</thead>
</table>
| Left lateral  
  - Relieve possible compression of the inferior vena cava  
  - Uterine obstruction of venous return can produce hypotension and could precipitate arrest in the critically ill pt | Move up a bit – remember heart enlarges during pregnancy | Check Femoral pulse to see if compressions adequate |
Intubation

- Advance airway sooner
- Trachea is more narrow
- Smaller tube – 6.0
- Increased secretions
- Lungs are higher – listen higher
- ETCO₂ recommended

ALS OB (healthstream.com)
Perimortem C-Section

• Goal is to improve maternal and fetal outcomes
• Goal – 5 minutes!
• At 4 minutes with no ROSC
• 5 minutes
Perimortem C-Sections

• Taking Care of Mom is Taking Care of Baby
• Consider GA – 20 wks or > and singleton
  • 20 – 23 weeks mom benefits
  • 24 and greater both benefit
• Provider – Who can do C-Section?
• No Prep Indicated
• No need to go to OR
  • Scalpel
  • Provider
  • Gloves
Maternal Code

• UT Nashville OBGYN Residents: Management of Maternal Code - Bing video
References and Resources

• FINAL_AIM_Bundle_CCOC-Resources.pdf (safehealthcareforeverywoman.org)
• 2021 Iowa Maternal Mortality Review Committee Report.pdf
• Cardiac Arrest in Pregnancy In-Hospital ACLS Algorithm (heart.org)
• Urgent Maternal Warning Signs Educational Materials | CDC
• Pregnancy Mortality Surveillance System | Maternal and Infant Health | CDC
• Jugular Vein Distention: Symptoms and Causes (clevelandclinic.org)