Caring for the Pregnant Patient

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Emory University School Of Medicine
October 25, 2015
## Personal/Professional Financial Relationships with Industry

<table>
<thead>
<tr>
<th>External Industry Relationships *</th>
<th>Company Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity, stock, or options in biomedical industry companies or publishers</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Board of Directors or officer</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Royalties from Emory or from external entity</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Industry funds to Emory for my research</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
Why should Internists care about Obstetric Medicine?

- > 1/3 of pregnant women have medical illnesses
- Co-management of existing or new issues with OB-GYNs
- You WILL take care of women who may become pregnant
  - Preconception counseling
  - Majority of women – no prenatal care until after organogenesis
Organogenesis

- **AGE OF EMBRYO (IN WEEKS):**
  - 1: dividing zygote, implantation and gastrulation
  - 4: eye
  - 5: eye, heart
  - 6: ear
  - 7: teeth
  - 8: external genitalia
  - 9: brain
  - 16: CNS
  - 20-36: teeth
  - 38: external genitalia

- **LOSS OF CONCEPTUS:**
  - Major morphological abnormalities:
    - heart
    - upper limbs
    - eyes
    - lower limbs
    - palate
    - external genitalia
    - ear

- **FUNCTIONAL DEFECTS AND MINOR MORPHOLOGICAL ABNORMALITIES:**
  - Timing of air pollution risks:
    - Interrupted placental development
    - Fetal growth restriction
    - Reduced weight gain
    - Early susceptibility to later preterm birth
    - Preterm birth
    - Heart defects

Note: Blue bars indicate time periods when major morphological abnormalities can occur, while light blue bars correspond to periods at risk for minor abnormalities and functional defects.
Question 1

A 26 year-old female who is 22 weeks pregnant comes to your office for a work physical.
Q1. Which of the following is an abnormal exam finding in pregnancy?

A. RR of 22/ min
B. HR of 110/ min
C. 2/6 syst murmur LSB
D. 2/6 diast murmur
E. B/L LE edema
# Pregnancy Cardiac Physiology

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systemic Vascular Resistance and BP</td>
<td>↓</td>
</tr>
<tr>
<td>Cardiac Output</td>
<td>↑</td>
</tr>
<tr>
<td>Systolic murmurs NORMAL if $\leq 3/6$ in severity</td>
<td>DIASTOLIC are NOT normal</td>
</tr>
<tr>
<td>Blood Volume (plasma $&gt;\text{RBC}$)</td>
<td>↑</td>
</tr>
</tbody>
</table>
ECHO = Exam of Choice for any valvular abnormality

- Diastolic murmur
- Loud (>3/6) systolic murmur
- Fixed split S2
- Opening snap
- Unclear etiology of murmur
Pregnant Women With Medical Conditions

- Healthy mom = Healthy baby
- How does pregnancy affect mom?
- How will mom’s condition affect pregnancy?
- Modify therapy as needed
A 30 year old primagravid female at 14 weeks gestation is referred to you because of BP measurements on successive visits of 148/98, 160/110, 150/105. PE is unremarkable except for a 2/6 SEM at the LSB. All blood and urine labs are within normal limits.
Q2. What is the diagnosis?

1. Chronic HTN - 34%
2. Preeclampsia - 6%
3. Eclampsia - 0%
4. Preeclampsia on chronic HTN - 2%
5. Gestational HTN - 57%
4 Classes of Hypertension in Pregnancy

- Chronic hypertension
- Preeclampsia - eclampsia
- Preeclampsia superimposed upon chronic hypertension
- Gestational hypertension
Chronic Hypertension

- **Definition**: repeated BP >140/90
  - before pregnancy
  - before 20 weeks gestation
  - diagnosed for the first time during pregnancy and **does not normalize postpartum**
Preeclampsia

- Disease of late pregnancy - after 20 wks
- SBP $\geq 140$ or DBP $\geq 90$ mm Hg and proteinuria $\geq 0.3$ g/24h or prot/cr $\geq 0.3$
- Caused by defect in placental implantation
- Risk Factors:
  - Past h/o preeclampsia
  - Primagravid, AMA, multiples
  - FH of preeclampsia
  - Preexisting medical conditions: HTN, DM, BMI >26
Preeclampsia with Severe Features

- SBP >/= 160 or DBP >/= 110 on 2 occasions at least 4 hrs apart
- Proteinuria (300mg+/24hrs)- not required for Dx
- **New** cerebral or visual disturbances
- **New** renal insufficiency Cr > 1.1 or doubled
- Liver transaminases 2x nl or unexplained RUQ pain
- Platelets < 100,000
- Pulmonary edema
Preeclampsia: Complications

- DIC
- Eclampsia
  - Preeclampsia + SEIZURE
- Cerebral Hemorrhage
- Pulmonary Edema
- Renal Failure
- Placental Abruption
- Hepatic Failure
- Hepatic Rupture
- HELLP Syndrome
  - Hemolysis
  - Elevated Liver enzymes
  - Low Platelets
Gestational Hypertension

- Blood pressure elevation for the first time after mid-pregnancy without proteinuria
- Transient hypertension
  - no preeclampsia
  - blood pressure normalizes by 12 weeks postpartum (unlike chronic HTN)
- Final diagnosis assigned postpartum
### Hypertension Summary

<table>
<thead>
<tr>
<th></th>
<th>Onset</th>
<th>Findings</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chronic HTN</strong></td>
<td>BEFORE 20 weeks/ pre-pregnancy</td>
<td>Hypertension NO protein</td>
<td>Does NOT normalize postpartum</td>
</tr>
<tr>
<td><strong>Preeclampsia</strong></td>
<td>AFTER 20 weeks (usually &gt;36 weeks)</td>
<td>Hypertension Proteinuria Uric acid</td>
<td>Delivery or by 12 weeks postpartum</td>
</tr>
<tr>
<td><strong>Gestational HTN</strong></td>
<td>AFTER 20 weeks</td>
<td>Hypertension NO protein</td>
<td>By 12 weeks postpartum (retrospective)</td>
</tr>
</tbody>
</table>
Prescribing in Pregnancy

- How severe are the symptoms/illnesses?
  - Can lifestyle changes be recommended?

- What would happen to the mother and fetus if you didn’t give the medicine?

- A useful treatment should **not** be stopped without good reason if condition is controlled but...is there a similar drug that’s safer?

- In general, **older = safer**

- **Avoid in 1st trimester** if possible
## FDA Pregnancy Risk Classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Controlled studies show NO RISK</td>
</tr>
<tr>
<td>B</td>
<td>No evidence of risk in humans</td>
</tr>
<tr>
<td>C</td>
<td>Risk cannot be ruled out</td>
</tr>
<tr>
<td>D</td>
<td>Positive evidence of risk</td>
</tr>
<tr>
<td>X</td>
<td>Contraindicated in pregnancy</td>
</tr>
</tbody>
</table>

Carefully consider Risks vs. Benefits!
A 30 year old primagravid female at 14 weeks gestation is referred to you because of BP measurements on successive visits of 160/100, 158/110, 150/106. PE is unremarkable except for a 3/6 SEM at the LSB. All labs are within normal limits.
Q2b. What is the best way for you to manage her condition at this time?

1. HCTZ
2. Atenolol
3. Labetalol
4. Lisinopril
5. Bed rest and salt restriction
*Treatment of HTN in Pregnancy*

- SBP >160 or DBP ≥ 105 mm Hg: treat with **meds**
- Goal SBP 120-160, DBP 80-105

- Below these cutoffs, meds have **not** been shown to improve fetal or maternal outcomes

- Do not treat with weight loss or severe salt restriction

- Bed rest *may* help but may also increase risk of VTE

- Reduce activity for Preeclampsia
## Medications for HTN in Pregnancy

<table>
<thead>
<tr>
<th>Use Justified WHEN INDICATED</th>
<th>Use Justified in RARE Situations</th>
<th>Use almost NEVER Justified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labetalol (DOC)</td>
<td>Other CCBs</td>
<td>ACEI ARBs</td>
</tr>
<tr>
<td>Alpha-Methyldopa</td>
<td>Other B-bl Hydralazine</td>
<td></td>
</tr>
<tr>
<td>Nifedipine</td>
<td>Clonidine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prazosin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HCTZ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diazoxide</td>
<td></td>
</tr>
</tbody>
</table>
Preeclampsia Treatment

- Rx if SBP > 150 or DBP > 95-100
- Parenteral Rx if close to delivery
  - Hydralazine or Labetalol 1st line
  - NOT Nitroprusside - risk of cyanide toxicity
- Drug of choice to prevent seizures: Magnesium sulfate IV

Delivery is the only cure
A 35 year-old patient with type 2 diabetes for 4 years just found out she is 4 weeks pregnant. Her A1C today on Glipizide is 7.4. What would you do now?
Q3. How would you manage her Type 2 Diabetes?

1. Diet alone
2. Metformin
3. Metformin + Glipizide
4. NPH + Lispro
5. Glargine
Pregnancy and Diabetes: Complications

- Preeclampsia
- Hydramnios
- Macrosomia/ Large for Gestational Age
- Fetal organomegaly
- Neonatal respiratory issues

These risks increase as maternal FPG > 75 mg/dL and as 1-hr & 2-hr OGTT increase
Interventions for Pregnant Diabetics
ACOG and ADA

- Monitor BG before and 1 hour after meals, qhs
  - Goals: FPG $\leq 95$; 1 hr PP $\leq 140$

- Check A1C monthly- goal $< 6 \%$ throughout pregnancy, avoiding hypoglycemia

- Urine protein excretion and baseline kidney function

- Close ophtho f/u and laser Rx of proliferative retinopathy pre-delivery
# Medications for Diabetes in Pregnancy

<table>
<thead>
<tr>
<th>Use Justified WHEN INDICATED</th>
<th>Use Justified in RARE Situations</th>
<th>Use almost NEVER Justified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin NPH</td>
<td>Glargine/ Detemir (not enough data)</td>
<td>All other oral hypoglycemics</td>
</tr>
<tr>
<td>Regular</td>
<td>Glyburide Metformin</td>
<td></td>
</tr>
<tr>
<td>Lispro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspart</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Oral Hypoglycemic Agents in Pregnancy

- Only observational data on Glyburide and Metformin
- **NOT** as effective as insulin in all women
- **NOT** FDA approved for use in pregnancy
- Found to be safe in GDM if diet alone not enough
- ACOG: *use of oral agents should be limited and individualized*
  - Might continue Metformin
Question 4a

A 32 year old female who is 12 weeks pregnant just returned from a 5 hour car trip and complains of left leg swelling and SOB. You suspect a PE.
Q4. What is your first test of choice?

<table>
<thead>
<tr>
<th>Rank</th>
<th>Test</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spiral CT</td>
<td>13%</td>
</tr>
<tr>
<td>2</td>
<td>US of LE</td>
<td>83%</td>
</tr>
<tr>
<td>3</td>
<td>CXR</td>
<td>0%</td>
</tr>
<tr>
<td>4</td>
<td>Angiogram</td>
<td>2%</td>
</tr>
<tr>
<td>5</td>
<td>MRI</td>
<td>2%</td>
</tr>
</tbody>
</table>
## Pregnancy Physiology

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Physiologic Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>↑</td>
</tr>
<tr>
<td>Resting minute ventilation</td>
<td>↑</td>
</tr>
<tr>
<td>pCO₂</td>
<td>↓</td>
</tr>
<tr>
<td>Coagulation factors II, VII, VIII, X, XII and XIII</td>
<td>↑</td>
</tr>
<tr>
<td>Resistance to Activated Protein C</td>
<td>↑</td>
</tr>
<tr>
<td>Protein S Activity</td>
<td>↓</td>
</tr>
</tbody>
</table>
VTE in Pregnancy

- Risk of VTE increased 4-5x in pregnant as compared to non-pregnant women

- Postpartum, risk is 20x higher
  - 1/3rd of pregnancy related DVT and ½ of pregnancy related PE occur after delivery

- Prevalence of VTE- 2/1000 deliveries
  - 20% arterial; 80% venous

- 80% of VTE events are DVT
  - DVT in pregnancy is more likely to be proximal, massive, and in the LLE
Physiologic Risk Factors

- Mechanical obstruction by the uterus
- Decreased mobility
- Hypercoagulability- often does not return to baseline until 8 weeks postpartum
Radiation in Pregnancy

- < 50mGy of radiation negligible risk to fetus
- Linear no-threshold model for risk of cancer
  - Age at exposure
  - Linear relation to cumulative organ dose
- Remember to shield when possible
- **Avoid** “radioactive” studies, 1\textsuperscript{st} trimester MRI
- Necessary radiologic procedures should **NOT** be withheld because of fetal concerns
<table>
<thead>
<tr>
<th>Imaging Study</th>
<th>Radiation Exposure (rads)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head CT</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Chest X-ray</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>V/Q scan</td>
<td>0.01 - 0.02 Vent, 0.02 Perf</td>
</tr>
<tr>
<td>Pulm Angiogram</td>
<td>&lt;0.05 via brachial route, 0.2 - 0.3 via femoral route</td>
</tr>
<tr>
<td>Helical Chest CT</td>
<td>0.006-0.013</td>
</tr>
<tr>
<td>Abdominal X-ray</td>
<td>0.263</td>
</tr>
<tr>
<td>IVP</td>
<td>0.8 complete series, 0.2 limited series</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>None</td>
</tr>
<tr>
<td>MRI/MRA/MRV</td>
<td>None</td>
</tr>
</tbody>
</table>
VTE in Pregnancy

- US of LE, V/Q scans and pulmonary angiograms are all SAFE
- Rx for DVT & submassive PE the same so can start with compression US -> V/Q or angiogram as needed
Q4b. You diagnosed your pregnant patient with a DVT/PE. With what would you treat her?

1. Warfarin
2. Fondaparinux
3. **LMWH**
4. UFH
5. IVC filter

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Low molecular weight heparin

- First choice in the prevention and treatment of VTE in pregnant patients
- Frequency of significant bleeding - 2%
- Does not cross the placenta, so no fetal bleeding or teratogenicity risk
- Switch to IV UFH 24h before delivery
- Resume 6h post vaginal 12h post c-section, continue for at least 6w postpartum, total treatment duration 3m
Treatment of VTE in Pregnancy

- Unfractionated heparin
  - IV then SQ or SQ only
  - Follow anti-Xa levels
  - Stop 6h before epidural is placed
  - Continue for 6 weeks postpartum
  - Does not cross the placenta, so no fetal bleeding or teratogenicity risk

- IVC filter safe in pregnancy if needed
Not recommended

- Oral direct thrombin inhibitors
  - Dabigatran
- Vitamin K antagonists
- Anti-Xa inhibitors
  - Rivaroxaban
  - Apixaban
  - Edoxaban
Take Home Points

- Know normal pregnancy physiology
- In Hypertension dx, TIMING is important!
- Know preferred and **contraindicated** meds
  - Chronic HTN-Labetalol DOC
  - Preeclampsia- Labetalol or Hydralazine parenteral
  - DO NOT USE ACE-I/ARBs, Coumadin
  - Insulin preferred for diabetes
  - LMWH preferred for VTE

- You CAN do radiologic studies… if needed
WELL, IT'S A BOY; AND... OOO! THE FORCE IS REALLY STRONG WITH HIM!

DOES THE DARKSIDE RUN IN YOUR FAMILY?

GET YOUR CHILD'S MIDI-CHLORIANS CHECKED!
Questions?
References


- Ehenthal et al. More common than we think: chronic medical risks in a representative obstetric population. JGIM 2007;22(Suppl 1):53

- Effects of Medications on the Fetus and Nursing Infant: A Handbook for Health Care Professional by Friedman and Polifka

- Medical Care of the Pregnant Patient, 2nd ed. Rosene-Montella et al, 2007

- Medications In Pregnancy and Lactation by Briggs, Freeman, Yaffe
References


- Some material adapted from the Women and Infants Hospital’s “Obstetric Medicine Curriculum for Internal Medicine Residents” developed by Drs. Raymond Powrie, Karen Rosene-Montella et al


- Toppenberg et al. Safety of radiographic imaging during pregnancy. Am Fam Physician. 1999 Apr 1;59(7):1813-8, 1820


- Watkins C. Care of the peripartum patient. Medical Management of the Surgical Patient, p. 505-511
Evaluation

- Please take < 90 seconds to evaluate this session.
- Time permitting, speaker will take questions following evaluation.
- Responses are not displayed and are important in maintaining high quality education.
The overall performance of the speaker:

1. Poor
2. Fair
3. Average
4. Good
5. Excellent
How well were the learning objectives met?

1. Poor
2. Fair
3. Average
4. Good
5. Excellent
Did speaker present a balanced view of therapeutic options?

1. Yes
2. No
3. N/A

- Yes: 96%
- No: 4%
- N/A: 0%
How useful will this session be in your practice?

1. Poor
2. Fair
3. Average
4. Good
5. Excellent

- Poor: 0%
- Fair: 4%
- Average: 6%
- Good: 16%
- Excellent: 74%
As a result of this program, do you intend to change your patient care?

1. Yes  
2. No  

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer</td>
<td>82%</td>
<td>18%</td>
</tr>
</tbody>
</table>
Thank you!